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About Us

North Carolina State University (https://www.ncsu.edu/) (NC State) began as a land-grant institution grounded in agriculture and engineering. Today, we’re building a leading public research university that excels across disciplines.

NC State is a powerhouse in science, technology, engineering and math. We lead in agriculture, education, textiles, business and natural resources. We’re at the forefront of teaching and research in design, the humanities and the social sciences. And we’re home to one of the planet’s best colleges of veterinary medicine.

Our more than 36,000 undergraduate and graduate students learn by doing. They pursue research and start new companies. They forge connections with top employers and serve local and global communities. And they enjoy an outstanding return on investment.

Introduction

Founded March 7, 1887 by the North Carolina General Assembly under the provisions of the national Land-Grant Act, North Carolina State University is now one of the nation’s preeminent research institutions and the university of choice for accomplished, high-performing students from around the world.

NC State’s extensive public and private partnerships create a unique culture of collaboration to address the grand challenges facing society. The university’s solution-driven research, technology and scholarship lead to new ideas, products and services. It’s no wonder NC State is known for its forward-looking philosophy: Think and Do.

With more than 35,000 students and 8,000 faculty and staff, NC State is a comprehensive university known for its leadership in interdisciplinary innovation. As a leader in experiential education, NC State provides remarkable opportunities for students to put learning into practice and to develop career-ready skills.

The university is consistently ranked as a top-tier university by U.S. News & World Report and is regularly named by Kiplinger’s as a top-10 best value in public higher education, a ranking that combines academic quality and affordability. Because of this value, NC State students graduate with lower-than-average debt, according to U.S. News.

Beginning their freshman year, NC State students are able to explore their major right away — by conducting research alongside faculty or starting a challenging co-op or internship. NC State has a large and diverse student population with the feel of a tight-knit community.

NC State is located in the Research Triangle region, home to many of the country’s leading Fortune 500 technology, research and pharmaceutical companies. NC State’s Centennial Campus is home to more than 150 corporate and government research partners, incubator companies and NC State research units.

Mission, Vision and Values

Mission

As a research-extensive land-grant university, North Carolina State University is dedicated to excellent teaching, the creation and application of knowledge, and engagement with public and private partners. By uniting our strength in science and technology with a commitment to excellence in a comprehensive range of disciplines, NC State promotes an integrated approach to problem solving that transforms lives and provides leadership for social, economic, and technological development across North Carolina and around the world.

Vision

NC State University will emerge as a preeminent technological research university recognized around the globe for its innovative education and research addressing the grand challenges of society.

Values

Consonant with our history, mission, and vision, North Carolina State University affirms these core values:

- Integrity—in the pursuit, creation, application, and dissemination of knowledge
- Freedom—of thought and expression
- Respect—for cultural and intellectual diversity
- Responsibility—for individual actions and service to society
- Stewardship—in sustaining economic and natural resources
- Excellence—in all endeavors

History

Founded March 7, 1887 by the North Carolina General Assembly, the school—then known as the North Carolina College of Agriculture and Mechanic Arts—embodied ideals that were rapidly transforming the field of higher education. Chief among them was the belief that colleges should not be reserved for a select few and that the children of farmers, mechanics and other workers should have access to the opportunities and benefits of higher education.

NC State was established under the provisions of the Morrill Act of 1862, which allowed the U.S. government to donate federally owned land to the states for the purpose of establishing colleges that would teach “agriculture and the mechanic arts.” The brand-new school held its first classes in the fall of 1889 with 72 students, six faculty members and one building. In the early 1900s, a new federal program sparked an era of outreach work at the college. The 1914 passage of the Smith-Lever Act created an educational partnership between land-grant colleges and the U.S. Department of Agriculture. Under this new cooperative extension program, the colleges would send staff to meet with farmers around the state and provide practical agricultural instruction. This led North Carolina to establish the Cooperative Agricultural Extension Service (now the North Carolina Cooperative Extension Service (http://www.ces.ncsu.edu/)) at NC State.

By the 1920s, North Carolina State College (as the school was then known) was beginning to grow beyond its original agricultural and mechanical focus, adding schools of engineering, textiles, education and business, as well as a graduate school. The Depression posed economic challenges for higher education throughout the nation, and State College was no exception. As the crisis slowly eased, the college renewed its growth, adding students and developing new programs until the onset of World War II. State College contributed to the war effort by hosting a number of military detachments and training exercises and by refitting the work of several departments and programs to military and defense purposes.

The campus experienced unparalleled growth during the postwar years as the G.I. Bill brought thousands of former servicemen to campus. In the following decades, the college continued to expand its curricula, creating schools of design, forestry, physical and mathematical sciences,
and humanities and social sciences. During these years of growth, the name was changed again, this time to North Carolina State University at Raleigh—the university’s current official name.

The university celebrated its 100th anniversary in 1987, which also saw the creation of Centennial Campus (http://centennial.ncsu.edu/), bringing together academic, corporate, government and nonprofit leaders to partner in teaching, research and economic development.

NC State has developed into a vital educational and economic resource, with more than 34,000 students and 8,000 faculty and staff. A wealth of university outreach and extension programs continue to provide services and education to all sectors of the state’s economy and its citizens. Consistently ranked a best value (http://www.kiplinger.com/tools/colleges/school.php?id=7794/) among the nation’s public universities, NC State—the state’s largest university—is an active, vital part of North Carolina life. Today, more than 128 years after its founding, NC State continues to follow its original mission: opening the doors of higher education to the citizens of North Carolina and providing teaching, research and extension that strengthen the state and its economy.

**Campus**

NC State University is located west of downtown Raleigh on 2,099 acres. The campus acreage includes Centennial Campus on 1,105 acres and Centennial Biomedical Campus on 215 acres. West Campus includes the College of Veterinary Medicine and the stadium/arena complex. Nearby are research farms, biology and ecology sites, horticulture and floriculture nurseries and research forests that cover an additional 3,000 acres. Elsewhere across the state are research farms and 4-H camps.

**Research Triangle Park**

NC State is one of three nationally renowned research universities in the Triangle area, along with Duke University in Durham and the University of North Carolina at Chapel Hill. Within the 30 mile triangle formed by the three universities is Research Triangle Park, a 7,000-acre research park founded in 1959 by leaders in academia, business and government. Today, Research Triangle Park is home to some of the most innovative technology and research-based companies in the world.

**Faculty**

The university has 9,553 employees, including 2,360 faculty. Among the many honors and recognitions received by members of the faculty are 9 memberships in the National Academy of Sciences, 18 memberships in the National Academy of Engineering, one membership in the Institute of Medicine, and 778 members of NC State’s Academy of Outstanding Teachers.

**Students**

In the 2018 Fall Semester, the university’s head count enrollment totaled 35,479. Included in this number were 25,199 students in undergraduate degree programs, 10,280 in graduate degree programs, 400 First Professional and 1,801 non-degree-seeking students. The total enrollments by college were:

- Agriculture and Life Sciences - 3,575
- Design - 841
- Education - 1,717
- Engineering - 9,617
- Natural Resources - 1,976
- Humanities and Social Sciences - 4,480
- Management - 3,947
- Sciences - 4,070
- Textiles - 1,110
- Veterinary Medicine - 483
- Division of Academic and Student Affairs - 1,345

The student population included 2,055 African American students, 4,190 other non-white students, and 16,562 female students. Students at the university come from 56 states (including DC and territories) and 132 foreign countries. The international enrollment is a distinctive feature of the institution as 4,068 international students give the campus a cosmopolitan atmosphere.

**Outreach and Extension**

As North Carolina’s flagship research intensive, community engaged land-grant university, NC State has a unique mission to serve the citizens of this state through technical assistance, professional development, lifelong education, technology transfer, and other means of applying knowledge to real world issues and problems. Faculty, students, and staff from all ten academic colleges and other units engage in collaborative research, learning, and service partnerships with business, industry, government, and communities, in the Triangle region and across the state. Extension and engagement imperatives include economic development, environmental stewardship, K-12 education, leadership development, and entrepreneur support. NC State’s Office of Extension, Engagement, and Economic Development reaches over one million citizens annually through Cooperative Extension, Industrial Extension, McKimmon Center for Extension and Continuing Education, NC State’s Economic Development Partnership, the General Hugh Shelton Leadership Center, and the North Carolina Small Business and Technology Development Center.

**Administration**

NC State is one of 16 constituent institutions of the multi-campus University of North Carolina system (http://www.northcarolina.edu/). The UNC Board of Governors is the policy-making body legally charged with “the general determination, control, supervision, management, and governance of all affairs, of the constituent institutions.”

NC State is a member of the National Association of State Universities and Land-Grant Colleges. It is also a member of the American Council on Education, the College Entrance Examination Board, the Council of Graduate Schools, the National Commission on Accrediting and the Southern Association of Colleges and Schools.

North Carolina State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (http://www.sacscoc.org/) to award associate, baccalaureate, master’s and doctoral degrees. Contact the:

Commission on Colleges
1866 Southern Lane
Decatur, Georgia, 30033-4097

Or call 404-679-4500 for questions about the accreditation of North Carolina State University. We are providing this contact information here to enable interested constituents:
1. to learn about the accreditation status of NC State,
2. to file a third-party comment at the time of NC State’s decennial review, or
3. to file a complaint against the institution for alleged non-compliance with a standard or requirement.

Normal inquiries about NC State, such as admission requirements, financial aid, educational programs, etc., should be addressed directly to the university and not the Commission’s office.

Executive Officers (https://leadership.ncsu.edu/)
Board of Trustees (https://leadership.ncsu.edu/board-of-trustees/)
UNC Board of Governors (http://www.northcarolina.edu/apps/bog/members.htm)

University Administration

Office of the Chancellor
W. Randolph Woodson, Chancellor
P.J. Teal, Secretary of the University
Lindsay Recchie, Assistant to the Chancellor
Maggie Thompson, Chancellor’s Communications Specialist
Mary Catherine Cole, Program Associate
Lisa Pierson, Business Officer

Office of the Executive Vice Chancellor and Provost
Warwick A. Arden, Executive Vice Chancellor and Provost
Dr. Mark Bernahard, Vice Provost for Continuing Education
Leslie Boney, Vice Provost for Outreach and Engagement
Dr. Fashaad Crawford, Vice Provost for Assessment and Accreditation
Dr. Louis Hunt, Senior Vice Provost for Enrollment Management and Services
Dr. Duane Larick, Senior Vice Provost for Academic Strategy and Resource Management and Chief of Staff
Dr. Bailian Li, Senior Vice Provost for Global Engagement
Dr. Thomas K. Miller, Senior Vice Provost for Academic Outreach and Entrepreneurship
Dr. Margery Overton, Senior Vice Provost for Institutional Strategy and Analysis
Greg Raschke, Senior Vice Provost and Director of Libraries
Sheri Schwab, Vice Provost for Institutional Equity and Diversity
Dr. Katharine Stewart, Vice Provost for Faculty Affairs

Chancellor’s Cabinet
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Brad Bohlander, Chief Communications Officer, Associate Vice Chancellor of University Communications
Boo Corrigan, Director of Athletics
Marc I. Hoit, Vice Chancellor for Information Technology
Kevin Howell, Vice Chancellor for External Affairs, Partnerships and Economic Development
Charles Maimone, Vice Chancellor for Finance and Administration
Allison Newhart, Vice Chancellor and General Counsel
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P.J. Teal, Secretary of the University and Assistant to the Chancellor
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Marie Williams, Associate Vice Chancellor for Human Resources
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Dr. Frank Buckless, Stephen P. Zelnak, Jr. Dean of the Poole College of Management
Dr. Mary Ann Danowitz, College of Education
Dr. Myron Floyd, College of Natural Resources
Dr. Peter Harries, The Graduate School
Dr. David Hinks, Wilson College of Textiles
Dr. Mark Hoversten, College of Design
Dr. Richard Linton, College of Agriculture and Life Sciences
Dr. D. Paul Lunn, College of Veterinary Medicine
Dr. Louis Martin-Vega, College of Engineering
Dr. Christine McGahan, College of Sciences
Bret Smith, Interim, University College, Division of Academic and Student Affairs

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Melanie Flowers, Student Body President

University Council
Melanie Flowers, Student Body President
Pat Gaddy, Chair-Elect, Staff Senate
Cecile Hinson, Director, Internal Audit
Hans Kellner, Chair of the Faculty
Margery Overton, Senior Vice Provost for Institutional Research and Planning
Greg Raschke, Senior Vice Provost and Director of Libraries
Coleman Simpson, Student Senate President
Janice Sitzes, Staff Senate Chair
Benny Suggs, Associate Vice Chancellor for Alumni Relations
James Withrow, Graduate Student Association President
*The University Council is also composed of the chancellor’s cabinet and the deans of the colleges.

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University of North Carolina System Board of Governors
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Pearl Burrus-Floyd, Secretary
Darrell Allison
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C. Philip Byers
Jimmy D. Clark
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Art Pope
David Powers
Temple Sloan
Dwight D. Stone
Michael Williford

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Jim Ptaszynski, Vice President for Digital Learning
Lynne Sanders, Vice President for Compliance & Audit
Keith Werner, Vice President for Information Technology & Chief Information Officer
Academic Calendar

Fall 2020 Semester

<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Day(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 10</td>
<td>Monday</td>
<td>First day of classes</td>
</tr>
<tr>
<td>November 13</td>
<td>Friday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>November 16-20</td>
<td>Mon - Fri</td>
<td>Final examinations</td>
</tr>
<tr>
<td>December 4</td>
<td>Friday</td>
<td>Fall Degree Conferral</td>
</tr>
<tr>
<td>December 24 - January 1</td>
<td>Thur - Fri</td>
<td>Winter Break</td>
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Spring 2021 Semester

<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Day(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 11</td>
<td>Monday</td>
<td>First day of classes</td>
</tr>
<tr>
<td>January 18</td>
<td>Monday</td>
<td>Holiday (Martin Luther King, Jr. Day); university closed</td>
</tr>
<tr>
<td>March 15-19</td>
<td>Mon - Fri</td>
<td>Spring break; no classes</td>
</tr>
<tr>
<td>April 29</td>
<td>Thursday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>April 30</td>
<td>Friday</td>
<td>Reading Day</td>
</tr>
<tr>
<td>May 3-11</td>
<td>Mon - Tue</td>
<td>Final examinations</td>
</tr>
<tr>
<td>May 15</td>
<td>Saturday</td>
<td>Spring Commencement Exercises</td>
</tr>
</tbody>
</table>

Summer 2021 Session I

<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Day(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 19</td>
<td>Wednesday</td>
<td>First day of classes</td>
</tr>
<tr>
<td>May 31</td>
<td>Monday</td>
<td>Holiday (Memorial Day); university closed</td>
</tr>
<tr>
<td>June 22</td>
<td>Tuesday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>June 23-24</td>
<td>Wed - Thur</td>
<td>Final examinations</td>
</tr>
</tbody>
</table>

Summer 2021 Session II

<table>
<thead>
<tr>
<th>Date(s)</th>
<th>Day(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 28</td>
<td>Monday</td>
<td>First day of classes</td>
</tr>
<tr>
<td>July 5</td>
<td>Monday</td>
<td>Holiday (Independence Day); university closed</td>
</tr>
<tr>
<td>July 30</td>
<td>Friday</td>
<td>Last day of classes</td>
</tr>
<tr>
<td>August 2-3</td>
<td>Mon - Tue</td>
<td>Final examinations</td>
</tr>
</tbody>
</table>

Note: Dates in this publication are those that have been approved by appropriate agencies of the university at the time of publication (July 2020). Changes may be announced in official university publications subsequent to this publication and maintained on the S (http://www.ncsu.edu/registrar/calendars/) and Student Services Center website (https://go.ncsu.edu/academiccalendar/).

Admission and Enrollment

View the following links for helpful information about the various paths to admission to NC State, enrollment options and procedures, financial aid eligibility, and university tuition and fees.

- Admission (p. 16)
- Enrollment (Registration) (p. 23)
- Financial Aid (p. 25)
- International Programs and Activities (p. 26)
- Supplemental Academic Programs (p. 28)
- Tuition and Fees (Graduate) (p. 29)
- Tuition and Fees (Undergraduate) (p. 29)

Admission

What best describes the type of student you are? Are you looking to attend NC State for one of our outstanding undergraduate baccalaureate degree programs? Are you thinking about pursing your doctoral degree here? Or, do you want to explore some of our course offerings as a Non-Degree Study student? Check out the links below to view admissions requirements and procedures based on your academic history, needs and goals.

- Undergraduate Admission (p. 16)
- Graduate Admission (p. 20)
- Non-Degree Studies (p. 22)
- Readmission (p. 23)

Undergraduate Admission

NC State is a member of the Common Application (http://www.commonapp.org/) and the Coalition for Access, Affordability, and Success (http://www.coalitionforcollegeaccess.org/). Students may choose to apply through either application system. Undergraduate Admissions implements a notification date system for both domestic freshman and transfer applicants. International applicants are notified of their admission decision on a rolling basis once their application is complete. Freshmen are strongly encouraged to apply during the fall of their senior year in high school by the early action deadline.

Application Dates and Deadlines (https://admissions.ncsu.edu/apply/dates-and-deadlines/)

Freshman and transfer applicants for the College of Design and Fashion and Textile Design program must submit a complete application including a portfolio and additional essay by November 1 and list it as their first choice major.

All applications for the spring semester should be submitted prior to October 1. A few programs do not accept applications for spring entry including applied mathematics and mathematics, College of Design studio-based majors, College of Engineering, Exploratory Studies, fashion and textile design, physics and statistics.

Students are notified of their decision on their wolfPAW account (https://wolfpaw.ncsu.edu/Default.asp) and admitted students (https://admissions.ncsu.edu/enroll/) must confirm their enrollment by May 1, or within ten days of if they are accepted after May 1.
The Undergraduate Admissions website (http://admissions.ncsu.edu/) provides more information on the application review process and procedure.

Office of Undergraduate Admissions
NC State University
121 Peele Hall
Campus Box 7103
10 Watauga Club Drive
Raleigh, NC 27607
Phone: 919-515-2434
Email: undergrad-admissions@ncsu.edu

Jon Westover, Associate Vice Provost and Director of Undergraduate Admissions

Admission to the university is highly competitive. Applicants are asked to indicate their first and second choices for a curriculum, including undeclared majors within a college, or, if undecided, to indicate their choice of participating in University College Exploratory Studies. Applicants not admitted in their first curriculum choice will be reviewed for admission in their second curriculum choice. The admissions decision is based on a holistic review of a complete application. Of primary importance is the high school record, including the level and difficulty of the courses taken, the overall grade point average, rank in class, and scores on the SAT or the ACT. Extracurricular involvement, leadership, and many other factors are also considered.

Admissions Requirements

The Board of Governors of the University of North Carolina System has determined that the Minimum Course Requirements (MCR) for all constituent institutions, including NC State, shall include a high school diploma or its equivalent and the following course units taken in high school:

1. Six course units in language, including
   - Four units in English
   - Two units in a language other than English
2. Four course units of mathematics in any of the following combinations:
   - Algebra I and II, Geometry, and one unit beyond Algebra II
   - Algebra I and II, and two units beyond Algebra II or
   - Integrated Math I, II, III and one unit beyond Integrated Math III
3. Three course units in science, including
   - At least one unit in a life or biological science, and
   - At least one unit in physical science, and
   - At least one laboratory course
4. Two course units in social studies, including
   - One unit in U.S. history
   - One other unit in social studies

Competitive applicants will typically exceed these minimum courses. It is recommended that every student take a foreign language course and a mathematics course in their senior year.

NC State does not conduct individual interviews with applicants, however, students are always welcome to walk-in and meet with an admissions officer at NC State's Joyner Visitor Center. Information sessions and student led campus tours are also available Monday through Friday at the Joyner Visitor Center (http://admissions.ncsu.edu/visit/schedule-your-visit/).

How to Apply

1. Review our deadlines: The application opens in August
2. Complete the application through the Common App or the Coalition App; we do not have a preference. Applicants for Studio-Based Majors will also need to submit a portfolio.
3. Pay the $85 application fee, or provide an official fee waiver.
4. Self-report your test scores. Visit our website (https://admissions.ncsu.edu/apply/freshmen/application-process/) for more information and for our school codes.
5. Submit your official academic transcript.
6. Check your status in your wolfPAW (https://apply.ncsu.edu/portal/wolfpaw/) account throughout the application process.

Admissions Dates and Deadlines

Decisions are released on the corresponding notification date as long as the application is complete by the deadline.

Fall Entry Early Action:
   - Deadline: November 1
   - Notification Date: January 30

Fall Entry Regular Decision:
   - Deadline: January 15
   - Notification Date: March 30

Spring Entry Regular Decision:
   - Deadline: October 1
   - Notification Date: December 1

Some programs do not accept applications for spring entry. Visit our website for details.

Studio-Based Majors

The following programs are considered studio-based majors and are fall entry only:

- Architecture
- Art & Design
- Fashion & Textile Design
- Graphic Design
- Industrial Design

Application Deadline: November 1
Portfolio and Optional Essay Due: November 1

Agricultural Institute

NC State’s 2-year Agricultural Institute (AGI) (p. 81) accepts freshman and transfer applicants.

Fall Entry:
   - Deadline: June 1
   - Decision Date: Rolling
Spring Entry:

• Deadline: November 1
• Decision Date: Rolling

Credit Opportunities
Students can jump-start their college careers by acquiring pre-enrollment credits by one or more of the following means:

1. by passing a proficiency examination administered by a teaching department at NC State;
2. by meeting a specific minimum score on certain Advance Placement Program (AP), International Baccalaureate (IB) examinations, and/or A and AS Level Equivalencies; and/or
3. by attaining a minimum score on certain College Level Examination Program (CLEP) subject tests.

Learn about the recognized test curriculum, accepted test scores and credit awarded at admissions.ncsu.edu/apply/credit-opportunities (http://admissions.ncsu.edu/apply/credit-opportunities/).

Out-of-State Students
Undergraduate applicants from outside North Carolina are reviewed using the same criteria as applicants from North Carolina. NC State is limited to enrolling not more than 18 percent of total new undergraduate students from outside the state as set forth by the University of North Carolina System.

The path to NC State is not always direct. About 20 percent of our students start their college career at another college or university. All transfer applicants should have at least 30 transferable college credit hours completed, including specific coursework and a competitive GPA based on the major you are applying for. Meeting these recommendations does not guarantee admission but sets you up to be considered a competitive applicant in the review process. View our recommendations for competitive applicants (https://admissions.ncsu.edu/apply/transfers/application-review/#recommendations-for-competitive-applicants).

What We Look For
Here are some of the items we’re looking at when evaluating your transfer application to NC State:

1. Your college coursework and GPA
2. Your high school coursework and test scores if you have less than 30 transferable college semester credit hours completed
3. Your interest in the program you’re applying for
4. Your accomplishments/involvement outside of the classroom
5. Your background and opportunities
6. Your individual story

Visit our Transfer Admissions website (https://admissions.ncsu.edu/apply/transfers/application-review/) for more information and recommendations for competitive transfer applicants. Students are always welcome to walk in and meet with an admissions officer at NC State’s Joyner Visitor Center. Information sessions and student led campus tours are also available Monday through Friday at the Joyner Visitor Center (http://admissions.ncsu.edu/visit/schedule-your-visit/).

How to Apply
1. Review our deadlines: The application opens in August. Be sure to pay attention to additional requirements and timelines for Studio-Based Majors and the Agricultural Institute.
2. Plan your path, and review our recommendations for competitive applicants.
3. Complete the application through the Common App (http://commonapp.org/) or the Coalition App (http://www.coalitionforcollegeaccess.org/); we do not have a preference. Applicants for Studio-Based Majors will also need to submit a portfolio.
4. Pay the application fee or provide an official fee waiver.
5. Submit your official academic transcript(s) from each institution you have attended.
6. Check your status in your wolfPAW (https://apply.ncsu.edu/portal/wolfpaw/) account throughout the application process.

Admissions Dates and Deadlines
Decisions are released on the corresponding notification date as long as the application is complete by the deadline.

Fall Entry Regular Decision:
• Deadline: January 15
• Notification Date: March 30

Spring Entry Regular Decision:
• Deadline: October 1
• Notification Date: December 1

Some programs do not accept applications for spring entry. Visit our website for details.

Studio-Based Majors
The following programs are considered studio-based majors and are fall entry only:

• Architecture
• Art & Design
• Fashion & Textile Design
• Graphic Design
• Industrial Design

Application Deadline: November 1
Portfolio and Optional Essay Due: November 1

Agricultural Institute
NC State’s 2-year Agricultural Institute (AGI) (p. 81) accepts freshman and transfer applicants.

Fall Entry:
• Deadline: June 1
• Decision Date: Rolling

Spring Entry:
Transfer Credit

Search our transfer course equivalency database (https://www.acs.ncsu.edu/php/transfer/) to get an initial idea of which course credits from other institutions transfer to NC State. An official course evaluation is provided to students once they are admitted.

Visit Us
Transfer Admissions Center
Joyner Visitor Center
1210 Varsity Drive
Raleigh, NC 27607
Phone: 919-513-1200

At NC State we value diversity and welcome international students. Located in Raleigh, North Carolina, we are proud to be home to the most diverse student body in North Carolina hosting students from 117 different countries.

The Office of International Services (https://internationalservices.ncsu.edu/future-students/) is the main resource for international students regarding immigration regulations, university policies, employment and travel. They provide assistance to you and your family as you prepare to arrive on campus and to smooth the transition to studying in the U.S.

What We Look For

Here are some of the items we're looking at when evaluating your transfer application to NC State:

1. Your Academic Achievement
3. Your level of English language skills
4. Your interest in the program you are applying for
5. Your accomplishments/involvement outside the classroom
6. Your background and opportunities
7. Your individual story

Visit our International Admissions website (https://admissions.ncsu.edu/apply/international/international-application-review/) for more information on application considerations, including interactive interviews (for Chinese applicants) and SAT or ACT composite scores (for Freshman applicants only).

How to Apply


1. Review our deadlines: The application opens in August. Be sure to pay attention to additional requirements and timelines for Studio-Based Majors and the Agricultural Institute.
2. Complete the application through the Common App (http://www.commonapp.org/) or the Coalition App (http://www.coalitionforcollegeaccess.org/); we do not have a preference. Applicants for Studio-Based Majors will also need to submit a portfolio.
3. Pay the application fee ($100 for international applicants).
4. Submit your academic credentials. Visit our website for details.
5. Show proof of English proficiency (https://admissions.ncsu.edu/apply/international/international-application-review/), if you are not from a country where English is the official or commonly spoken language.
6. Check your status in your wolfPAW (https://apply.ncsu.edu/portal/wolfpaw/) account throughout the application process.

Admissions Dates and Deadlines

Decisions are released on the corresponding notification date as long as the application is complete by the deadline.

Fall Entry Early Action:
• Deadline: November 1
• Notification Date: January 30

Fall Entry Regular Decision:
• Deadline: January 15
• Notification Date: March 30

International applicants must apply by the deadline and will have their admissions decisions released on a rolling basis once your application is complete.

Spring Entry Regular Decision:
• Deadline: October 1
• Notification Date: December 1

Some programs do not accept applications for spring entry. Visit our website for details.

Studio-Based Majors

The following programs are considered studio-based majors and are fall entry only:
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**Fall Entry:**
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**Spring Entry:**
- Deadline: November 1
- Decision Date: Rolling

**Use of Agents or Educational Agencies**

NC State does not partner with incentive-based agents or educational agencies to represent the University or to administer any part of the application process.

We recognize that in many countries agents or consultants are retained by students and their families to assist in applying to universities in the United States. It is not necessary to engage an agent in order to have a strong chance of admission to NC State. Admission decisions are not based on the recommendations of agents.

NC State expects an application to be the work of the applicant and that all information on the application is complete, accurate and truthful. We may reject application materials, cancel an admissions offer or dismiss a student from attendance, if it is determined that application materials have been falsified.

It is critical that applicants use their own email address, phone number, and mailing address on their application to ensure that all communication from NC State is delivered in an accurate and timely manner. Missing any important communication from NC State may delay applicants’ application process and admission decisions.

**Financial and Immigration Information**

All international applicants seeking an F-1 or J-1 student visa must submit a Certificate of Financial Responsibility (CFR) as part of the admission process. The purpose of this form is to certify financial solvency for the student throughout his/her program of study - this is a federal requirement that must be met before the Office of Undergraduate Admissions can issue any visa certificates.

In addition, applicants deemed admissible who are already in the U.S. must also fill out a Visa Clearance Form (VCF). This includes international applicants who are in a nonimmigrant visa category other than F-1 or J-1 (ex: H-4, L-2, DACA, E-2, Pending Permanent resident etc.). These applicants are not required to complete a CFR, unless they plan to change to F-1 or J-1 student status (if eligible).

CFR and VCF forms are reviewed by the Office of Undergraduate Admissions upon receipt. If the information provided by the applicant is incomplete or not acceptable (e.g. sponsor and bank official signatures, bank statements, etc.), the applicant will be notified that his/her documents were not approved and why. Notification is done via e-mail. The applicant will then have an opportunity to correct the problem(s) and resubmit the form(s). Applicants can check the status of their applications through their WolfPAW account.

Once the applicant is considered admitted (fully or conditionally) to the University, the Office of Undergraduate Admissions mails out the appropriate Certificate of Eligibility (Form I-20 for an F-1 visa or Form DS-2019 for a J-1 visa) along with the full admission letter and other important pre-arrival information. Newly fully admitted international students will also receive information and guidance from the Office of International Services (OIS) via email prior to their arrival to NC State. Conditionally admitted international students will received information from the Intensive English Program (IEP) prior to their arrival as well.

New F-1 and J-1 international students must check-in with the Office of International Services upon arrival to campus and attend the New International Student Orientation, which is scheduled a few days before the semester begins.

New international students who are accepted to NC State have the opportunity to participate in a Summer Start program during the month of July before fall classes begin. More information can be found here. [https://newstudents.dasa.ncsu.edu/summerstart/](https://newstudents.dasa.ncsu.edu/summerstart/)

**Contact Us**

**Office of Undergraduate Admissions**

Jeong Powell
Director, International Admissions and Recruitment
Phone: 919-515-2434
Email: jcpowell@ncsu.edu

**Graduate Admission**

For a list of graduate degrees, details on the programs, and admissions information, please consult the Graduate Programs website ([https://grad.ncsu.edu/programs/](https://grad.ncsu.edu/programs/)).

The Graduate School is committed to provide a transformative experience for graduate students and postdoctoral researchers at NC State by preparing these talented individuals to become true leaders ready to tackle the major challenges facing our state, nation, and world. NC State is recognized as a national leader in the STEM disciplines, and the University supports advanced study and innovative research in numerous fields, including agriculture, life sciences, design, education, engineering, natural resources, humanities and social sciences, management, textiles, and veterinary medicine, along with many exciting interdisciplinary programs.

NC State currently offers over 160 master’s programs and more than 60 doctoral programs in both traditional and emerging disciplines, including biomedical engineering, biotechnology, genomics, geographical information systems, nanotechnology, and natural resources. The University also offers a broad range of certificate programs that afford graduate students and postdoctoral scholars with opportunities to collect certification for key skills and knowledge. Moreover, several Professional Science Master’s programs are offered that tailor educational outcomes to employer needs.

The Graduate School also proudly offers numerous professional development experiences throughout the year. These opportunities are meant to endow graduate students and postdoctoral scholars with a competitive edge that enhances their ability to land jobs and to experience long-term career success. Graduate School professional development programming incorporates training that pertains to four core competency areas: professional and personal development, leadership and management, academic development, and communication.
Signature programs include the Notes From the Field seminar series, the Transition to Industry Immersion Program, the Dissertation and Thesis Institute, the Teaching and Communication Certificate program, the Preparing Future Faculty program, the STEM Faculty Launch program, the Team Case Studies course, and the Job Search Strategies course.

The criteria used for admissions decisions vary according to programs and schools/colleges, reflect an evaluation of the applicant’s potential for graduate work, and consider the ability of a program to accommodate additional students. Commonly, departmental admissions committees consider requests for admission and forward their recommendations to the Graduate School. However, Graduate School regulations govern the criteria for the classification of graduate student status.

Applications and all supporting documents must be received on or before the priority deadlines OR the Program Deadlines (https://grad.ncsu.edu/programs/), whichever is earlier. Please be aware of specific program deadlines (https://grad.ncsu.edu/programs/), as many are earlier than the Graduate School priority deadlines. All application fees are totally non-refundable. Note that applications must be submitted to the Graduate School by midnight Eastern Standard Time on the deadline.

The Graduate School (https://grad.ncsu.edu/)
1020 Main Campus Drive, Box 7102
Raleigh, NC 27695

For a list of graduate degrees, details on the programs, and admissions information, please consult the Graduate Programs website (https://grad.ncsu.edu/programs/).

Applications and all supporting documents must be received on or before the priority deadlines OR the Program Deadlines (https://grad.ncsu.edu/programs/), whichever is earlier. Please be aware that many program deadlines are earlier than the Graduate School priority deadlines.

**Domestic Applicants**

- Unofficial transcripts from all colleges and universities previously attended
  - If you are currently enrolled in an institution taking courses, you will need to provide a list of courses in progress
  - All foreign transcripts must be translated to English through a certified Credential Evaluation Service
  - Official transcripts and statements of degree will be required if you are recommended for admission
- 3 Recommendations from people who know your academic record and potential for graduate study
  - All recommendation letters are submitted online through a link that will be sent to each recommender's email once their information is listed on the recommendation list
- Standardized Test Scores
  - Depending on the prospective program's admission requirements, this may include: GRE, GMAT, and/or MAT scores
- Statement of Purpose & CV/Resume
- Supplemental Documentation
  - Depending on the prospective program's admission requirements, this may include: research papers, additional essay questions, or writing/media samples
- Application Fee
  - Domestic Application: $75.00
  - Graduate Certificate Application: $25.00
- Payments are made online as the last step of the Admissions application through any major credit card issuer
- All application fee submissions are totally non-refundable

**International Applicants**

- Unofficial transcripts from all colleges and universities previously attended
  - If you are currently enrolled in an institution taking courses, you will need to provide a list of courses in progress
  - All foreign transcripts must be translated to English through a certified Credential Evaluation Service
  - Official transcripts and statements of degree will be required if you are recommended for admission
- 3 Recommendations from people who know your academic record and potential for graduate study
  - All recommendation letters are submitted online through a link that will be sent to each recommender's email once their information is listed on the recommendation list
- Standardized Test Scores
  - English Proficiency Scores (IELTS/TOEFL) are mandatory for International Students (please see the following link for more information: https://grad.ncsu.edu/students/rules-and-regulations/handbook/2-3-graduate-school-admissions/#p)
  - Depending on the prospective program's admission requirements, this may include: GRE, GMAT, and/or MAT scores
- Statement of Purpose & CV/Resume
- Supplemental Documentation
  - Depending on the prospective program's admission requirements, this may include: research papers, additional essay questions, or writing/media samples
- Application Fee
  - International Application: $85.00
  - Graduate Certificate Application: $25.00
  - Payments are made online as the last step of the Admissions application through any major credit card issuer
  - All application fee submissions are totally non-refundable

For a list of graduate degrees, details on the programs, and admissions information, please consult the Graduate Programs website (https://grad.ncsu.edu/programs/).

**Application Checklist**

Applications and all supporting documents must be received on or before the priority deadlines OR the Program Deadlines (https://grad.ncsu.edu/programs/), whichever is earlier. Please be aware that many program deadlines are earlier than the Graduate School priority deadlines.

- Unofficial transcripts from all colleges and universities previously attended
  - If you are currently enrolled in an institution taking courses, you will need to provide a list of courses in progress
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  - All application fee submissions are totally non-refundable

**Non-Degree Studies**

NC State’s **Non-Degree Studies (NDS)** program provides opportunities for students who are not full-time degree-seeking students to enroll at NC State for a variety of reasons. NDS caters to:

- Working professionals looking to advance in their careers,
- Students who need to meet NC State admission requirements for an undergraduate or graduate program,
- Students who would like to try out classes at NC State,
- High school students (https://registrar.ncsu.edu/nds/aoe-students/) who wish to earn college credit and have exhausted enrollment options at their home institutions,
- North Carolina Senior learners (https://registrar.ncsu.edu/nds/over65/) wishing to audit courses tuition-free,
- and so many others.

**Eligibility**

- Students must have graduated from high school at least one year before beginning enrollment or have the written support of their high school principal
- Students must be eligible to return to any previous institution(s) attended
- Students must maintain a minimum cumulative GPA of 2.0 at all times to remain eligible to continue

**NDS Classifications**

**Undergraduate Studies**

- Students who have not yet obtained a baccalaureate degree
- Students enrolled in an undergraduate certificate program

**Post-Baccalaureate Studies**

- Students who have obtained a baccalaureate degree

**Academic Enrichment Opportunities**

- Rising high school juniors and seniors with a cumulative weighted GPA of 3.5 or higher
- North Carolina Senior Auditors (“65+”)
  - North Carolina residents aged 65-years and older

**How to Apply to the NDS Program**

Students interested in the NDS program will apply online through our ApplyNDS portal. Depending on what type of student you are, whether you have previously been a student at NC State, and your residency (in-state, out-of-state, or international), there may be different components to the application. Details are available on the NDS website (https://registrar.ncsu.edu/nds/). It is important that applicants follow each step of the application carefully, as your application may not be considered if we are missing any important information or documentation.
Application Dates and Deadlines

The deadline to apply to the NDS program for the Fall 2020 semester is August 14, 2020. Applicants are notified of their decision on a rolling basis. The deadline for the Spring 2021 application will be posted to the NDS website during the summer.

Contact Us

Non-Degree Studies
Department of Registration and Records
1000 Harris Hall
Phone: 919-515-2572
Email: studentservices@ncsu.edu
Website: go.ncsu.edu/nds

Readmission

Sometimes students may take some time away from NC State, and that's okay. Any Undergraduate or Agricultural Institute student who has not enrolled in a Fall or Spring semester may apply for readmission to continue their degree program if they wish to continue.

Eligibility

Students are eligible to apply for readmission if you fall into one of the following categories:

1. Former Undergraduate and Agricultural Institute students eligible to return to NC State University
2. Suspended Undergraduate Students (additional action required)
3. Former Undergraduate who obtained a degree and wishes to seek an additional undergraduate degree

Students who desire a change of curriculum can apply through the Change of Degree Application (CODA) upon readmission, except for Leadership in the Public Sector. The Leadership in the Public Sector (LPS) major, housed within the College of Humanities and Social Sciences, is an online degree completion program for students who have been away from NC State University for more than three years. It is not available for transfer via CODA. If you are interested in this program, please visit the LPS Program website (https://spia.ncsu.edu/lps/) and contact the program advisor or director before readmitting into your previous major.

Students who have completed their undergraduate degrees and wish to return to pursue an additional degree must complete the application for readmission and complete the Change to Additional Degree form (http://studentservices.ncsu.edu/wp-content/uploads/2018/12/Readmit-Second-Degree-072617-2-1.pdf).

Suspended Students

Students on Academic Suspension may appeal to the Admissions Committee for readmission. Students will be directed to the appeal upon completing the readmission application above. Appeals will not be reviewed unless all documents are included.

Academically Suspended students who have had a break in enrollment for at least 3 years may appeal for Contractual Readmission. Students who are contractually readmitted will be placed on Academic Warning and must maintain a 2.0 GPA on all coursework attempted after readmission. Failure to do so will result in permanent dismissal from the university.

Students are encouraged to begin the Contractual Readmission process early. Colleges may have additional requirements or deadlines; students should consult with their college and/or academic advisor before starting the contractual readmission application. Visit our website (https://studentservices.ncsu.edu/your-degree/readmission/) for more information and to download the Contractual Readmission Application Form.

How to Apply

Application dates and deadlines are updated on our website throughout the year.

All students applying for readmission to NC State must pay a non-refundable, $60 Readmission Application Fee.

The Readmission application is available online at our Apply/Readmit portal (https://go.ncsu.edu/apply_readmission/). Decisions are released on a rolling basis.

Residency Determination

All students applying for undergraduate readmission and requesting in-state tuition are required to complete the North Carolina Residency Determination Service (RDS) (https://ncresidency.cfonc.org/residencyInfo/) prior to completing the Readmission application. You will need your Residency Certification Number (RCN) in order to complete your Readmission application.

Contact Us

Readmission
Department of Registration and Records
Phone: 919-515-2572
Email: readmission@ncsu.edu

Enrollment (Registration)

Enrollment Process

Enrollment is conducted using MyPack Portal, NC State’s online student services application. The Student Services Center website (https://studentservices.ncsu.edu/) houses tutorials and guides for completing enrollment as easily and efficiently as possible. A schedule of courses for each semester is also available online prior to the beginning of the enrollment period.

Enrollment consists of three steps:

1. Students meet with advisors to determine course requirements and to have their Advising Hold released;
2. Students enroll in courses in MyPack Portal; and
3. Students pay tuition, fees, and all other debts to the university by the established deadlines.

Students can find more information about how to search for classes, how to enroll, how to drop and edit their class schedules, and how to utilize degree planning tools on the Student Services Center website (https://studentservices.ncsu.edu/your-classes/).
Enrollment Calendar and Timeline

Students are assigned a date and time during which they can begin enrolling for the upcoming term. These assignments are determined by a number of factors, including the student’s academic career (i.e. undergraduate, graduate, etc.), classification by credit hours (i.e. junior, senior), and any university groups the student may be a part of.

Enrollment typically begins in October for Spring and Summer semesters, and in March for Fall semesters. The enrollment calendars are published shortly before then.

New freshmen entering in the Fall enroll during summer orientation after meeting with advisors and becoming acquainted with the MyPack Portal.

The enrollment calendar is available online on the Student Services Center website (https://studentservices.ncsu.edu/calendars/enrollment/).

Schedule Revision (drops and adds)

Note: NC State University policies, rules and regulations are updated and reviewed as the need arises. For the most current information regarding this section, please visit the Policies, Rules, and Regulations website (http://policies.ncsu.edu/regulation/reg-02-20-02/).

Courses may be added during the first week of a regular semester without permission of the instructor and during the second week with the permission of the instructor.

Courses may be dropped without regard to course load prior to the Census Date of a regular semester. After the Census Date and prior to the Drop/Revision deadline, full-time undergraduate students who wish to drop courses at any level and whose academic load would thereby fall below the twelve hour minimum course load may do so only for documented medical reasons or other verified, unforeseen grounds of personal or family hardship.

Exceptions to the drop policies require the recommendation of a student’s advisor, the departmental coordinator of advising or the departmental head, and approval by the student’s dean.

The full academic calendar is available on the Student Services Center website (https://go.ncsu.edu/academiccalendar/).

Students who wish to drop all courses must withdraw from the university for the remainder of the semester or summer session in which they are enrolled. All withdrawals for a current or upcoming term are initiated through the self-service Term Withdrawal page in the MyPack Portal. Withdrawals after the drop/revision deadline are approved by the university only under extenuating circumstances. Documentation is required to support these requests. More information about how to initiate a Term Withdrawal is available online (https://studentservices.ncsu.edu/your-classes/withdrawal/).

Veterans Education Benefits

NC State University is approved to administer veterans benefits to eligible students. The Veterans Education Benefits office is located in Witherspoon Student Center, suite 100. Students who are eligible to receive veterans benefits should contact the NC State Certifying Official at veterans-ed@ncsu.edu. For more information see the NC State Veterans Education website (http://registrar.ncsu.edu/veterans/).

Military Priority Registration

NC State strives to ensure the academic success of our military-affiliated students by offering priority registration to student service members, veterans and those using GI Bill benefits. For more information regarding priority registration for military-affiliated students, please contact the university’s Veterans Education Benefits office at veterans-ed@ncsu.edu.

Exchange Programs

Several enrollment programs exist for the purpose of fostering cooperative educational activities. Under these programs students have the opportunity to register for courses at other institutions and to participate in cooperative library arrangements and joint student activities.

Inter-Institutional Program

The Inter-Institutional Registration Program is a voluntary organization comprised of NC State, Duke, North Carolina Central University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, and University of North Carolina at Greensboro for the purpose of developing and conducting cooperative educational activities. The program provides the opportunity for students to enroll at another institution for a course accepted for their program of study and not offered on their home campus. Distance education courses are not eligible to be used for Inter-Institutional registration. Other activities include a cooperative library arrangement, joint student activities, and faculty cooperation and interchange. Interested students should contact the Inter-Institutional Coordinator at (919) 515-1427 or visit the Inter-Institutional website (https://studentservices.ncsu.edu/your-classes/exchange-programs/inter-institutional-program/).

UNC Online

The University of North Carolina Online Academic Services supports members of the UNC multi-campus community. This portal provides access to information on University-wide cross-campus online course offerings to enrolled students. It also administers an exam proctoring system to accommodate students, faculty and qualified proctors for scheduled proctored exams. The program provides the opportunity for students to enroll at another institution for a course accepted for their program of study and not offered on their home campus through Distance Education courses only. Students should contact the Inter-Institutional Coordinator at (919) 515-1427 or visit the UNC Online website (http://online.northcarolina.edu/).

Cooperating Raleigh Colleges

The Cooperating Raleigh Colleges Program (CRC) is a voluntary organization comprised of NC State, Meredith College, St. Augustine’s College, Shaw University, Wake Technical Community College, and William Peace University for the purpose of developing and conducting cooperative educational activities within the Raleigh area. The course taken at the visited school must be a course that is accepted for their program of study and not offered through NC State. Interested students should contact the Inter-Institutional Coordinator at (919) 515-1427 or visit the Cooperating Raleigh Colleges website (https://studentservices.ncsu.edu/your-classes/exchange-programs/cooperating-raleigh-colleges/).

Contact Us

For more information, contact:
Student Services Center
Financial Aid

Website: studentservices.ncsu.edu (https://studentservices.ncsu.edu)

Our mission is to make an NC State education affordable and accessible. We provide scholarships, grants, loans, and work funding to support students and their families. Our staff is here to help as you navigate the process of applying for financial aid.

To be considered for financial assistance, a student must complete the Free Application for Federal Student Aid (FAFSA). This form, submitted online at www.fafsa.gov (http://www.fafsa.gov), evaluates the family’s ability to pay for educational expenses. Students who submit a FAFSA to the federal processor by March 1 are given first priority for need-based scholarship and grant consideration.

By completing the FAFSA, students are considered for all forms of federal financial aid, as well as most types of state and institutional aid. Some academic scholarships may require separate applications. Determination of the applicant’s need is based on estimated educational costs as established by the Office of Scholarships and Financial Aid and a consideration of the family’s financial strength, as determined by the analysis of the FAFSA.

Aid is available on a non-discriminatory basis to all qualifying students based on the applicant’s financial need. Financial aid awards are usually made in the form of “packages,” which combine aid from all sources including the federal, state and institutional funds, and private entities.

Award packages can include gift aid (scholarships and grants), student loans, and/or employment through the Federal Work-Study program. Students must reapply for aid each year. Renewal is based on continued financial need as well as satisfactory academic progress as defined by the Policy (https://studentservices.ncsu.edu/your-degree/academic-progress/) on Satisfactory Academic Progress for Financial Aid Eligibility.

Please visit the Student Services Center website (http://studentservices.ncsu.edu/your-money/) for more detailed information regarding types of aid and how to apply.

Scholarships

NC State offers a variety of scholarships (https://studentservices.ncsu.edu/your-money/financial-aid/types/scholarships/) for both incoming first-year students and those who are continuing at NC State. Consideration for these awards is given to students who are academically competitive and exhibit special talents or characteristics. Some scholarships require that students also demonstrate financial need. Once admitted to NC State, students can apply for scholarship consideration by using PACK ASSIST (https://ncsu.academicworks.com/), NC State University’s scholarship application portal. To maximize scholarship consideration, students should apply for admission by October 15 and complete the FAFSA by March 1.

In addition to these university-wide scholarships, many colleges and departments offer specific awards to students enrolled in their academic programs. These scholarships, funded by alumni, friends of the university, foundations, and industry, are available to both incoming freshmen and to continuing students. Consult the college or department websites for important deadlines and apply online with PACK ASSIST (https://ncsu.academicworks.com/). (https://go.ncsu.edu/packassist/)

NC State encourages students to search for private scholarships. Many organizations offer awards based on place of residence, background, professional affiliations and/or field of study. Students should use the many free online scholarship search websites to search and apply for outside scholarships.

University Academic Scholarships

Park Scholarships

The Park Scholarships program, established in 1996, brings exceptional students to NC State University based on outstanding accomplishments and potential in scholarship, leadership, service, and character. The program develops and supports Park Scholars in these areas, preparing them for lifelong contributions to the university, state, nation, and world.

Approximately 40 scholarships will be awarded this year to outstanding entering freshmen for undergraduate study in any discipline at NC State. As one of the most prestigious and comprehensive undergraduate scholarships in the nation, the Park Scholarship covers the cost of attendance for four years and includes educational trips, retreats, and seminars; enrichment grants to fund study abroad, research projects, service activities, and conferences; individualized faculty mentoring; and more.

The Park Scholarships are named for the late Roy H. Park ’31, an NC State alumnus who created the charitable Park Foundation, dedicated to education, media, and the environment. The Park Foundation initially funded the Park Scholars through annual grants; then, in September 2013, the Park Foundation committed $50 million to begin an endowment for Park Scholarships. With others’ support, this endowment will sustain the Park Scholars program in perpetuity.

To date, 20 classes of Park Scholars have graduated and built a vibrant alumni network. For more information, visit the Park Scholarships website (http://park.ncsu.edu/).

Goodnight Scholars Program

The Goodnight Scholars Program, funded by a gift from Dr. Jim and Ann Goodnight, began in 2008 with 25 scholars. Since that time, it has grown into a comprehensive student development program designed to develop scholars into leaders within the STEM and/or education fields. The Program celebrated its eighth graduating class in May 2019, adding to its network of alumni stretching from coast to coast in the United States and throughout the world: all of whom are using their STEM talent to address critical societal, economical, and educational issues. Currently, the Program has more than 200 active students, and expanded to include transfer students beginning in Fall 2017.

The scholarship is targeted at low and middle-income families from North Carolina and is limited to students studying in the STEM disciplines or affiliated education majors. The current value of the scholarship is $20,500 and is renewable for up to four years for first-year students, and two years for transfer students. In addition to the scholarship, Goodnight Scholars have access to an assortment of developmental programming focused on their professional and personal growth, as well as enrichment grant funding to support their unique endeavors.

Dr. Jim Goodnight is founder and CEO of the SAS Institute, the world’s leading business intelligence software vendor. Ann Goodnight, director of
community relations at SAS, serves on the University of North Carolina Board of Governors and is a former member of the NC State Board of Trustees. Both are NC State graduates. Their frequent interactions with Goodnight Scholars provide unique and invaluable exposure to visionary leaders. Please visit the Goodnight Scholars website (https://goodnight.ncsu.edu/) for more information about the program and its exceptional scholars.

The Caldwell Fellows

The Caldwell Fellows is an intensive and comprehensive leadership development program that over 50 years at NC State has produced 1300+ outstanding alumni shaped by the Robert Greenleaf model of Servant Leadership. Supported through endowments held by the NC State Alumni Association, over 100 alumni “invest” in individual Fellows, providing funds for their development through experiential learning. Students selected as Fellows are expected to engage deeply in the program’s rich offerings, which include community-based service-learning, wilderness adventure, international engagement, and capstone training at the Center for Creative Leadership. Students receive three years of stipend (divided 70-30 between tuition and funds available for experiential learning), all contingent upon a students’ maintenance of the program ideals and a 3.25 cumulative GPA.

The application period for selection begins in January of each year, after a student’s initial semester(s) at NC State is complete. The program actively seeks applicants from all colleges at NC State. The rigorous selection process is based on an application portfolio which includes essays, short video, letters of recommendation, and the first semester transcript at NC State (minimum 3.25 GPA); high school transcripts and standardized test scores are not reviewed. The application is available on the Caldwell Fellows website (http://ncsu.edu/caldwellfellows/). Application reviews by campus faculty and program alumni determine the finalists who are invited to interviews in February. Only first year students are eligible to apply.

The Caldwell Fellows program was created to honor the legacy of John T. Caldwell and to carry out his spirit and ideals. As Chancellor of NC State for 16 years, he presided over the university as a servant leader: inspiring excellence, modeling moral behavior and marshaling the strengths of the entire campus to further the common good. Guided by a deep respect for the potential inside every individual, he held a vision of NC State as a place where young people could find and refine their unique capabilities and potential. The Caldwell endowment is the only university-wide merit-based scholarship funded by alumni and supporters of NC State.

The program also derives from the NC Fellows program, originally known as the Richardson Fellows program, established in 1968 by Smith Richardson of the Richardson Vicks Corporation. Concerned for the state’s future leadership, Mr. Richardson established Fellows Programs on North Carolina campuses and charged them with developing leadership in their promising students. Caldwell Fellows maintain close ties with the internationally acclaimed Center for Creative Leadership, also created by the Smith Richardson Foundation.

Open minds and open hearts are core to the Caldwell Fellows community. Curiosity, creativity, respect for diversity, and commitment to service to the greater good are common qualities which are sought and developed in all Fellows.

International Programs and Activities

Study Abroad

Study abroad allows students to develop skills required to face the grand challenges of society - deepen intercultural sensitivity, think more critically and creatively, and broaden both personal and academic perspectives. Distinguish yourself from your peers by developing skills in independence, flexibility, and the ability to deal with ambiguity. Make the world your classroom at NC State.

Study Abroad Programs

NC State offers programs worldwide that meet academic, career, and personal interests. Study Abroad is for every major: fulfill major, minor, or general education program courses abroad. Plus, participation in NC State study abroad programs fulfill the Global Knowledge co-requisite degree requirement for NC State students. Students should work with their academic advisor to identify a time frame and outline a course plan for study abroad. For all majors, with academic planning, study abroad does not delay graduation at NC State. View program options by major. (http://go.ncsu.edu/studyabroadbymajor/)

Funding Study Abroad

Study Abroad is affordable at NC State. Semester exchange programs provide the most economical option for most students since standard tuition and fees keep the cost of a semester abroad comparable to a semester on campus at NC State. Students are eligible to receive financial aid (including loans, grants, and scholarships) for the cost of any study abroad program. Study abroad scholarships provide additional funding to about 1/3 of applicants receiving an award, plus many other financial resources are available in support of study abroad. View information about NC State Study Abroad Scholarships (https://studyabroad.ncsu.edu/funding/nc-state-scholarships/).

Applying for Study Abroad

With hundreds of opportunities to choose from—each differing in courses, duration, language, cost, location—early planning is key to a successful study abroad experience. Well prepared students typically start planning a year in advance.

Learn more at http://studyabroad.ncsu.edu.

Study Abroad
315 Holmes Hall
Campus Box 7344
Raleigh, NC 27695
Phone: 919-515-2087
Email: study_abroad@ncsu.edu

Kim Priebe, Director

Global Perspectives Certificate

The goal of the Global Perspectives Certificate is to:

• recognize students for their international studies and activities and
• encourage students to continue their global interests both overseas and within the United States.

All undergraduate degree-seeking students and all majors are welcome, including undergraduate international students. Upon completion,
students will receive an official certificate and a notation on their transcript documenting their global experiences during their studies. Learn more about the GPC and get started today at gpc.dasa.ncsu.edu (http://gpc.dasa.ncsu.edu/).

**North Carolina Japan Center**

Jonathan Brewster, Director

The NC Japan Center was established in July 1980 to strengthen the state’s academic, economic, scientific, and cultural ties with Japan. In its many aspects, the Center serves as a focal point for interaction between Japanese and North Carolinians. It is a statewide resource intended to assist all citizens, universities, companies, and public and private institutions in relations with the Japanese. The NC Japan Center works to inform people of the state about modern Japan and its people. It also provides information and resources for Japanese citizens living in North Carolina.

Consistent with NC State’s “Think and Do” land-grant mission, the NC Japan Center works in partnership with the Economic Development Partnership of North Carolina to attract Japanese businesses to the state, as well as strengthens relationships between NC State and academic partners in Japan. An external Board of Advisors includes prominent citizens of North Carolina who have a strong interest in Japan and US-Japan relations. Its Academic Advisory Committee consists of faculty from colleges across the university who provide guidance and direction for academic exchange and development. The NC Japan Center cooperates closely with the NC State Japanese language program and provides a full range of non-credit Japanese language courses to the public. For more information, please contact Jonathan Brewster at (919) 515-3450 or visit the North Carolina Japan Center’s website (http://www.ncsu.edu/japan/).

**International Students**

The Office of International Services (OIS) is charged with meeting the immigration advising and cross-cultural programming needs for the university’s more than 4000 international students and 700 J-1 Exchange Visitor scholars who come from more than 120 different countries. Services provided by OIS include advising students and scholars on immigration regulations and university policies; authorizing certain types of on or off-campus employment authorization for F-1 and J-1 visa holders; and providing cultural programs designed to enrich the cultural and academic experience of the campus community. OIS programs include: New International Student Orientation, Culture Corps, ISSERV service learning program, English Conversation Club, and many others. New international students are required to participate in New International Student Orientation. OIS also provides opportunities for U.S. students to get involved in the international community at NC State by inviting participation in various cross-cultural programs such as volunteering at the International Student Orientation and English Conversation Club.

International applicants must apply to the Admissions Office by the stated deadlines and must meet all the necessary requirements for admission. In addition, international applicants must meet certain language and financial criteria (see the TOEFL and Financial Information sections under Freshman Admission).

The North Carolina Global Training Initiative (GTI) sponsors several short-term certificate, internship, and research programs that international students may be interested in. These full-time non-degree study programs allow international students to study at NC State for one semester in order to learn about U.S. culture and education, improve their conversational English, take undergraduate courses in their field of study back home or in preparation for admission to a degree program here in the U.S., and experience life in the U.S. These programs have a later application deadline and are great for students to take before enrolling in an undergraduate or graduate degree program in the US or for siblings and friends of current degree-seeking students who want to study in the US together.

International students may be interested in joining the GTI’s Cultural Exchange Network (CENet). CENet connects NC State’s domestic and international students through joint participation in social, academic, and service learning events and workshops. Visit the CENet website (go.ncsu.edu/CENet) for more details about the program and how you can apply.

Anyone interested in the GTI’s programs can visit us on the web at www.ncsu.edu/gti (http://www.ncsu.edu/gti/) for more information.

Outline of minimum immigration requirements for F-1 and J-1 students:

- Keep passport and I-20 or DS-2019 current
- Maintain full-time enrollment every semester (12 hours/semester for undergraduates)
- Make good academic progress toward your degree
- Do not work or intern off campus without prior written approval from OIS
- Do not work on campus more than 20 hours in any one week during the semester
- Update any address change in MyPack Portal within ten days of moving
- Update OIS immediately of any changes in name, funding, or visa status
- Consult with an OIS advisor before changing curriculum/majors, withdrawing, dropping below full-time, transferring to another school/program, etc.
- Purchase and maintain the NC State University approved Health and Accident Insurance or other insurance plan that meets the published minimum coverage requirements.
- Keep your valid passport and recently signed visa certificate (I-20 or DS-2019) with you when you travel abroad. Consult with an OIS advisor about visa and travel questions

Further information about immigration requirements, employment and travel questions, cultural opportunities, and other critical information designed to assist international students are detailed on the OIS website. For individual advising, please call (919) 515-2961 to make an appointment with an advisor or stop by during our walk-in hours of 10:00am-11:45am and 1:00pm-2:45pm on Monday, Tuesday, Thursday and Friday (no walk-ins on Wednesdays).

**Office of International Services (OIS)**

111 Lampe Drive
Campus Box 7222
NC State University
Raleigh, NC 27695-7222

Phone: (919) 515-2961
Email: ois@ncsu.edu
Website: http://internationalservices.ncsu.edu/
The Intensive English Program (Conditional Admission and IEP-only)

The Intensive English Program (IEP) at North Carolina State University is a full-time, non-credit academic program offered to international, non-native English speakers. Its mission is to provide high-quality language instruction to those seeking academic preparation, professional development and/or personal enrichment. Programs of study are offered in the fall, spring, and summer semesters.

In the IEP, students take up to 25 hours per week of intensive language study in all core language skills. Students who enroll in the IEP will be tested for the appropriate level of English instruction when they arrive on campus.

Classes are located on NC State’s main campus and nearby on Hillsborough Street. IEP students are also offered the opportunity to participate in numerous cultural enrichment activities designed to help them get to know the surrounding area and interact with other students. Academic coaching (tutoring) is offered to students free of charge.

Students join the IEP as conditionally admitted students or IEP-only students. While the course of instruction is identical for both, IEP-only students are not guaranteed admission to degree programs, but may apply directly to such programs while enrolled in the IEP.

Conditional Admission

For undergraduate applicants who meet the competitive academic requirements for admission, but who do not yet possess the minimum English proficiency requirements for full, direct admission, NC State offers conditional admission. For NC State conditionally admitted students, the IEP provides the opportunity to improve one’s English language skills before moving into a degree program.

Successful completion of the IEP requires achieving at least a B or higher in each course, meeting strict attendance obligations, and passing all exit requirements.

Intensive English Program
North Carolina State University
2526 Hillsborough Street, Suite 200
Raleigh, North Carolina USA 27607
Office hours: 8am-5pm, Monday-Friday
Phone: 919-515-4002
Email: iep@ncsu.edu
Website: https://intensive-english.ncsu.edu/

Incoming Exchange Students

NC State has a growing number of international exchange partners from around the world. The Study Abroad Office warmly welcomes incoming exchange students to NC State's internationally renowned programs for a semester or for the full academic year.

Visit the NC State Study Abroad website (https://studyabroad.ncsu.edu/subpage-example/incoming-student/) for information about exchange programs at NC State, the application process, English proficiency requirements, preparation and arrival, and what you can expect during your time in Raleigh!

Study Abroad Office
Phone: +1 919-515-2087
Email: study_abroad@ncsu.edu
Website: https://studyabroad.ncsu.edu/

Cultural Exchange Network (CENet)

The Cultural Exchange Network (CENet) at NC State is a student organization comprised of undergraduate and graduate students from all fields of study and from around the world. CENet fosters global learning and international friendship through social, academic and service activities.

CENet is facilitated by the Global Training Initiative (GTI) and details can be found on the website (go.ncsu.edu/CENet (http://go.ncsu.edu/CENet)).

Supplemental Academic Programs

Cooperative Education Program

The Cooperative Education Program (co-op) is an opportunity for students to gain hands-on work experience while pursuing a degree. Through alternate semesters of full-time study and full-time work experience, students can:

• Strengthen their job prospects after graduation; companies usually prefer hiring students who have related work experience, especially within their organization
• Be well-paid
• Explore career fields and confirm their choice of major
• Work with state-of-the-art equipment in the industry
• Experience “corporate culture” by working with professionals and observing how they handle job situations in the given field

The co-op plan can be completed in five years, during which time the student receives 12 to 18 months of industrial experience.

To be eligible for a co-op, students must:

• Be full-time students (in any degree program)
• Have completed a minimum of 30 credit hours (or one semester for transfer students)
• Have been admitted into a degree program prior to reporting for a co-op job
• Have a cumulative GPA of at least 2.50 (3.00 for graduate students)

For more information, visit: https://go.ncsu.edu/co-op (https://go.ncsu.edu/co-op)

The Peer Mentor Program

The Peer Mentor Program (PMP), offered through the Department of Multicultural Student Affairs, is a student advisory program aims to foster a network of support for culturally diverse first-year students (“mentees”). The peer mentoring relationship is designed to aid in the academic, emotional, and socio-cultural adjustment to college life of mentees. Peer Mentors serve as peer support personnel for mentees and share program goals and responsibilities aimed at ensuring the retention of student participants.

For more information, visit: https://oied.ncsu.edu/divweb/msa/peer-mentor-program/
Supplemental Instruction

Supplemental Instruction (SI) is a voluntary academic support opportunity for students in selected sections of historically difficult, large lecture courses. SI supports students who want to improve their understanding of course material in a small group setting. Students are actively engaged with small group activities facilitated by the SI leader, a trained peer tutor. Several sessions are offered at various times each week. A schedule of current SI sessions can be found on the SI website (https://tutorial.dasa.ncsu.edu/si/si-schedule/).

Tuition and Fees (Graduate)

The University Cashier’s Office (https://treasurer.ofb.ncsu.edu/cashier/) provides billing, financial aid disbursement and account management services to all students. All students paying tuition and fees are entitled to University services, facilities and programs, including the services, facilities, and programs offered by the Student Center, Health Services, Physical Education Department, and Athletics Department.

Visit the Student Services Center website (https://studentservices.ncsu.edu/your-money/tuition-and-fees/) for the most up-to-date information on campus finances and student tuition and fees.

Students should view the Graduate School website for important information on Residence for Tuition Purposes (https://grad.ncsu.edu/admissions/residency/) and the North Carolina Residency Determination Service (RDS) for graduate programs.

Tuition and Fees (Undergraduate)

- North Carolina Resident: $4,550 per semester (effective 2019-2020 academic year)
- Nonresident: $14,610 per semester (effective 2019-2020 academic year)

A statement of tuition and fees is posted on each student’s account that registered during a normal registration period. Students (and authorized parents) are notified via e-mail (eBILL) when a new statement has posted. Payment in full or approved financial aid information must be received by the due date appearing on the statement. The due date is approximately two weeks before classes begin. Students registering during a late registration period will be required to pay their tuition and fees at the time of registration and may be subject to a late registration fee. Fees are the same for both residents and nonresidents and are required of all students. Nonresident students are required to pay an additional $10,060 per semester for tuition.

Estimated Annual Undergraduate Expenses

(©Dependent Student living on Campus)

<table>
<thead>
<tr>
<th>Description</th>
<th>First Semester</th>
<th>Second Semester</th>
<th>Full Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC Residents</td>
<td>4,550</td>
<td>4,550</td>
<td>9,100</td>
</tr>
<tr>
<td>Out of State Residents</td>
<td>14,610</td>
<td>14,610</td>
<td>29,220</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>1,308</td>
<td>1,308</td>
<td>2,616</td>
</tr>
<tr>
<td>Room Rent</td>
<td>3,384</td>
<td>3,384</td>
<td>6,768</td>
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<tr>
<td>Meals</td>
<td>2,417</td>
<td>2,417</td>
<td>4,834</td>
</tr>
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</table>

Books and Supplies

<table>
<thead>
<tr>
<th>Description</th>
<th>First Semester</th>
<th>Second Semester</th>
<th>Full Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Expenses</td>
<td>804</td>
<td>804</td>
<td>1,608</td>
</tr>
<tr>
<td>Transportation - in state</td>
<td>561</td>
<td>561</td>
<td>1,122</td>
</tr>
<tr>
<td>Transportation - off campus/out of state</td>
<td>664</td>
<td>664</td>
<td>1,328</td>
</tr>
</tbody>
</table>

Total Estimated Expenses

<table>
<thead>
<tr>
<th>Description</th>
<th>First Semester</th>
<th>Second Semester</th>
<th>Full Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC Residents</td>
<td>$13,565</td>
<td>$13,565</td>
<td>$27,130</td>
</tr>
<tr>
<td>Out of State Residents</td>
<td>$23,728</td>
<td>$23,728</td>
<td>$47,456</td>
</tr>
</tbody>
</table>

1. Note: Tuition and fees are fixed items of cost. The rates listed above are for Undergraduate students in a degree program. Tuition and fee rates for Distance Education courses are billed based on the student’s affiliation, see the Student Services Center website (https://studentservices.ncsu.edu/your-money/tuition-and-fees/distance-education/) for full details.

2. Health Insurance is billed unless you waive out of the program each semester. For more information, visit the Student Health website (https://healthypack.dasa.ncsu.edu/insurance-and-billing/ship/).

3. Room rent is shown as main-campus, double occupancy rate.

4. Meals, books and supplies, other personal expense, and transportation are shown as estimates.

5. For estimated costs of other student classifications please go to the Student Services Center website (https://studentservices.ncsu.edu/your-money/financial-aid/estimated-cost-of-attendance/).

Expenses Other than Tuition and General Fees

Application Fee: A nonrefundable fee $85 U.S. must accompany each application for admission ($100 for international students). Applicants may pay the fee online using their WolfPAW account.

Room Rent: New incoming students receive instructions on how to apply for housing with the letter of acceptance. Continuing students receive room reservation information each January at their residence hall rooms. The 2020-2021 residence hall room rent ranges from $3,210 to $3,925 per semester and plus a mandatory $140.00 ResNet (internet) charge. The Wolf Village Apartments charge $3,375 per semester plus mandatory charges for ResNet ($140) and cable television ($46) per person per semester. Wolf Ridge Apartments range form $3,585 per person to $4,230 per person per semester plus mandatory charges for ResNet ($140) and cable television ($46) per person per semester.

Meals: During their first academic year, new freshmen living on campus are required to participate in one of the university’s available meal plans. Meal plans are available to all registered students and costs for 2020-2021 range from $800 to $2,400. Students may also pay for meals individually at the various dining facilities available both on and near campus.
Books and Supplies: Books and supplies are usually purchased during the first week of classes directly from the NCSU Bookstores. Allow approximately $541 per semester for purchasing books and supplies.

Personal Expenses: Personal expenses vary widely among students but the estimate of $804 is based on what students report that they spend on these items.

Cooperative Education Program Fee: Required of all participating co-op students for each semester in which they are enrolled in an off-campus work assignment. This fee, set at $490 for the 2020 Fall Semester, the 2021 Spring Semester, or the combined 2021 Summer Sessions, is used for partial support of the Cooperative Education Program staff in job development and placement activities. Students paying this fee are entitled to all university services, facilities, and programs during the semester or combined summer sessions for which they are enrolled.

COE Program Enhancement Fee: Students enrolled in the College of Engineering will be charged a COE Program Enhancement Fee. This fee is used for program and infrastructure improvements in the College of Engineering to ensure our engineering students are provided career-ready skills that continue to advantage them in the marketplace. Each semester, undergraduates will be charged $750 (12 or more hours), $562.50 (9-11 hours), $375.00 (6-8 hours), and $187.50 (0-5 hours). Each semester graduate students will be charged $750 (9 or more hours), $499.95 (6-8 hours), and $249.98 (0-5 hours). Engineering students who enroll in a co-op work session will not be billed for the computing fee unless they also enroll in an NC State course.

Professional Golf Management Fee: Students enrolled in the Professional Golf Management program (PGM) will be charged $350/semester. The fee pays for golf play and practice privileges at several area golf courses.

Required Fees
Required fees are levied for services, facilities, and programs available to all students whether or not the student takes advantage of them. Students are assessed fees based on the course load they are taking. An itemization of required fees and other detailed information concerning expenses or related data can be obtained on the Student Services Center website (https://studentservices.ncsu.edu/your-money/tuition-and-fees/fees-explanation/) or by contacting:

University Cashier’s Office
NC State, Box 7213
Raleigh, North Carolina 27695-7213
919-515-2986 (Option 4), or via e-mail at studentaccounts@ncsu.edu (studentaccounts@ncsu.edu)

Refund Policy
Reduction in Hours: The last day to reduce hours and receive a refund or reduction in rates is the same as the last day to register or add hours, typically the 10th day of a fall or spring term and the 4th day of a summer session. Tuition and Fees are not prorated after this date for reduced course loads. Specific dates are posted on the Student Services Center website (https://studentservices.ncsu.edu/your-money/bill/refunds-and-reimbursements/refunds-for-reduction-in-hours/) and in MyPACK Portal.

Withdrawal: Dropping all courses for which you are registered constitutes a Withdrawal from the University. Refunds for official withdrawals from NC State University are prorated based upon the percentage of the enrollment period attended. No refunds are made for official withdrawals after 50 percent of the enrollment period has passed. The prorated withdrawal schedule for each semester is publicized on the Student Services Center website (https://studentservices.ncsu.edu/your-money/bill/refunds-and-reimbursements/refunds-for-withdrawal/).

In some instances circumstances such as severe medical issues can justify an appeal of your refund percentage. You may submit an appeal to the Fee Appeals Committee when you believe special consideration is merited. Applications for such appeals may be obtained from the Student Services Center website (https://studentservices.ncsu.edu/forms/cashier/refundapp.pdf).

Residency Determination Service (RDS)
The Residency Determination Service (RDS) was established in coordination with the University of North Carolina (UNC), the North Carolina Community College System (NCCCS), the North Carolina State Education Assistance Authority (NCSEAA), and the North Carolina Independent Colleges and Universities (NCICU) as the centralized service for determining residency for students. This service enables a student to use one residency determination for admissions applications to multiple North Carolina public colleges and universities and to demonstrate residency for state aid programs consideration at all (public and private) North Carolina colleges and universities. In compliance with state law, the UNC system requires Undergraduate, Agricultural Institute, and Non-Degree Studies students to request a residency classification through the RDS.

Learn more online at https://ncresidency.cnc.org.

Residence Status for Tuition Purposes
According to the North Carolina General Assembly (North Carolina General Statutes Section (G.S.) 116-143.1(b) (http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_116/GS_116-143.1.html)), a student qualifies as a resident for tuition purposes if he or she has:

• an established legal residency (domicile) in North Carolina
• maintained that legal residence for at least 12 continuous months prior to being considered for in-state residency

The North Carolina State Residence Classification Manual (http://www.northcarolina.edu/sites/default/files/documents/state_residence_classification_manual.pdf) offers complete information on residency statutes, as well as explanations as how the two qualifications above are evaluated.

Initial Classification: The student’s initial residence classification occurs during the admission application process when the student is first admitted to a community college or UNC institution.

Reclassification: A student, accepted for admission, who is initially classified as a nonresident and believes he or she meets the requirements of G.S. 116-143.1, -143.3, or any other applicable laws and regulations may request a reclassification by completing the RDS process. The request for reclassification may be submitted either in direct response to the initial classification (if the student believes the initial classification is erroneous), or at a future time if the student has experienced a change in circumstances that he or she believes makes him or her eligible for in-state resident status. Students must submit requests for reclassification in accordance with approved procedures and
application deadlines. The institution will not assume responsibility for initiating such an inquiry independently.

Residency Reclassification Application Deadlines. Except for deadlines set out in the General Statutes, institutions (undergraduate or graduate) may set their own deadlines so long as they are not inconsistent with the deadlines. The deadline to submit the reclassification application along with all supporting documentation cannot be later than the 10th business day of the term for which the student is seeking residency reclassification. All conditions necessary for achieving in-state status must still be satisfied prior to the beginning of the academic term for which the student is seeking reclassification. It is the student’s responsibility to provide the documentation necessary to support his or her claims for in-state residency for tuition purposes by the applicable deadlines.

Residence. To qualify as a resident for tuition purposes, a person must become a legal resident and remain a legal resident for at least twelve consecutive months (365 days) immediately prior to classification. Thus, there is a distinction between legal residence and residence for tuition purposes. Furthermore, twelve months legal residence means more than simple abode in North Carolina. In particular, it means maintaining a domicile (permanent home of indefinite duration) as opposed to “maintaining a mere temporary residence or abode incident to enrollment in an institution of higher education.” The burden of establishing facts which justify classification of a student as a resident entitled to in-state tuition rates is on the applicant for such classification, who must show his or her entitlement by the preponderance (the greater part) of the residency information.

Parents’ Domicile. If an individual, irrespective of age, has living parent(s) or court appointed guardian of the person, the domicile of such parent(s) or guardian is, prima facie, the domicile of the individual; but this prima facie evidence of the individual’s domicile may or may not be sustained by other information. Further, non-domiciliary status of parents is not deemed prima facie evidence of the applicant child’s status if the applicant has lived (though not necessarily legally resided) in North Carolina for the five years preceding enrollment or registration.

Effect of Marriage. Marriage alone does not prevent a person from becoming or continuing to be a resident for tuition purposes, nor does marriage in any circumstance insure that a person will become or continue to be a resident for tuition purposes. Marriage and the legal residence of one’s spouse are, however, relevant information in determining residency intent. Furthermore, if both a husband and his wife are legal residents of North Carolina and if one of them has been a legal resident longer than the other, then the longer duration may be claimed by either spouse in meeting the twelve month requirement for in-state tuition status.

Military Personnel. Any active duty member of the armed services qualifying for admission to an institution of higher education but not qualifying as a resident for tuition purposes shall be charged the in-State tuition rate and applicable mandatory fees for enrollments while the member of the armed services is abiding in this State incident to active military duty in this State. In the event the active duty member of the armed services is reassigned outside of North Carolina or retires, the member shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the member was enrolled at the time the member is reassigned. In the event the active duty member of the armed services receives an Honorable Discharge from military service, the member shall continue to be eligible for the in-

State tuition rate and applicable mandatory fees so long as the member establishes residency in North Carolina within 30 days after the discharge and is continuously enrolled in the degree or other program in which the member was enrolled at the time the member is discharged.

Any dependent relative of a member of the armed services who is abiding in this State incident to active military duty, as defined by the Board of Governors of The University of North Carolina and by the State Board of Community Colleges while sharing the abode of that member shall be eligible to be charged the in-State tuition rate, if the dependent relative qualifies for admission to an institution of higher education. The dependent relatives shall comply with the requirements of the Selective Service System, if applicable, in order to be accorded this benefit. In the event the member of the armed services is reassigned outside of North Carolina or retires, the dependent relative shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the dependent relative is continuously enrolled in the degree or other program in which the dependent relative was enrolled at the time the member is reassigned or retires. In the event the member of the armed services receives an Honorable Discharge from military service, the dependent relative shall continue to be eligible for the in-State tuition rate and applicable mandatory fees so long as the dependent relative establishes residency within North Carolina within 30 days after the discharge and is continuously enrolled in the degree or other program in which the dependent relative was enrolled at the time the member is discharged. A person charged less than out-of-state tuition rate solely by reason of this section shall not, during the period of receiving that benefit, qualify for or be the basis of conferring the benefit of G.S. 116-143.1.

Grace Period. If a person (1) has been a bona fide legal resident, (2) has consequently been classified a resident for tuition purposes, and (3) has subsequently lost North Carolina legal residence while enrolled at a public institution of higher education, that person may continue to enjoy the in-state tuition rate for a grace period of twelve months measured from the date on which North Carolina legal residence was lost. If the twelve months extends during an academic term for which the person is enrolled at a State institution of higher education, the grace period extends, in addition, to the end of that term. The fact of marriage to one who continues domicile outside North Carolina does not by itself cause loss of legal residence marking the beginning of the grace period.

Minors. Minors (persons under 18 years of age) usually have the domicile of their parents, but certain special cases are recognized by the residence classification statute in determining residence for tuition purposes.

a) If a minor’s parents live apart, the minor’s domicile is deemed to be North Carolina for the time period(s) that either parent, as a North Carolina legal resident, may claim and does claim the minor as a tax dependent, even if other law or judicial act assigns the minor’s domicile outside North Carolina. A minor thus deemed to be a resident will not, upon achieving majority before enrolling at an institution of higher education, lose North Carolina legal residence if that person

1. Upon becoming an adult “acts, to the extent that the person’s degree of actual emancipation permits, in a manner consistent with bona fide legal residence in North Carolina” and

2. Begins enrollment at an institution of higher education not later than the fall academic term following completion of education prerequisite to admission at such institution.”

b) If a minor has lived for five or more consecutive years with relatives (other than parents) who are domiciled in North Carolina and if the
relatives have functioned during this time as if they were personal guardians, the minor will be deemed a resident for tuition purposes for an enrolled term commencing immediately after at least five years in which these circumstances have existed. If under this consideration a minor is deemed to be a resident for tuition purposes immediately prior to his or her eighteenth birthday, that person on achieving majority will be deemed a legal resident of North Carolina or at least twelve months duration. This provision acts to confer in-state tuition status even in the face of other provisions of law to the contrary; however, a person deemed a resident of twelve months duration pursuant to this provision continues to be a legal resident of the State so long as he or she does not abandon North Carolina domicile.

Lost but Regained Domicile. If a student ceases enrollment at or graduates from an institution of higher education while classified as a resident for tuition purposes and then both abandons and re-acquires North Carolina domicile within a twelve month period, that person, if he or she continues to maintain the reacquired domicile into re-enrollment at an institution of higher education, may re-enroll at the in-state tuition rate without having to meet the usual 12-month durational requirement. However, any one person may receive the benefit of this provision only once.

Change of Status. A student admitted to initial enrollment in an institution (or permitted to enroll following an absence from the institutional program which involved a formal withdrawal from enrollment) must be classified by the admitting institution either as a resident or as a nonresident for tuition purposes prior to actual enrollment. A residence status classification once assigned (and finalized pursuant to any appeal properly taken) may be changed thereafter (with corresponding change in billing rates) only at intervals corresponding with the established primary divisions of the academic year.

Transfer Students. When a student transfers from one North Carolina public institution of higher education to another, he or she is treated as a new student by the institution to which he or she is transferring and must be assigned an initial residence status classification for tuition purposes.

Non-U.S. Citizens. Persons who are not U.S. citizens but who have certain visa and immigration statuses that grant them the legal ability to establish and maintain a bona fide domicile in this country are subject to the same considerations as U.S. citizens in determining residence status for tuition purposes. If it is later discovered that the person’s visa or immigration status was obtained fraudulently, the institution shall have the right to seek and collect payment of full, out-of-state tuition, along with fees and costs associated with such collection. Non-U.S. citizens present in the United States under certain visa statuses such as tourists, visitors on business, and temporary foreign/international students do not have the legal capacity to establish a bona fide domicile in this country (and thus, not in North Carolina). As examples, holders of non-immigrant visa statuses such as B, C, D, F, J, M, Q, S, and TN visas (and dependent visas for spouses and children such as a TD visa) cannot establish domicile with these documents, in and of themselves, unless there is a change in their visa status. An EAD, in and of itself, does not confer any immigrant or non-immigrant status and does not give the EAD holder the legal capacity to establish residency for tuition purposes in this state.

UNC System Employees. A person who is a full-time employee, in a permanent position, of The University of North Carolina, or is the spouse or dependent child of a full-time employee, in a permanent position, of The University of North Carolina, and who is a legal resident of North Carolina, qualifies as a resident for tuition purposes without having maintained that legal residence for at least 12 months immediately prior to his or her classification as a resident for tuition purposes.

The following categories of persons are eligible for tuition waivers:

Survivors of Deceased Law Enforcement/ Emergency Workers. Tuition waivers are available to the surviving spouse and children of a law enforcement officer (including sheriffs), firefighter, volunteer firefighter or rescue squad worker who was killed as a direct result of a traumatic injury sustained in the line of duty (including both active service and training for active duty). Additional eligibility requirements must be met.

Families of Disabled Law Enforcement/Emergency Workers. Tuition waivers are available to the spouses and children of law enforcement officers (including sheriffs), firefighters, volunteer firefighters, or rescue squad workers who are permanently and totally disabled as a direct result of a traumatic injury sustained in the line of duty (including both active service and training for active service). Additional eligibility requirements must be met.

Note: Decisions on residence for tuition purposes are based on NC G.S. 116-143.1 and 116-143.3 and on the State Residence Classification Manual which was prepared by the General Administration of the University of North Carolina system.

This information is subject to change.
DELTA also manages the university’s learning technology infrastructure, including various asynchronous learning management systems (WolfWare, Moodle, Zoom), a tool for synchronous online teaching and learning, and lecture capture technologies for all technology-assisted courses, whether online or on-campus.

Office of Information Technology

NC State offers you a leading-edge academic computing environment to enrich your student life and learning. Here, you’ll find that many colleges and administrative and academic units are involved in providing various IT resources, services and information.

The Office of Information Technology (OIT) provides centralized campus-wide computing and information and communication technology services in support of the university’s academic and administrative goals. Some of OIT’s major services are:

- Campus-wide data network infrastructure, including the multi-gigabit network backbone and wireless computing infrastructure
- MyPack Portal, the gateway to university online enterprise systems and services, such as Human Resources, Financials and the Student Information System
- ResNet, high-speed wired and wireless Internet access for students living in campus housing
- Cable TV and telephone, which are available to all students, faculty and staff
- Hundreds of software packages for student use from computing labs, and many also available from the NC State Virtual Computing Lab (VCL) environment
- G Suite, which provides the university’s official email and calendaring services and numerous collaborative tools powered by Google
- University’s central Web servers
- File space
- Classroom technology support
- High Performance Computing (HPC) for researchers and students in computational science
- IT security for campus computing resources, including acceptable use, rules and regulations
- NC State Help Desk, which provides support to students and other users of campus resources
- Hardware and software support for student-owned computers through the OIT Walk-in Center

Unity ID and Password

As an NC State student, you will have a Unity ID and password, which are your credentials to access campus-wide computing services and facilities.

Information about your Unity ID and password and help are provided during student orientation sessions, from the NC State Help Desk, and online on the OIT (https://oit.ncsu.edu) website.

Unity Labs

As a student, you may use the Unity computer labs that are equipped with Windows, Linux and Macintosh workstations that provide direct access to information technologies. Colleges and academic departments support additional computing facilities, and overall, there are about 123 student-computing labs on campus, with about 2,800 workstations with high-speed network connections. NC State does not require you to own a computer, although specific colleges or programs may make this requirement. Information about computer recommendations, specifications and purchasing options are published online on the OIT (https://oit.ncsu.edu) website and updated annually.

Help

For additional information, see NC State’s computing resources:

- OIT (https://oit.ncsu.edu) website
- OIT Walk-in Center, West Dunn Building (corner of Dan Allen and Thurman drives)
- NC State Help Desk, 515-HELP (4357); help@ncsu.edu; or help.ncsu.edu (https://help.ncsu.edu)

Marc Hoit, Vice Chancellor for Information Technology and Chief Information Officer

Office of Institutional Equity and Diversity

The Office for Institutional Equity and Diversity (OIED) is committed to fostering an inclusive, accessible and diverse intellectual and cultural campus experience related to the mission of NC State University.

Diversity Engagement, Training and Education

The Diversity, Engagement, Training and Education unit within the Office for Institutional Equity and Diversity provides leadership in the university’s efforts to coordinate, implement and facilitate educational programs, promote cultural competence and foster an understanding of and appreciation for diversity, equity and inclusion throughout the university community. Activities include providing diversity training, programs and consultation for the recruitment, retention and success of students, faculty and staff and reviewing and recommending changes to university policies, procedures and regulations to promote diversity and enhance inclusion.

Equal Opportunity and Equity

The Equal Opportunity and Equity unit of the Office for Institutional Equity and Diversity strives to make NC State University a discrimination-free, harassment-free environment for faculty, students and staff to work, live and learn. This unit is responsible for managing and monitoring the university’s equal opportunity compliance activities, overseeing the university’s equal opportunity policies, responding to complaints, conducting investigations, developing and delivering training and educational outreach to campus and consulting with supervisors, managers and unit equity officers regarding equal opportunity concerns and initiatives.

Bias Impact Response Team

The Bias Impact Response Team (BIRT) at NC State supports the campus community by providing a system through which a person can report incidents of bias on and around campus. BIRT seeks to effectively engage with impacted individuals and groups to achieve awareness, support, education and restoration. See the BIRT website at bias-incident.ncsu.edu (http://bias-incident.ncsu.edu/).
Campus Community Centers
NC State’s Campus Community Centers report to the Office for Institutional Equity and Diversity (OIED). Collectively, the centers foster community; celebrate identity and culture; raise awareness; and support, empower and advocate for positive change for underrepresented and marginalized students, families and communities. They assist OIED in its goal of fostering an inclusive, accessible and diverse intellectual and cultural campus experience by creating spaces and activities that improve campus climate and enhance the overall educational experience for all students.

See Campus Community Centers under Student Services for information on the African American Cultural Center, GLBT Center, Multicultural Student Affairs and the Women’s Center, which report to the Office for Institutional Equity and Diversity.

Office of Professional Development
NC State University’s Office of Professional Development (OPD) is a unit of the office of Continuing and Professional Education (https://mckimmoncenter.ncsu.edu/cpe/). Dedicated to the development and delivery of non-degree professional training courses, OPD provides you with a broad range of quality educational opportunities in a flexible, comfortable, and affordable learning environment.

The Office of Professional Development (OPD) develops, promotes, and coordinates noncredit seminars, certificate programs, and conferences to a broad market on a wide range of topics. Program areas include:

- test preparation;
- accounting and taxation;
- agriculture;
- communications;
- education;
- engineering;
- English as a second language;
- environmental;
- management;
- textiles;
- and general interest.

Events management services are available to help both campus and non-campus groups more efficiently and productively administer educational seminars, workshops, and conferences.

Chip Futrell, Director
Website: ncsu.edu/opd (http://ncsu.edu/opd/)
Phone: (919) 515-2261

Office of Research and Innovation
Mladen A. Vouk, Vice Chancellor for Research and Innovation
Wade Fulghum, Assistant Vice Chancellor, Office of Research Commercialization
Genevieve Garland, Assistant Vice Chancellor for Research Operations and Communications
Jonathan Horowitz, Associate Vice Chancellor for Research Infrastructure and Development
Rick Liston, Assistant Vice Chancellor for Administration
Lorena McLaren, Executive Director, Corporate and Foundation Relations, University Development
Pradip Pramanik, Director, Proposal Development Unit
Shawn Troxler, Associate General Counsel
Alison Wilson, Associate Vice Chancellor for National Security and Special Research Initiatives

Office of the Vice Chancellor
Vice Chancellor
As Chief Research Officer (CRO), the Vice Chancellor oversees all research activities at NC State. Under his authority, units reporting to the Office of Research and Innovation centrally manage research administration, the university’s intellectual properties, and industry and government agency alliances on the university’s award-winning research campus. Researchers at NC State are supported by $405++ million in sponsored programs from federal, local government, industry, and nonprofit organizations. NC State’s research portfolio exceeds 5,000 invention disclosures, 960+ US patents (OR rated #6 in patents issued), 800 active commercialization agreements, and 595+ products to market. Centennial Campus hosts more than 70 corporate, government and nonprofit partners working with the university’s 75+ centers and institutes, laboratories and research departments.

Research Operations
The Research Operations Unit provides strategic leadership and support to the Office of Research and Innovation. The office consists of three units: Strategic Initiatives, Education and Training, and Marketing and Outreach.

Integrated Support Services Center (ISSC)
The ISSC was created to provide streamlined, professional services to faculty and administrators, eliminating costly duplication, creating efficiency and improving timeliness.

Research Development
Research Development Office (RDO)
The RDO facilitates collaboration between faculty and interdisciplinary research experts, providing strategic and responsive support that enhances the university’s most valued research initiatives. By searching a centralized, easy-to-access portal, researchers quickly find internal and external funding opportunities. Once identified, potential funding translates to successful grants with the help of Research Development’s tools and training resources that support researchers as they plan, write, and submit competitive proposals.
Centers + Institutes

NC State's Centers and Institutes reflect the university's commitment to interdisciplinary scholarly pursuit, including research, instruction and public service. These cutting-edge organizations are frontrunners in their field, blazing the trails for other researchers to follow. Research and innovation on topics ranging from climate change to textiles add value to the everyday lives of our state's citizens, maintaining public trust and admiration and standing at the forefront in global excellence for research and discovery. Here, the leadership of these organizations can access the materials, procedures and policies necessary to manage their efforts responsibly, equitably and with the highest integrity.

Proposal Development Unit (PDU)

The PDU supports faculty teams in the development of large-scale, interdisciplinary research proposals. These services include team facilitation, budget development, writing and editing, and administrative assistance, thereby enabling investigators to concentrate on the research-related aspects of their proposals. PDU support is available to NC State faculty planning proposals with estimated total budgets of at least $1M.

Research Administration and Compliance

Sponsored Programs & Regulatory Compliance Services (SPARCS)

SPARCS facilitates the submission of proposals, negotiation of agreements, the administration of internally and externally funded projects, and the administration of subagreements that provide funding to NC State. This includes all aspects of externally sponsored research and scholarship, from pre-award management to non-fiscal post-award management.

Office of Research Commercialization

Office of Research Commercialization (ORC)

NC State University is a research powerhouse and a powerful economic engine for North Carolina. ORC plays a crucial role in this by protecting and promoting University research discoveries and intellectual property, working with and guiding industry partners, and promoting the acceleration of startups. ORC provides innovators with a wide range of programs and services to protect, market, and license intellectual property developed at NC State. Collaboration with NC State innovators and industry partners has led to the creation of more than 125+ startups and 575+ commercialized products that benefit society on a local, national and global scale. Among surveyed universities without medical schools, NC State consistently ranks among the top 10 for key technology transfer metrics.

University Advancement

The mission of University Advancement of NC State University is to facilitate communication, internally and externally, and to enhance the image of the University; to provide meaningful programs and service to alumni and friends; to seek service-support participation and ambassadorship from constituents; to build and sustain a strong volunteer leadership network; to raise money from private sources; to manage the collection of private gifts for North Carolina State University; to manage an effective alumni and development database and gift systems; and to coordinate with the General Administration in areas of government and legislative priorities in Raleigh and Washington.

The office oversees a division that includes development, alumni relations, university communications, and advancement services. Visit the University Advancement website (https://leadership.ncsu.edu/advancement/) for more information.

Advancement Services

Advancement Services supports the operations of Alumni Relations, University Development and University Communications. The department oversees the alumni and donor database, working to process gifts and conduct research about potential contribution opportunities. Other initiatives include management of the University online giving website, support of the alumni association alumni web portal, conducting education and training in the areas of national best practices and rules and regulations pertaining to fundraising activities, ethics, and accountability, and management of an international listserv dedicated of the furtherance of the entire advancement services profession.

The NC State Alumni Association

The NC State Alumni Association engages alumni through programs and services that foster pride and enhance lifelong connections to NC State. The Association encourages alumni to be Red and White for Life — with connections to the university and fellow alumni no matter where they live by linking alumni to the university through membership, a statewide, national, and growing international network of alumni, programming for special-interest groups and students, events and an array of communication tools, including the award-winning NC State magazine. The Alumni Association offers membership options and benefits for alumni who join, and supports a growing Student Alumni Association (SAA), with events and programming that builds connections and enhances their student experience. The Association also sustains the prestigious Caldwell Fellows Scholarship Program, funded by alumni endowments and contributions, and designed to foster academic excellence, leadership, personal growth and service learning.

The Association upholds campus traditions such as the official class ring, Homecoming, Ram Roast, the Tradition Keepers Medals, Wolfpack Freshmen Welcome events, and Founders’ Day, as well as the Legacy Luncheon for incoming freshmen whose parents and/or grandparents attended NC State. In addition, the Association is responsible for the Evening of Stars Gala to celebrate NC State’s distinguished alumni, and the Faculty Awards to recognize the achievements of the university’s outstanding undergraduate and graduate faculty. The Association offers services such as the Wolf Treks alumni travel program and Career Services. Students and alumni can visit the Alumni Association in the Dorothy and Roy Park Alumni Center on Centennial Campus, or contact the Alumni Association at (919) 515-3375 or (800) 627-2586. For a complete overview of programs, services and events, visit the Alumni Association’s website (http://www.alumni.ncsu.edu).

University Development

University Development works with the colleges and programs at North Carolina State University to secure private financial support for priority projects and programs. This support may come from individuals (alumni, parents, students, faculty, staff, and friends), corporations, philanthropic foundations and other organizations. The mission of University Development is to strengthen relationships with alumni and friends and reconnect them with campus colleagues in their colleges and areas of interest, reach out to alumni and friends living out-of-state to carry the messages of NC State’s progress, success, and vision for the
future, and to serve as liaisons to university-wide programs to support
their fundraising and outreach efforts.

University Development provides services to the colleges and programs
in capital campaigns, gift planning, corporate & foundation relations,
and annual giving. University Development also facilitates external and
internal communication among fundraisers, and coordinates approaches
to prospective donors.

**University Communications and Marketing**

University Communications and Marketing builds positive relationships
between NC State University and its many constituents through strategic
internal and external communications that convey the university’s brand
identity. The office is comprised of university relations, marketing and
creative strategies, web communications, and special events, and
focuses on:

- Increasing awareness of the university’s distinctive benefits
- Ensuring consistency in university-wide messaging and visual identity
  by facilitating integration and coordination of public relations and
  communications efforts through out the university
- Monitoring and responding to public issues and perceptions
- Providing marketing, communication and Web strategy, counsel and
  creative services to campus clients
- Providing guidance and resource assistance for university events

**Leadership**

Brian C. Sischo, Vice Chancellor for University Advancement

Brad C. Bohlander, Associate Vice Chancellor for University
Communications & Chief Communications Officer

Jim Broschart, Associate Vice Chancellor for University Development

Derek Bryan, Assistant Vice Chancellor of Finance and
Administration

Jeff Baynham, Interim Associate Vice Chancellor for Advancement

Services

Maggie Musick, Interim Executive Assistant to the Vice Chancellor

Reid Ricciardi, Executive Director of Talent Management

Benny Suggs, Associate Vice Chancellor and Executive Director for
Alumni Relations & Alumni Association

Alan Taylor, Assistant Vice Chancellor for Principal Gifts

Christina Walker, Chief of Staff and Executive Director of University
Advancement

**NC State Policies**

North Carolina State University is committed to academic integrity, and all
students are required to adhere to the NC State Code of Student Conduct
(https://policies.ncsu.edu/policy/pol-11-35-01/). Individual policies on
conduct, including those listed below, are posted on University Policies,
Regulations, and Rules (https://policies.ncsu.edu/) (PPRs).

University Patent Procedures (https://policies.ncsu.edu/policy/pol-10-00-01/)

Grievance Procedures for Graduate Students (https://policies.ncsu.edu/
regulation/reg-11-40-02/)

Code of Student Conduct (https://policies.ncsu.edu/policy/pol-11-35-01/)

Academic Integrity (https://policies.ncsu.edu/policy/pol-11-35-01/)

Policy on Illegal Drugs (https://policies.ncsu.edu/policy/pol-04-20-05/)

Sexual Harassment Policy (https://policies.ncsu.edu/regulation/
reg-04-25-02/)

Racial Harassment Policy (https://policies.ncsu.edu/regulation/
reg-04-25-02/)

University Copyright Procedures (https://policies.ncsu.edu/regulation/
reg-01-25-03/)

**Equal Opportunity and Non-Discrimination**

It is the policy of the State of North Carolina to provide equality of
opportunity in education and employment for all students and employees.
Accordingly, the university does not practice or condone unlawful
discrimination in any form against students, employees or applicants on
the basis of race, color, religion, creed, sex, national origin, age, disability
or veteran status. Nor does the university allow discrimination on the
basis of sexual orientation with respect to internal university matters
that do not contravene federal or state law and that do not interfere with
the University’s relationships with outside organizations, including the
federal government, the military, ROTC, and private employers.  [NOTE:
The NC State University equal opportunity and nondiscrimination policy
includes transsexual individuals within the policy’s prohibitions against
discrimination on the basis of sex. This includes actual or perceived
gender identity and gender expression. See Price Waterhouse v.
Hopkins, 490 U.S. 228 (1989); Smith v. City of Salem, 378 F.3d 566 (6th
Circ. 2004).] Retaliation against any person complaining of discrimination
is in violation of federal and state law and North Carolina State University
policy, and will not be tolerated.

**Unlawful Harassment**

Harassment based upon race, color, religion, creed, sex, national origin,
veteran status, age, or disability is a form of discrimination in violation of
federal and state law and North Carolina State University policy and will
not be tolerated. It is the internal policy of North Carolina State University
to prohibit harassment on the basis of sexual orientation. Retaliation
against any person complaining of harassment is in violation of federal
and state law and North Carolina State University policy, and will not
be tolerated. North Carolina State University will respond promptly to
all complaints of harassment and retaliation. Violation of this policy can
result in serious disciplinary action up to and including expulsion for
students or discharge for employees.

Every individual is encouraged, and should feel free, to seek assistance,
information and guidance from his/her supervisor, the Office for Equal
Opportunity, the Office of Student Conduct or the Employees Relations
section of Human Resources. For additional information, contact:
Office for Equal Opportunity, 1 Holliday Hall, Box 7530, North Carolina
State University, Raleigh, NC 27695-7530, Phone: (919) 513-1234 or
515-3148.

**Disability Resource Office**

Individuals desiring reasonable accommodations for their documented
disabilities should contact the Disability Resource Office (https://
dro.dasa.ncsu.edu/) (DRO), 2751 Cates Avenue, Holmes Hall,
(919) 515-7653 (Voice), (919) 515-8830 (TTY). Services and
accommodations are provided based on an individual’s documented
needs and are determined in consultation with the individual and a
DRO representative. For students, such requests should be made
far in advance of registration deadlines to ensure timely services and
accommodations. DRO will maintain appropriate confidentiality of records and communication regarding disability.

Associations and Accreditation

Associations

The university is a member of the Association of Public and Land-grant Universities, the American Council on Education, the Association of Governing Boards of Universities and Colleges, the Association of American Colleges and Universities, the Education Advisory Board, the Engagement Scholarship Consortium, the National Association of College and University Business Officers, the Oak Ridge Associated Universities, the Southern Association of Colleges and Schools Commission on Colleges, Campus Compact, the University Professional and Continuing Education Association, and the Cooperating Raleigh Colleges.

Accreditation

North Carolina State University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award associate, baccalaureate, master's and doctoral degrees. Contact the Southern Association of Colleges and Schools Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call 404-679-4500 for questions about the accreditation of NC State University.

In addition, many of the university's professional programs and departments are accredited by national professional associations, including:

Specialized Academic Program Accreditation (https://provost.ncsu.edu/institutional-quality/accreditation/specialized-program-accreditation/)

College of Agriculture & Life Sciences (https://cals.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Education (BS)¹</td>
<td>Council for the Accreditation of Educator Preparation (CAEP)</td>
<td>2015</td>
<td>2022</td>
</tr>
<tr>
<td>Biological Engineering (BS)²</td>
<td>Engineering Accreditation Commission of ABET</td>
<td>2017</td>
<td>2023</td>
</tr>
</tbody>
</table>

¹ Accredited through the College of Education.
² Accredited through the College of Engineering.

College of Design (http://design.ncsu.edu/)

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<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture (B.Arch, M.Arch)</td>
<td>National Architectural Accreditation Board (NAAB)</td>
<td>2018</td>
<td>2026</td>
</tr>
</tbody>
</table>

College of Engineering (http://www.engr.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering (BS)</td>
<td>Engineering Accreditation Commission of ABET</td>
<td>2018</td>
<td>2022</td>
</tr>
<tr>
<td>Biological Engineering (BS)</td>
<td>Engineering Accreditation Commission of ABET</td>
<td>2018</td>
<td>2022</td>
</tr>
</tbody>
</table>

The Office of Assessment and Accreditation website (https://provost.ncsu.edu/institutional-quality/accreditation/specialized-program-accreditation/) provides the accreditation dates for the following programs. Each of the following programs’ next comprehensive review date is 2022-2023.

College of Education (https://ced.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counselor Education (PhD, MEd, MS) (MEd and MS concentrations are: Community Agency Counseling, School Counseling, and College Counseling)</td>
<td>Council for Accreditation of Counseling and Related Educational Programs (CACREP)</td>
<td>2012</td>
<td>2021</td>
</tr>
<tr>
<td>All teacher education programs, School Counselor (MEd, MS), School Administration (MSA) and School of Social Work (MR) at initial and advanced levels.</td>
<td>Council for the Accreditation of Educator Preparation (CAEP)</td>
<td>2015</td>
<td>2022</td>
</tr>
</tbody>
</table>
Biomedical Engineering (BS) | Engineering Accreditation Commission of ABET  
Chemical Engineering (BS) | Engineering Accreditation Commission of ABET  
Civil Engineering (BS) | Engineering Accreditation Commission of ABET  
Computer Engineering (BS) | Engineering Accreditation Commission of ABET  
Computer Science (BS) | Computing Accreditation Commission of ABET  
Construction Engineering and Management (BS) | Engineering Accreditation Commission of ABET  
Electrical Engineering (BS) | Engineering Accreditation Commission of ABET  
Engineering - Mechanical Engineering Systems Concentration (BS) | Engineering Accreditation Commission of ABET  
Engineering - Mechatronics Concentration (BS) (Joint Program with UNC-Asheville) | Engineering Accreditation Commission of ABET  
Environmental Engineering (BS) | Engineering Accreditation Commission of ABET  
Industrial Engineering (BS) | Engineering Accreditation Commission of ABET  
Materials Science and Engineering (BS) | Engineering Accreditation Commission of ABET  
Mechanical Engineering (BS) | Engineering Accreditation Commission of ABET  
Nuclear Engineering (BS) | Engineering Accreditation Commission of ABET  
Paper Science and Engineering (BS) | Engineering Accreditation Commission of ABET  
Textile Engineering (BS) | Engineering Accreditation Commission of ABET  

College of Humanities & Social Sciences (http://www.chass.ncsu.edu/)  
<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Factors/Ergonomics Psychology (PhD)</td>
<td>Human Factors and Ergonomics Society (HFES)</td>
<td>2018</td>
<td>2024</td>
</tr>
<tr>
<td>Public Administration (MPA)</td>
<td>National Association of Schools of Public Affairs and Administration (NASPAA)</td>
<td>2014</td>
<td>2021</td>
</tr>
<tr>
<td>School Psychology (PhD)</td>
<td>American Psychological Association</td>
<td>2014</td>
<td>2021</td>
</tr>
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</table>

Spanish/French Education (LAA, LTA, LTF) | Council for the Accreditation of Educator Preparation (CAEP) | 2015 | 2022 |

Poole College of Management (http://www.mgt.ncsu.edu/)  
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<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting (BS, MAC)</td>
<td>Association to Advance Collegiate Schools of Business (AACSB International)</td>
<td>2020</td>
<td>2025</td>
</tr>
<tr>
<td>Business Administration (BS, MBA)</td>
<td>Association to Advance Collegiate Schools of Business (AACSB International)</td>
<td>2020</td>
<td>2025</td>
</tr>
<tr>
<td>Master of Global Innovation Management (MGiM)</td>
<td>Association to Advance Collegiate Schools of Business (AACSB International)</td>
<td>2020</td>
<td>2025</td>
</tr>
</tbody>
</table>

College of Natural Resources (https://cnr.ncsu.edu/)  
<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Management (BS)</td>
<td>Society of American Foresters</td>
<td>2015</td>
<td>2025</td>
</tr>
<tr>
<td>Paper Science &amp; Engineering (BS)</td>
<td>Engineering Accreditation Commission of ABET</td>
<td>2017</td>
<td>2023</td>
</tr>
<tr>
<td>Parks, Recreation &amp; Tourism Management (BS)</td>
<td>Council on Accreditation of Parks, Recreation, Tourism &amp; Related Professions</td>
<td>2017</td>
<td>2022</td>
</tr>
<tr>
<td>Professional Golf Management (BS)</td>
<td>Professional Golf Association of America</td>
<td>2015</td>
<td>2021</td>
</tr>
<tr>
<td>Wood Products (BS)</td>
<td>Society of Wood Science &amp; Technology</td>
<td>2015</td>
<td>2025</td>
</tr>
</tbody>
</table>

1 Accredited through the College of Engineering.
### College of Sciences (https://sciences.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry (BA, BS)</td>
<td>American Chemical Society (ACS)</td>
<td>2017</td>
<td>2023</td>
</tr>
</tbody>
</table>

### Wilson College of Textiles (https://textiles.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textile Engineering (BS)</td>
<td>Engineering Accreditation Commission of ABET</td>
<td>2017</td>
<td>2023</td>
</tr>
</tbody>
</table>

1 Accredited through the College of Engineering.

### College of Veterinary Medicine (http://www.cvm.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinary Medicine (DVM)</td>
<td>American Veterinary Medical Association Council on Education (AVMA COE)</td>
<td>2014</td>
<td>2021</td>
</tr>
</tbody>
</table>

### Administrative Program Accreditation and Certification (https://provost.ncsu.edu/institutional-quality/accreditation/specialized-program-accreditation/)

### Division of Academic & Student Affairs (https://dasa.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Skills Enhancement Program within the Academic Support Program for Student Athletes</td>
<td>International Tutor Program Certification within the College Reading &amp; Learning Association (CRLS)</td>
<td>2019</td>
<td>2024</td>
</tr>
<tr>
<td>Cooperative Education (On-the-job experience in chosen field)</td>
<td>Council for Cooperative Education</td>
<td>2016</td>
<td>2022</td>
</tr>
</tbody>
</table>

### Counseling Center
International Association of Counseling Services, Inc. (IACS) 2015 2023

### Student Health Services
Accreditation Association for Ambulatory Health Care (AAAHHC) 2019 2022

### UG Tutorial Center Program
College Reading & Learning Association (CRLA) CRLA’s International Tutor Program Certification 2019 2024

1 Review Complete, Awaiting Results.

### Environmental Health & Public Safety (https://ehps.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Police</td>
<td>Commission on the Accreditation of Law Enforcement Agencies</td>
<td>2020</td>
<td>2024</td>
</tr>
<tr>
<td>Campus Police</td>
<td>International Association of Campus Law Enforcement Administrators (IACLEA)</td>
<td>2016</td>
<td>2020</td>
</tr>
</tbody>
</table>

### College of Veterinary Medicine (http://www.cvm.ncsu.edu/)

<table>
<thead>
<tr>
<th>Program Name</th>
<th>Accrediting Body</th>
<th>Last Yr Accred</th>
<th>Next Yr Accred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinary Health Complex</td>
<td>American Veterinary Medical Association performs accreditation inspections</td>
<td>Inspection 2014</td>
<td>Inspection 2021</td>
</tr>
</tbody>
</table>
Lab Animal Facilities | Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) Performs accreditation inspections. | Inspection 2018 | Inspection 2021

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Equal Opportunity and Non-Discrimination Policy

It is the policy of the State of North Carolina to provide equality of opportunity in education and employment for all students and employees. Educational and employment decisions should be based on factors that are germane to academic abilities or job performance. North Carolina State University ("NC State") strives to build and maintain an environment that supports and rewards individuals on the basis of relevant factors such as ability, merit, and performance. Accordingly, NC State engages in equal opportunity and affirmative action efforts and prohibits discrimination, harassment and retaliation, as defined by NC State's Equal Opportunity and Non-Discrimination Policy (POL 04.25.05) (https://policies.ncsu.edu/policy/pol-04-25-05/).¹

NC State will promptly, thoroughly and impartially respond to all complaints of Discrimination, Harassment and Retaliation.

Any individual with a complaint of Discrimination, Harassment or Retaliation should use the procedures outlined in the Resolution Procedures for Discrimination, Harassment and Retaliation Complaints.

Substantiated instances of Discrimination, Harassment and Retaliation, as defined in the policy, are violations of the policy and will not be tolerated by NC State.

For more information, please contact:

Office for Institutional Equity and Diversity
231 Winslow Hall
Box 7530
NC State University
Raleigh, NC 27695-7530
Phone: 919.515.5148
TTY: (919) 515-9617
Website: http://oied.ncsu.edu/oied/

¹ This policy is established in accordance with 41 CFR Part 60 and is implemented in accordance with applicable laws and their amendments, including but not limited to, Title VI and Title VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Executive Order 11246, the Age Discrimination in Employment Act of 1975, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, the Vietnam Era Veterans' Readjustment Assistance Act of 1974, the Civil Rights Restoration Act of 1988, North Carolina General Statutes Chapters 116 and 126.

Discrimination, defined as unequal and unlawful treatment based upon race, color, religion, creed, sex,² national origin, age, disability, veteran's status, or genetic information is a violation of this policy and will not be tolerated by NC State. Discrimination based on sexual orientation is also prohibited by this policy². Harassment is unwelcome conduct based upon race, color, religion, creed, sex, national origin, age, disability, veteran status or sexual orientation that either 1) creates a quid pro quo situation, or 2) creates a hostile working or learning environment. Retaliation is an adverse action against a covered individual because that individual engaged in a protected activity.

NC State will respond promptly to all complaints of discrimination, harassment and retaliation. Violation of this policy can result in serious disciplinary action up to and including expulsion for students or discharge for employees.

Any individual with a concern, grievance or complaint of discrimination, harassment or retaliation should use the procedures outlined in the Resolution Procedures for Discrimination, Harassment and Retaliation Complaints.

For more information, please contact:

The Office for Institutional Equity and Diversity
231 Winslow Hall
Box 7530, NC State University
Raleigh, NC 27695-7530
Phone: (919) 515-3148
fax: (919) 513-1428
TTY: (919) 515-9617
Website: http://oied.ncsu.edu/oied/

² The policy's prohibition against discrimination on the basis of sex includes actual or perceived gender identity and gender expression.
³ NC State does not allow discrimination nor harassment on the basis of sexual orientation with respect to internal university matters that do not contravene federal or state law and that do not interfere with NC State's relationship with outside organizations, including the federal government, the military, ROTC, and private employers.

Student Activities

At NC State, we are dedicated to providing students with not only a world-class education, but a well-rounded and enriching collegiate experience. Students have the opportunity to take in thrilling performances put on by Arts NC State, connect with like-minded peers by joining or beginning any of 700+ student organizations through Student
Involvement, or cheer on the Wolfpack with pride as our 23 varsity sports teams take on the competition.

Take a look through the resources below to see just some of the ways that students can get involved and stay active both on and off campus with the Wolfpack community.

- Arts NC State (p. 41)
- Campus Facilities (p. 42)
- Intercollegiate Athletics (p. 44)
- Student Involvement (p. 45)
- Student Media (p. 45)

Arts NC State

The six visual and performing arts programs of Arts NC State - Crafts Center, the Dance Program, the Gregg Museum of Art & Design, the Department of Music, NC State LIVE and University Theatre – provide opportunities for our students and our community to explore, learn, create, and grow. Whether through academic courses, cutting-edge performances and exhibitions or the preservation of traditional crafts, Arts NC State educates our students for the 21st century while providing a living link to our rich cultural heritage. For additional information, please visit the Arts NC State website (https://arts.ncsu.edu/).

The Crafts Center

Explore your creative side and Make it Here! The NC State Crafts Center is an excellent resource for all students. Whether you’re interested in learning a skill or just want to “de-stress,” the Center has a comprehensive range of offerings in clay, digital photography, wood, jewelry/metals, fibers, glass, lapidary, mixed media and more. The Crafts Center is a diverse and creative space where skill and self-expression are fostered through the making and sharing of art and craft. Join us for special student-only classes such as Friday CRAFTernoons, Stressbusters and more. It’s also a great place to visit, study and surround yourself with creativity. Mentorship thrives at the Center. Professional staff and crafts instructors provide quality technical advice and materials support. With the intent of enhancing quality of life, the Crafts Center reaches out through academic collaboration, support for student life, and partnerships with other arts organizations. Participation in associated crafts guilds that routinely meet at the Crafts Center provides NC State students a creative platform within the university and beyond.

For answers to your questions about the Crafts Center, please call 919.515.2457 or visit the Crafts Center website (https://crafts.arts.ncsu.edu/) for our upcoming programming, calendar information, map and directions.

Dance Program

The NC State Dance Program gives students the opportunity to study dance through direct experience in choreography and performance. The program’s two student companies, the State Dance Company (DAN 295 Problems of Dance Performance) and the Panoramic Dance Project (DAN 210 Current Trends in Afrocentric and World Dance), are open by audition. A vast array of classes, offered through the Master Class Series, are open to all NC State students, faculty and staff. The program also offers other academic courses such as Dance Composition (DAN 272 Dance Composition - Solo Forms) and Hip-hop Dance (DAN 260 Hip-hop Dance).

The Dance Program provides a rich training ground for choreographers through the study of composition, independent study, and guided choreographic projects. As undergraduate and graduate students pursuing degrees in various fields, the dancers at NC State bring their diverse insights and experiences into the artistic process and contribute meaningfully to the art. The Dance Program’s three annual concerts are described below:

- The Dance Program Fall Concert: The Fall Concert features the choreography of current students who create work through independent study, as well as guest artists and company directors. Both the State Dance Company and the Panoramic Dance Project are represented on the Fall Concert.

- State Dance Company Concert: The State Dance Company performs a distinguished collection of modern dance for their annual concert. The concert features premiere and repertory work created by the dance program directors and invited guest artists.

- Panoramic Dance Project Concert: For their annual spring concert, the Panoramic Dance Project presents a variety of dance styles in a world context with a focus on African, hip-hop and Latin dance. The concert features work by the director, guest artists and selected student choreographers.

For more information, please contact 919.515.7034 or visit the Dance Program website (https://dance.arts.ncsu.edu/).

Gregg Museum of Art & Design

The Gregg Museum seeks to inspire creativity, innovation and the expression of ideas. With frequently-changing exhibitions and exciting free programs like films, artist talks, workshops, or yoga nearly every week, there’s always something new to see or do at the Gregg. As one of NC State’s designated Student Centers, the museum and its surrounding gardens offer a great place to study, have a picnic, or hang out with friends in a stimulating environment. Wifi is available both outdoors and inside.

The Gregg collection includes more than 35,000 objects from every continent, such as ceramics, glass, textiles, furniture, photography, paintings and sculptures, folk and outsider art, works on paper, Native American art, industrial design, archaeological artifacts, and fashion and costume. If you’re looking for inspiration or researching a topic involving objects, feel free to approach the museum staff for help. Each semester the Gregg also offers internships (for class credit) and paid student positions that provide experience in museum work.

To schedule tours or class visits, or to plan to use the permanent collection for research, please call 919.515.3503 or visit gregg.arts.ncsu.edu (https://gregg.arts.ncsu.edu/).

The Gregg is located at 1903 Hillsborough Street, just across Pullen Road from the university’s Memorial Belltower, at the northern tip of Pullen Park. Opening hours are 10am-5pm Tuesday, Wednesday, Friday and Saturday; 10am-9pm Thursday; and 1pm-5pm on Sunday. The galleries are closed Mondays. Admission is free.

Department of Music

The Department of Music provides educational and performance opportunities for student and community participants through a variety of musical experiences and academic courses. Both a 15-hour minor in Arts Entrepreneurship and a 20-hour music minor is offered for qualified undergraduate students who wish to engage in more extensive study of
music and the arts. Three tracks are offered: Performance, Composition, and General Studies.

For full descriptions of the academic courses, consult the Department of Music (p. 1493) page in the NC State University Course Catalog, contact 919.515.2981 or visit the Department of Music's website. (https://music.arts.ncsu.edu/)

A wide variety of performing ensembles provide opportunities for students to develop both artistically and intellectually through applied music study. Through performance, the ensembles play an important role in campus life, presenting public concerts and performing at official functions (both on and off campus) and athletic events. Curricular performing ensembles receive one academic credit that may be used to satisfy free elective requirements in any academic major. Membership in most ensembles requires an audition with the instructor. See the Department of Music's website (https://music.arts.ncsu.edu/) for audition information.

- **Choral Ensembles.** The Choral program offers students from all academic areas an opportunity to participate in the exploration and performance of the highest quality choral repertoire from all eras. The ensembles include State Chorale, Tenor-Bass Choir (Singing Statesmen), Soprano-Alto Choir (Vox Aculalia), and the African American Choral Ensemble. Performance highlights have included concerts every semester, tours and occasional collaborations with other ensembles.

- **Orchestras.** The Raleigh Civic Symphony and Chamber Orchestra combine student and community musicians with professional leaders to present concerts of innovative programming on campus and in other Triangle area venues. Area professionals serve as concertmaster, principal cellist, and guest coaches, to provide high-level instruction and leadership to community and student players. Both orchestras require an audition.

- **Athletic Bands.** The Marching Band (Power Sound of the South) is active during football season, and the Varsity (Pep) Band is active during basketball season. Students must audition for a band and will be placed according to their ability and interest.

- **Concert Bands.** Two concert bands, the Symphonic Band and the Wind Ensemble, are offered each semester. Students must audition for the Wind Ensemble and will be placed according to their ability and interest.

- **Jazz Ensembles.** The jazz program includes Jazz Ensemble I, Jazz Ensemble II and a variety of Jazz Combos. The jazz groups perform both on and off campus during the fall and spring semesters. Students must audition for a jazz ensemble or combo and will be placed according to their ability and interest.

- **Piano.** Beginning piano classes are offered to students from all academic areas for credit. No previous experience is required. Applied lessons are offered to advanced piano students who have passed an audition and are admitted to the music minor program in piano performance with limited additional openings for non-minors.

- **Voice.** A Vocal Techniques class is offered to beginning voice students for credit with instructor approval. Previous voice study is not required. Applied voice lessons are offered to advanced voice students who have passed an audition and are admitted to the music minor program in vocal performance with limited additional openings for non-minors.

- **Pipes & Drums.** Students may learn to play the bagpipes, an instrument known to many of North Carolina’s earliest settlers. Pipes, drums, and other equipment are furnished. Beginning pipe and drum lessons are available to students without previous experience.

**NC State LIVE**

Experience amazing performers from around the world. A typical NC State LIVE season features outstanding professional artists from a wide range of disciplines, including jazz, world music, modern and contemporary dance, drama and comedy. Discounted tickets are available to NC State students, faculty, and staff, as well as parents of current NC State students and members of the NC State Alumni Association. The NC State community also has the opportunity to engage with world-class artists through free workshops, master classes, artist lectures, and more. Contact: 919.515.3030 or visit the NC State LIVE website (https://live.arts.ncsu.edu/).

**University Theatre**

University Theatre is NC State’s volunteer student theatre, open to all students regardless of major. Through our large-scale Main Stage series, cutting-edge performance based Open Door Series, and professional summer TheatreFEST series, students can enjoy theatrical works that tell stories from different perspectives and in varied genres.

Participating both on stage and backstage, students can be a part of the campus theatre community. Audition for a show; develop skills in our various shops, including scenery, costumes, lighting, sound or projections; join a production crew; or become a member of our stage management team. Academic classes are offered in conjunction with our theatre minor and numerous workshops throughout the year. Employment opportunities for live events are also offered. University Theatre is also home to a chapter of Alpha Psi Omega national theatre honor society.

Contact: 919.515.3927 or visit the University Theatre website (https://theatre.arts.ncsu.edu/).

**Ticket Central**

Ticket Central serves as the centralized box office for the visual and performing arts programs at NC State. Ticket Central tickets events in a variety of performance venues including Titmus Theatre, Kennedy-McIlwee Theatre, and the Talley Student Union. In addition to serving the six Arts NC State programs, Ticket Central provides ticketing services on a fee basis for many campus and community organizations.

The box office is located in the main lobby of Thompson Hall. Normal hours of operation are Monday-Friday 1- 6 p.m. If there are performances during the week, the box office will remain open until curtain. On weekends with performances, the box office will open one hour prior to curtain. Hours vary during University holidays and during the summer. Tickets may be purchased in person, over the phone by calling 919.515.1100, or online by visiting the Ticket Central website (https://tickets.arts.ncsu.edu/).

**Campus Facilities**

NC State’s campus facilities are home to many of our student activities and events. From screening films in the historic Witherspoon Student Center, joining Student Government meetings in Talley Student Union, participating in intramural sports at the Carmichael Complex, or watching one of University Theatre’s student-directed plays in Frank Thompson Hall, students and visitors can have a variety of experiences all right here on campus. Here are just a few of the spots that serve our student activities and services.
The Campus Cinema

The Campus Cinema, located in Witherspoon Student Center, presents films ranging from independent works to the latest Hollywood blockbusters in digital format with Dolby® Digital Surround Sound. The cinema is a fully functional movie theatre with 460 seats and a concession stand offering freshly popped popcorn, one free popcorn per person. Movie screenings are free to NC State and the general public unless otherwise specified. Check out the cinema website at: https://uab.ncsu.edu/films-schedule/ (http://uab.ncsu.edu/films-schedule/). If you desire any assistive devices, services, or other accommodations to participate in these activities, please contact the UAB Films Advisor at 919-515-5168.

Carmichael Complex

Carmichael Complex consists of Carmichael Gym, Carmichael Recreation Center, Willis R. Casey Aquatic Center, Miller Fields, 12 tennis courts, and 8 basketball courts, which offer a wide variety of indoor and outdoor fitness choices for students. Students may use the pools, indoor track, courts, cardio equipment, the outdoor fields, and tennis courts unless otherwise reserved for classes, events or maintenance. The Carmichael Complex is home to University Recreation and the Department of Health & Exercise Studies. For more information, please visit the Carmichael Complex website (http://recreation.ncsu.edu/facilities/carmichael/) or call (919) 515-PLAY (7529).

Gregg Museum of Art & Design

Gregg Museum of Art & Design is NC State’s collecting museum, with more than 35,000 examples of contemporary and historic ceramics, textiles, glass, furniture, photography, paintings, sculptures, folk and outsider art, archaeological artifacts, works on paper, and fashion garments preserved in its permanent collection. Frequently-changing exhibitions and interesting programs make every visit special.

Located in the original 1928 Chancellor’s Residence at 1903 Hillsborough Street (just across from NC State’s famous Memorial Belltower), the Gregg includes period rooms, formal gardens, and a contemporary 15,000 sq ft. galleries wing. All are used as exhibition and programming spaces, and are free and open to students and public alike.

Departments, groups, and individuals may also book spaces for private meetings, conferences, workshops, parties, weddings, and other events. Call 919-515-8956 for rates and availability.

To schedule tours or class visits, or to make arrangements to use the permanent collection, call 919-515-3503 or visit Gregg.arts.ncsu.edu (https://gregg.arts.ncsu.edu/). The Gregg and its surroundings offer a great place to meet, hang out, study, play, or have a picnic in a stimulating environment. WiFi is available both inside and outdoors. Hours are 10am-5pm Tuesday, Wednesday, Friday and Saturday; 10am-9pm Thursday; and 1pm-5pm on Sunday. The galleries are closed Mondays. Admission is free.

Price Music Center (PMC)

Price Music Center (PMC) is the location for the Department of Music and its programs. Until 1965, the first Pullen Hall had been the original music building, which, along with many band instruments, pianos, and a music library, was destroyed by a student arsonist. Built in 1971, Price Music Center is named to honor Percy Walter (Daddy) Price, the father of today’s musical organizations on campus and the University’s first music director in 1923.

Practice studios are available to NC State students on a first-come, first-served basis. Each practice room has an upright piano and music stand. For questions about practice space in Price, call 919.515.2981. For more information, see Department of Music (https://music.arts.ncsu.edu/).

Price Music Center is located at 2620 Cates Avenue, next to the Talley Student Union. The main office is located on the second floor, room 203. Additional facilities and offices are located in the south wing of Broughton Hall.

Talley Student Union (TSU)

Talley Student Union (TSU) is the hub of student life on campus and is the place to study, shop, dine and engage with your peers. Talley Student Union is anchored with nine food venues, Wolfpack Outfitters, the Woodward Student Involvement Center and Stewart Theatre. If students are looking to connect with the arts, enhance their leadership skills, or connect with peers, Talley Student Union is the place to start. Students can even be part of the amazing student employment team that operates the facility.

Program offices and service areas that can be found in the Talley Student Union include:

• Arts NC State;
• Center for Student Leadership;
• Dance Program;
• Ethics & Public Service;
• Fraternity and Sorority Life; GLBT Center;
• Multicultural Student Affairs; Student Involvement;
• NC State LIVE;
• NC State Student Centers Administration;
• Student Centers Board of Directors;
• Union Activities Board;
• University Theatre Administration;
• Women’s Center;
• RAVE! Events;
• Ticket Central;
• and University Graduate Student Association.

RAVE! Events

To reserve room in the Talley Student Union or to plan your event, please visit R (http://campusenterprises.ncsu.edu/talley-student-union)/RAVE!‘s website (https://campusenterprises.ncsu.edu/rave-events/) or contact RAVE! Events at 51-EVENT (513-8368).

Frank Thompson Hall

Frank Thompson Hall is the location for University Theatre and the Crafts Center. Built in 1925 as a gymnasium, Thompson Hall reopened in Fall 2009 after an extensive renovation that was an extraordinary partnership between NC State students, private citizens, businesses and the extended NC State community.

Thompson Hall houses University Theatre’s full production activities, performances, and classes. Facilities include the Titmus Theatre, the Kennedy-McIlwee Studio Theatre, the costume shop, the scenic construction and paint shop, lighting and sound facilities, as well as
rehearsal and classroom spaces. The renovation brought state-of-the-art technologies and improved accessibility to the building that now returns to its purpose as a hub of student activity. For more information, see University Theatre (https://theatre.arts.ncsu.edu/).

Located on the ground floor of Thompson Hall, the Crafts Center offers technology-rich studios and specializes in classes and workshops in clay, digital photography, wood, jewelry/metals, fibers, glass, lapidary, mixed media and more. For more than fifty years, the Crafts Center has provided a friendly learning environment for students and craftspeople of all levels. NC State’s Crafts Center is one of the finest university crafts programs in the country. Classes and studio use are available to NC State students, alumni, employees, and the general public. For information, see Crafts Center (https://crafts.arts.ncsu.edu/).

Thompson Hall is located on Dunn Street and Jensen Drive.

Witherspoon Student Center (WSC)

Witherspoon Student Center (WSC) currently houses the African-American Cultural Center, Student Government and Student Media which includes the offices of five student-run media organizations:

- Agromeck (yearbook);
- The Nubian Message and Technician (newspapers);
- Windhover (literary magazine);
- and WKNC FM 88.1 (radio station).

Witherspoon includes two accessible balconies; one meeting room available by reservation through REM; the African-American Cultural Center’s Sankofa Room, Gallery and Library; and Campus Cinema, used for films, lectures, classes and special events.

**Intercollegiate Athletics**

**Go Pack!**

NC State has a long and storied history in athletics, as well as a loud and passionate fanbase that supports the Wolfpack faithfully. The university’s athletics programs (http://www.gopack.com/) enjoy a tradition of excellence as they compete in the prestigious Atlantic Coast Conference.

The athletics program is self-supporting and is operated primarily through gate receipts, radio and television revenues, NCAA distributions, student fees, and private donations. Funds for athletics grants-in-aid are provided through the North Carolina State Student Aid Association, also known as the Wolfpack Club.

**Sports**

The Department of Athletics conducts the university’s intercollegiate athletics program, which includes 23 varsity sports. The athletics program is administered by the Director of Athletics, Boo Corrigan. The Council on Athletics is appointed by the Chancellor and serves in an advisory capacity to the Director of Athletics and the Chancellor.

Men’s varsity sports include soccer, cross country, and football in the fall; basketball, swimming and diving, indoor track, and wrestling in the winter; and outdoor track, golf, softball and tennis in the spring. Varsity sports for women include soccer, cross country, and volleyball in the fall; basketball, indoor track, swimming and diving, and gymnastics in the winter; and outdoor track, golf, softball and tennis in the spring. The co-ed rifle team competes during the winter.

**Athletics Facilities**

The Wolfpack’s football facility, Carter-Finley Stadium, boasts 57,600 permanent seats. The 106,000 square-foot Murphy Football Center, which is the operations hub for the football program, stands in the south end zone, while the Finley Fieldhouse houses visitor locker rooms and other operations spaces on the north end of the field. Soaring high above it all is Vaughan Towers, a 117,000 square-foot structure along the west grandstand that houses 955 club-level seats, 51 private luxury suites, a University suite for the Chancellor and a state-of-the-art press box.

The men’s basketball squad competes in the PNC Arena, which boasts one of the top capacities in the Atlantic Coast Conference with seating for 19,500 fans. Since PNC Arena opened in 1999-2000, NC State has finished every year in the top-25 nationally in attendance. The women’s basketball squad plays in the James T. Valvano Arena at William Neal Reynolds Coliseum – one of nine areas on campus designated as a “hallowed space.” The arena has seating for 5,500 in the facility which recently underwent a $35 million renovation and now houses the Wolfpack Walk of Fame and History. It’s also the home of gymnastics, wrestling and rifle, as well as NC State’s ROTC programs.

Located in the heart of campus, the Dail Soccer Field is located inside Paul Derr Track under stadium lights. Adjacent to that complex is the Dail Softball Stadium. Situated across from historic Reynolds Coliseum, the picturesque campus setting serves as the background for one of the best softball facilities in the ACC.

With seating for 3,480, Doak Field at Dail Park has been the home of Wolfpack baseball for over 50 years. Across the street from “The Doak” is the J.W. Isenhour Tennis Center. The outdoor stadium, has six lighted courts, chairback seating for up to 1,000 spectators, and an electronic scoreboard. The indoor courts, named in honor of former Wolfpack standout Andy Andrews, provides seating for up to 200 spectators.

The golf team trains at the beautiful Lonnie Poole Golf Course, an 18-hole, 7,350-yard, par 71 public course located on Centennial Campus. The $11.6 million dollar Arnold Palmer Signature multipurpose golf course also houses a research center and The Carol Johnson Poole Clubhouse. This facility also supports critical academic programs, including the Professional Golf Management (PGM) and turfgrass programs.

The Willis R. Casey Aquatic Center serves as the hub for the Pack’s nationally-ranked swimming and diving teams. The site of many ACC Championship meets over the years, it features two pools and spectacular seating for approximately 1,000 fans.

The Wolfpack’s athletics administrative offices and coaches’ offices for soccer, track and cross country, and wrestling are located in the Weisiger Brown General Athletics Facility. The Case Athletics Center houses the Academic Support Program for Student-Athletes.

The fundraising offices of the Wolfpack Club and the athletic department’s ticket offices are located in the Palisades Building near Carter-Finley Stadium: 5400 Trinity Rd. (Suite 500), Raleigh, NC 27607.

For ticket information call (919) 865-1510 or 1-800-310-Pack. The main athletic department receptionist: (919) 515-2101. Visit the official athletic department website (http://www.gopack.com/) for complete information.
Student Involvement

Student Involvement
The Wolfpack’s starting place for students to get involved at NC State, Student Involvement helps students find fun and meaningful ways to make NC State home through involvement on campus. The department supports the Wolfpack’s diverse community of student organization members, leaders, and advisors through advising, education, and programming. Student Involvement also provides resources to students that make it easy to find any of over 700 student organizations to join or start an organization that doesn’t exist.

Getting involved is an important way students can develop the sense of belonging necessary for academic success, personal and professional development. Being involved on campus is a great way to build a sense of belonging at NC State, increase cultural competencies and develop multiple perspectives, as well develop academically, personally, and professionally.

Student Involvement Center
4201 Talley Student Union
2610 Cates Avenue
Raleigh, NC 27695-7295

Web: studentinvolvement.dasa.ncsu.edu
Phone: 919.515.2797
Email: studentinvolvement@ncsu.edu

Student Government
Founded in 1921, Student Government is a student-run organization that serves as the official voice of the student body. The organization attempts to better the student experience at NC State by working alongside university administrators to address student concerns.

Student Government is organized into five primary areas: executive, legislative, judicial, the treasury, and the Board of Elections. Student organizations may seek funding from Student Government appropriations committee through a bi-annual process.

Website: https://orgs.ncsu.edu/student-govt/
Talley Student Union
Suite 4251
Email: studentgovernment@ncsu.edu

Melanie Flowers, Student Body President
McKenzy Heavlin, Student Body Vice President
Coleman Simpson, Student Senate President
Garrison Seitz, Student Body Treasurer

The University Activities Board
The University Activities Board (UAB) was formed in 1951 to produce quality programming “for the students, by the students.” The mission of UAB is to create innovative activities that stimulate, motivate, educate, and involve the student body. Annual programs include Wolfstock, Pan-African Week, and TUFFTalks.

Web: https://orgs.ncsu.edu/uab/
Zach Hover, President
Josie Thompson, Vice President of Communication

Michael Barilla, Vice President of Finance
Bri Murphy, Vice President of Internal Affairs

Fraternity and Sorority Life
There are over 50 fraternities and sororities at NC State University, each founded to prepare students for society through a values-based fraternal experience. Affiliation with an organization is designed to empower students to pursue their potential, providing opportunities to belong, give, achieve, live and lead. How organizations enact those values through membership, programs, and activities are what makes each organization unique. Fraternities and sororities provide opportunities to get involved, helping students on a large campus build a support network of peers that share similar goals and interests. Organizations challenge members to take on new responsibilities, develop their leadership potential, be active within the campus and surrounding communities, and adopt a commitment to volunteerism and civic engagement. Fraternities and sororities also provide their members with a unique lifetime membership, connecting them with local graduate and alumni chapters and national alumni groups well after graduation.

Approximately half of our chapters provide housing for their members with 15 chapters currently living in Greek Village on campus and 4 new homes under construction. The University, in partnership with our fraternities and sororities, has committed to redevelop Greek Village over the next 10 years. At completion, Greek Village will be home to over 35 different fraternities and sororities in a combination of homes, townhouses and apartments.

For more information on membership, educational programming, or service opportunities, visit the Department of Fraternity and Sorority Life’s website, the office in 5261 Talley Student Union, or call (919) 513-2910.
Website: fsl.dasa.ncsu.edu
Shelly Brown Dobek, Director of Fraternity and Sorority Life

Student Media
Department website: https://ncsu.edu/sma
NC State students have the opportunity to produce and manage a variety of student-oriented media. By working with these media, students gain valuable co-curricular experience in sales, marketing, journalism, broadcasting, production, design, multimedia communication, leadership and management. NC State boasts five media outlets staffed by students and supported in large part by self-generated non-fee revenue, as well as a student-staffed Business and Marketing office which coordinates advertising sales, sponsorships and full-service marketing opportunities for all five media. Many staff positions are paid.

Agromeck
Agromeck, the university’s yearbook, provides a record in words and pictures of student and campus activities each year. Student staff members include photojournalists, writers, designers and editors, all with a common mission: documenting the history of the university from the student perspective. The Agromeck has received the nation’s highest awards for general excellence and photography as well as national Pacemaker and Crown awards.

Nubian Message
Nubian Message provides news and features about the African-American community at NC State, as well as coverage of regional, state and
national issues of interest to our students. To find out more about this bi-weekly publication, visit the Nubian Message online.

**Technician**

The Technician, the university’s oldest student newspaper, is published each Thursday when school is in session during the fall and spring semesters, and online with breaking news and online-only content year-round at technicianonline.com (https://technicianonline.com). With a print circulation of 4,000 copies at nearly 100 newsstands on and near campus, the Technician has earned numerous state and national awards for news, features, sports, opinion writing and photography, as well as general excellence. Online, you’ll find continuous updates of news, features, sports, campus events, and other content of interest to students, including video, audio and photo slideshows.

**The Windhover**

The Windhover, the campus literary and visual arts magazine, is published each spring. As a showcase for NC State’s creative writers, poets, artists, photographers and musicians, it has received numerous national awards, including the Pacemaker from the Associated Collegiate Press and Gold Crown from the Columbia Scholastic Press Association. Visit the Windhover online (http://www.ncsu.edu/windhover/).

**WKNC (88.1 FM)**

WKNC (88.1 FM), NC State’s student radio station, operates at 25,000 watts, for a potential effective potential audience of more than 1.4 million through its FM signal alone, as well as an online stream and a mobile app that lets listeners enjoy WKNC from anywhere in the world. It employs a full complement of student managers, DJs, engineers, journalists and bloggers to provide programming 24 hours a day. It also sponsors a variety of live music events both on campus and at various music venues in Raleigh. Visit (and listen to!) WKNC online (http://www.wknc.org). If you have an HD radio, you can also enjoy WKNC HD-2.

**Student Media’s Business Office**

Student Media’s Business Office gives students interested in sales and marketing an opportunity to hone their skills while earning commission on every advertisement and sponsorship they sell. From print, to broadcast, to online sales, few (if any) organizations at NC State offer our students a better way to build their "real-world" business and marketing acumen as they work toward earning their degree from NC State. To find out more, visit the Business and Marketing Office online. (https://www.ncsu.edu/sma/)

**The Student Media Board of Directors**

The Student Media Board of Directors is a way for students to get involved in the management of a large business operation. The Board of Directors is the governing arm for all student media which use student fee monies to support their operations. Elections to the Board are held in the spring.

**Student Services**

NC State University knows that there's more to academic success than books and research papers. That's why we offer a full range of services to support students in all aspects of their academic careers. Our full-service Student Health Center helps keep students healthy, while our Career Development Center helps them plan for life after graduation.

Take a look through all of our student services below to see how we are here to support your time at NC State.

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**Academic Advising Services**

2751 Cates Avenue
Holmes Hall  
NC State Box #7925  
Raleigh, NC  27695-7925  
Website: https://advising.dasa.ncsu.edu/  
Phone:  919-515-8130  Fax:  919-515-8267  

Dr. Carrie McLean, Assistant Dean and Director  

Academic Advising Programs and Services (AAS) provides quality and timely advising services to students and faculty to facilitate academic success, major selection, career development, and personal enrichment. Current or former NC State undergraduate degree students in transition are the priority population for AAPS. AAPS is a collaborative of cross-curricular professional advisors who partner to provide walk-in, face-to-face, and virtual advising to undergraduate students exploring majors; current information on General Education, declaring majors & minors, and academic policies; and advising support and development to faculty and staff across the campus.

**Pre-Professional Programs**

**Pre-Law Advising**

Law schools neither prescribe nor recommend a particular undergraduate curriculum for prospective candidates. A student may prepare for law school within any of the majors offered by the nine undergraduate colleges. Pre-Law Services at NC State are offered through the Career Development Center (http://careers.ncsu.edu/). Through Pre-Law Services, students receive guidance on preparing for law school, taking the LSAT, and applying to law school. Students have the opportunity to learn and network through experiential learning programs, internships, seminars and workshops, and the annual Law School Fair.

The Pre-Law Advisors also work with the Pre-Law Students’ Association (PLSA), which is open to all interested students. During the year the PLSA provides programs that have included: NC State Law School Fair, local attorneys, panel of Law School students, Law School Directors of Admission, information on the admissions process. For more information, visit the Pre-Law Services website (https://careers.dasa.ncsu.edu/gain-experience/pre-professional/pre-law/).

**Health Professions Advising**

Many NC State undergraduate students are planning a career in the health professions and will apply to attend medical, dental, optometry or other health care graduate schools after graduation. Health Professions Advising at NC State University offers guidance, information, and support to students interested in attending health professional school. The Health Professions Advisor can assist you with:

- Prerequisite course selection
- Becoming a competitive candidate
- Selecting potential health professions schools
- Application materials & timelines
- Personal statement assistance
- Interview tips & preparation

Health professional schools do not require students to obtain a designated “Pre-Health” degree. Instead, they seek students who have demonstrated academic success and who also have excelled in other areas including clinical and service experience as well as social development. Like most schools, NC State does not offer a dedicated “Pre-Health” curriculum. Instead, we recommend that students interested in health professions select the academic major that is of greatest interest to them while ensuring that they select courses that provide a strong foundation in the natural sciences required by most professional programs for admission. These include biology, chemistry, physics, and calculus along with recommended courses like genetics and biochemistry. It is also recommended that students select courses that improve communication and writing skills as well as provide a strong foundation in the humanities, psychology and ethics.

For more information on Health Professions Advising, visit the Health Professions Advising website (https://prehealth.dasa.ncsu.edu/).

**Veterinary Professions Advising Center (VetPAC)**

The Veterinary Professions Advising Center (VetPAC) aims to provide NC State students and alumni the guidance, resources and experience necessary to become uniquely competitive veterinary school applicants. While there is no formal "pre-veterinary" program or degree at NC State, many students interested in pursuing veterinary school often declare majors in the following disciplines: Animal Science, Zoology, Biological Sciences, Biochemistry, Microbiology, and Poultry Science.

VetPAC is housed within the College of Agriculture and Life Sciences. For more information on pre-veterinary advising, visit the VetPAC website (https://cals.ncsu.edu/vetpac/).

**Academic Support Program for Student Athletes**

The Academic Support Program for Student Athletes (ASPSA) is a comprehensive support program that strives to meet the academic, personal and professional development needs of all student-athletes, promoting excellence and effectiveness in undergraduate and graduate education as well as leadership and civic engagement.

ASPSA is committed to extending the educational experience of its constituency with particular emphasis on empowering student-athletes to become strong self advocates, providing specialized initiatives to facilitate a smooth transition from high school to college and from college to professional life while successfully integrating student-athletes into the campus community; enhancing academic skills for student-athletes at all skill levels and providing academic support personalized to the needs of each student-athlete.

ASPSA will maintain a strong sense of integrity and will continue to strive to be one of the benchmark programs for academic support for all collegiate academic support programs in the nation. The mission of the Office of Academic Support Program for Student Athletes at NC State University is:

1. to support the recruitment, retention and graduation of NC State student-athletes;  
2. to provide a comprehensive support system that affords NC State student-athletes equitable opportunity to pursue academic, personal, and professional development and  
3. to strongly adhere to the principles of integrity, excellence, and lifelong learning.

200 Case Academic Center  
240 Jeter Drive  
Campus Box 7104
Campus Community Centers

NC State’s Campus Community Centers are proudly comprised of the African American Cultural Center, the GLBT Center, Multicultural Student Affairs, and the Women’s Center.

African American Cultural Center

The mission of the African American Cultural Center is to promote awareness of and appreciation for African American and other African descent experiences through activities and events that enhance academic excellence and strengthen cultural competence for the campus and surrounding communities. Students, staff and visitors are welcome to attend our programs and events and to visit the Art Gallery and Library in Witherspoon Student Center, the first building on NC State’s campus named for an African American, Dr. Augustus M. Witherspoon.

To learn more about the African American Cultural Center, visit our website (https://diversity.ncsu.edu/aacc/). Our main office is located on the 3rd floor of Witherspoon Student Center.

African American Cultural Center
355 Witherspoon Student Center
Email: aaculturalcenter@ncsu.edu

GLBT Center

The mission of the NC State GLBT Center is to engage, develop and empower members of the gay, lesbian, bisexual and transgender communities and their allies. To fulfill that mission, we help students connect to form social support networks; offer identity-based and health-related information and resources; consult with students individually and collectively on issues related to personal identity and academic success; refer students to a wide variety of resources on campus and in the local community; provide professional and leadership development opportunities; and host educational events and programs.

Our vision is of a campus where students, staff, faculty and alumni feel a shared responsibility to increase their individual understanding of and comfort with diversity, to enhance their ability to connect with members of their own communities, to build coalitions across identity groups and to work collaboratively to raise awareness, promote respect and create a culture where they can advocate for equity, inclusion and social justice on behalf of themselves and others.

For more information about our educational workshops, events, student organizations, resources or support services, visit our website (http://www.ncsu.edu/gltb/). We are located on the 5th floor of Talley Student Union.

GLBT Center
5230 Talley Student Union
Email: gltbcenter@ncsu.edu

Multicultural Student Affairs

Multicultural Student Affairs researches, designs and implements programs that promote the academic success, retention and
graduation of students, with an emphasis on students from historically underrepresented and marginalized ethnic populations. Our programs and services aim to expand students’ horizons while honoring their respective cultural experiences.

Multicultural Student Affairs collaborates with many university organizations to conduct programs to enhance personal, professional and cultural development and student success. Programs and services have included orientation symposia, peer mentoring, heritage month programming, cultural celebrations, academic recognition programs, student leadership development, recruitment and advising.

We welcome any NC State student to our programs and services. Visit our website (https://diversity.ncsu.edu/msa/) for more information. We are located on the 4th floor of Talley Student Union.

Multicultural Student Affairs
4261 Talley Student Union
Email: multicultural@ncsu.edu

Women’s Center

The mission of the Women’s Center is to build and create a community of authentic and engaged allies and leaders to pursue gender equity and social justice; enhancing the campus climate through education, advocacy, support and leadership development.

The Women’s Center provides leadership opportunities through programming initiatives such as Feminist Friday’s, alternative service break trips and volunteer and internship opportunities. Staff in the Women’s Center also serve as direct advocates for survivors of interpersonal violence. Students can speak with an advocate by stopping by the center or calling the 24-Hour Sexual Assault Helpline at 919.515.4444.

To learn more about the Women’s Center visit our website (https://diversity.ncsu.edu/womens-center/). We are located on the 5th floor of Talley Student Union.

Women’s Center
5210 Talley Student Union
Email: womens-center@ncsu.edu

Career Development Center

The Career Development Center’s mission is to prepare and empower students to identify and pursue their career goals. From first year students to graduate students, services are designed to meet the needs of students across all stages of career development. Career coaches are available to meet with students one-on-one or in group settings. Students are provided access to career related assistance ranging from resume development and interview strategies to job search techniques and experiential learning opportunities.

The Career Development Center’s online career tool, ePACK, allows students to search and apply for co-op’s, internships, and full-time jobs, schedule an appointment with a career counselor, schedule on-campus interviews with employers, find career fairs, and search for career-related events and activities. A wealth of career information is available on the Career Development Center’s website (http://careers.dasa.ncsu.edu/).
College Advising Corps (CAC)

In February 2014, the College Advising Corps launched a partnership with the John M. Belk Endowment to expand the Corps to institutions of higher education, such as NC State University. In its inaugural year, 9 recent NC State graduates were placed into 9 rural high schools across North Carolina to assist students navigate the path to college. Going into its second year, the NC State College Advising Corps has placed 21 recent NC State graduates into 21 high schools.

The College Advising Corps aims to increase the number of first-generation college going, low-income, and/or underrepresented students who apply, enter, and complete college. We believe that every student deserves the opportunity to enter and complete higher education.

211 Park Shops
NC State Box 7105
Raleigh, NC 27695-7105
Website: http://advisingcorps.dasa.ncsu.edu/
Phone: 919-515-5247, Fax: 919-515-4416

Nicole Ditillo, Program Director

Counseling Center

NC State and the Counseling Center work hard to create a campus culture that supports and connects us all. College is a time for tremendous intellectual, social and professional growth. But as we create leaders and innovators, we also want to cultivate emotional and psychological growth that will allow our students to be successful and flourishing.

The Counseling Center provides individual and group counseling for NC State students wishing for assistance with personal, academic or career concerns. Services are primarily short-term in nature and referrals are made as appropriate. Counseling staff includes psychologists, professional counselors, social workers, graduate interns and psychiatrists who are available to work with students with concerns such as anxiety, depression, relationship issues, substance abuse, test anxiety, time management, dissertation support, and choosing a career. All counseling is strictly confidential with exceptions noted on the Counseling Center website. In addition to counseling, workshops and support groups are offered throughout the year in a variety of areas such as time management, stress reduction, suicide prevention, and relationship skills.

The Counseling Center is located on the 2nd floor of the Student Health Center, 2815 Cates Avenue. Appointments may be scheduled by coming by the Counseling Center during walk in hours daily as posted on our website. Emergency after-hours assistance is available by calling the Counseling Center at 919-515-2423 and selecting the Counselor on Call.

Additional information about services can be found on the Counseling Center's website (https://counseling.dasa.ncsu.edu/).

The Counseling Center is accredited by the International Association of Counseling Services (http://iacsinc.org/).

Student Health Center
2815 Cates Avenue
Raleigh, NC 27695-7312
Phone: 919-515-2423
Fax: 919-515-8525

Monica Osburn, Executive Director and Licensed Professional Counselor

Disability Resource Office

The Disability Resource Office (DRO) facilitates accommodations and services for individuals with documented disabilities and serious medical conditions. Accommodations and services are rendered based on the individual’s documented needs and are determined through an interactive process. DRO will maintain appropriate confidentiality of records and communication regarding disability. To receive accommodations and services, please contact the DRO as far in advance as possible.

Visit The Disability Resource Office online (http://dso.dasa.ncsu.edu/) for more information about services, student and faculty rights, and other resources.

Holmes Hall, 3rd Floor
2751 Cates Avenue, Suite 304
NC State Box 7509
Raleigh, NC 27695-7509
Website: http://dro.dasa.ncsu.edu
Phone (voice): 919.515.7653
Phone (TTY): 919.515.8830
Fax: 919.513.2840
Email: disability@ncsu.edu

In accordance with Section 504 of the Rehabilitation Act of 1973 ("Rehab Act"), the Americans with Disabilities Act of 1990 ("ADA"), The ADA Amendments Act of 2008 ("ADAAA"), and state law, NC State is committed to ensure that no qualified individual with a disability in the United States shall be excluded from, denied the benefits of, or be subjected to discrimination under any program or activity. The DRO works diligently to ensure that individuals with disabilities are provided an inclusive experience and equal opportunity by determining eligibility for accommodations for students with disabilities and serving as a resource to faculty in helping them understand their obligation in providing equal access.

Military and Veteran Services

NC State University Military and Veteran Services (MVS) is the university’s centralized resource to coordinate integrated support to military-affiliated students. Our primary objective is to ensure that our veterans and military-affiliated students feel a strong sense of belonging to NC State.

Mission

NC State University is committed to educating, supporting, and honoring student veterans and their families by helping them acquire
the knowledge and skills necessary to achieve their personal and professional goals.

The MVS proudly serves all military-affiliated students, staff, faculty and retirees:

- Discharged and retired veterans
- Active duty military
- Members of the National Guard and Reserve Components
- Spouses and dependents of military and veterans
- Gold Star family members

The goal of the MVS is to ensure you are successful as you:

- Transition from the military to the campus;
- Persist to graduation; and
- Transition from NC State into your chosen career

For more information about our services and resources, visit our website (https://veterans.dasa.ncsu.edu/).

NC State Military and Veteran Services
100 Witherspoon Student Center
2810 Cates Ave.
Campus Box 7318
Raleigh, NC 27695-7318
Phone: 919-515-5041
Email: ncstatevets@ncsu.edu

Nick Drake, Director

NC State Dining

NC State Dining’s award-winning program offers food options that are convenient, fresh, wholesome and delicious. We have over 40 dining locations across campus, all of which accept some form of the meal plan. From traditional all-you-care-to-eat dining halls to a mix of restaurants, cafes and convenience stores, our program is designed to meet the unique needs and tastes of the campus community.

NC State Dining hosts a number of theme meals and monotony breakers during the year, including our famous All Carolinas Meal, which features items grown or produced in North Carolina. We also host a number of cultural meals, too. Check out the special events calendar (http://www.ncsudining.com/university-dining-events/) for more details.

Nutrition

We understand the diverse nutritional needs of our campus population, such as food allergies, intolerances, and special dietary preferences. Our website (https://dining.ncsu.edu/locations/) provides nutritional information for all of our restaurants and dining halls, and many locations have a nutrition kiosk where guests can check the daily menu for allergens and other key ingredients.

Our Well-Fed Wolfpack nutrition team and registered dietitian are nationally recognized for their efforts to make NC State one of the best campuses known for its nutrition and wellness programs (http://www.ncsudining.com/campus-dining/healthwellness/). Our dietitian is available for a free consultation to discuss your nutrition goals and special dietary needs. We place a special emphasis on fresh foods and wellness while providing nutrition resources, education, and awareness across campus.

These efforts have helped us earn national recognition, including the Top 26 Healthiest Colleges and Top 10 Gluten Free Accommodating Colleges in the nation.

Meal Plans

All first-year students living on campus are required to have a meal plan.

Our meal plans (https://dining.ncsu.edu/meal-plan-options/) are designed to cover the cost of meals and snacks in three different ways: Dining Hall Swipes, Meal Credits, and Dining Dollars.

- **Dining Hall Swipes**: Just one swipe at our dining hall locations and you can enjoy a full meal or a light snack, all with a single swipe.
- **Meal Credits**: Use Meal Credits to purchase a meal at one of our many restaurants or cafes. Meal Credits are also used to purchase a dining hall take-out meal. Meals Credits vary by location and only one Meal Credit can be used per meal period.
- **Dining Dollars**: Use Dining Dollars at convenience stores and vending machines, or to make small purchases at a restaurant or cafe in lieu of a Meal Credit.

Our Core Plans (the Dining Hall Plan, Flex Plan, and Flex Plus Plans) are primarily designed for students who desire to have the majority of their meals covered by a convenient, affordable campus dining plan. All three plans include all-day access to our dining halls, so students can come and go when they’re hungry to our three all-you-care-to-eat dining halls and enjoy a full meal or light snack as often as they like throughout the semester. (The all-access pass requires 30 minutes pass between each Dining Hall Swipe.)

We also have the **Block 170 Plan** (170 meals-per-semester) that can be used at any time in the dining halls or once per meal period in a restaurant or cafe, and includes 100 Dining Dollars. Our **Commuter/ Apartment Plan** is for students who commute or live in on-campus apartments. It includes $800 Dining Dollars that can be used at any dining location and comes with a five percent discount at the register on all purchases.

Picking a Plan

Detailed information and a full guide on selecting a plan is available on our website at dining.ncsu.edu. We recommend you review the plans, then consider your expected daily travel and eating patterns once you’ve received your residence hall assignment and course schedule. Once you’ve picked a plan, register online (https://dining.ncsu.edu/meal-plan-options/meal-plan-signup/) or complete the paper form you’ll receive in your packet before you arrive on campus this fall. You can then try out your plan and make any changes via our website prior to September 15. Be sure to re-evaluate for the spring semester to ensure your plan is the right one for you and make any changes by January 31.

We're Here for You

We take pride in offering quality food and services designed specifically to meet the needs of students. For more information, visit NC State Dining online (http://dining.ncsu.edu) or call 919.515.3090.

Follow us on Facebook (https://www.facebook.com/ncstatediningpack/), Twitter (https://twitter.com/ncstatedining/) and Instagram (https://www.instagram.com/ncstatedining/) for information on special events, featured menu items, cooking demos, and more.
NC State Stores

NC State Stores has been the authority on textbooks, school supplies, computers and apparel since our founding in 1954. NC State Stores ensures students have access to the best prices and service to secure course materials through price comparison tools and easy on-campus shopping. The Stores also offer the most extensive collection of officially licensed merchandise available anywhere, featuring apparel from leading brands like Adidas, Southern Tide, Peter Millar, Vineyard Vines, Clinique and more.

Shop online or find out more at bookstore.ncsu.edu (http://bookstore.ncsu.edu/).

Locations

Wolfpack Outfitters is the flagship location, located in Talley Student Union. The store carries fan gear, apparel, gifts, books, novelty items, school supplies, technology and more.

Wolfpack Outfitters also services students on Centennial Campus with a smaller satellite location that carries books, school supplies, apparel and snacks. It is located in Wolf Ridge Apartments next to On the Oval Culinary Creations.

Textbooks

Once a student has completed course registration, they can view their book list from their Class Schedule page in MyPack Portal. From there, students can view all required and recommended course materials, compare prices with the online shopping tool, and place an order.

NC State Stores prides itself on the value it provides, and it is backed up with pricing transparency. NC State stores also offers a textbook buy-back program at the end of each semester, and students can visit the Stores’ website to check their value before bringing them in.

Financial Aid and Scholarship Funds

Wolfpack Outfitters will defer payment of online and in-store textbook orders for students who receive financial aid or academic scholarship funds. These charges will be sent to the University Cashier’s office for processing upon disbursement of funds. Only items fulfilled by NC State Bookstores are eligible for this payment method at checkout. Students who receive athletic scholarships or sponsorship (VA, VR, WIA, Services for the Blind) should make all purchases in the store.

Laptops

The Technology Department offers business class computers that meet the specifications for all areas of study at NC State. All computers sold at the NC State Stores meet or exceed the university-set recommendations, and are guaranteed to last through all four years of college.

By purchasing from the NC State Stores, students are guaranteed to receive the convenience of full warranty support on campus.

Wolfpack Outfitters
Talley Student Union
2610 Cates Ave, Suite 2210
Raleigh, NC 27607
Phone: 919-515-2161
Email: bookstore@ncsu.edu

Wolfpack Outfitters, Centennial Campus

New Student Programs (NSP)

New Student Programs (NSP) addresses the holistic needs of each new NC State student to create a foundation of success.

Based on the core value that people matter, we achieve this through:

• Cultivating strategic partnerships across the University
• Promoting an environment of personal responsibility
• Fostering inclusivity through a shared campus identity
• Partnering with parents and families
• Preparing and empowering student leaders to serve the campus
• Striving to be innovative in meeting the needs of our community

New first-year, transfer, and international students can visit our website (https://newstudents.dasa.ncsu.edu) to view new student checklists, learn about orientation, explore pre-semester programs, and view other resources for how to connect with the Wolfpack before arriving on campus.

3219 Broughton Hall
NC State Box 7525
Raleigh, NC 27695-7525
Phone: 919-515-1234
Email: new-students@ncsu.edu
Website: newstudents.dasa.ncsu.edu

Michael Coombes, Director

Office of International Services

The Office of International Services (OIS) is charged with meeting the immigration advising and cross-cultural programming needs for the university's more than 4000 international students and 700 J-1 Exchange Visitor scholars who come from more than 120 different countries. Services provided by OIS include advising students and scholars on immigration regulations and university policies; authorizing certain types of on or off-campus employment authorization for F-1 and J-1 visa holders; and providing cultural programs designed to enrich the cultural and academic experience of the campus community. OIS programs include: New International Student Orientation, Culture Corps, ISSERV service learning program, English Conversation Club, and many others.

New international students are required to participate in New International Student Orientation. OIS also provides opportunities for U.S. students to get involved in the international community at NC State by inviting participation in various cross-cultural programs such as volunteering at the International Student Orientation and English Conversation Club.

International applicants must apply to the Admissions Office by the stated deadlines and must meet all the necessary requirements for admission.
In addition, international applicants must meet certain language and financial criteria (see the TOEFL and Financial Information sections under Freshman Admission).

The North Carolina Global Training Initiative (GTI) sponsors several short-term certificate, internship, and research programs that international students may be interested in. These full-time non-degree study programs allow international students to study at NC State for one semester in order to learn about U.S. culture and education, improve their conversational English, take undergraduate courses in their field of study back home or in preparation for admission to a degree program here in the U.S., and experience life in the U.S. These programs have a later application deadline and are great for students to take before enrolling in an undergraduate or graduate degree program in the US or for siblings and friends of current degree-seeking students who want to study in the US together.

International students may be interested in joining the GTI’s Cultural Exchange Network (CENet). CENet connects NC State’s domestic and international students through joint participation in social, academic, and service learning events and workshops. Visit the CENet website (go.ncsu.edu/CENet (http://go.ncsu.edu/CENet/)) for more details about the program and how you can apply.

Anyone interested in the GTI’s programs can visit us on the web at www.ncsu.edu/gti (http://www.ncsu.edu/gti/) for more information.

Outline of minimum immigration requirements for F-1 and J-1 students:

- Keep passport and I-20 or DS-2019 current
- Maintain full-time enrollment every semester (12 hours/semester for undergraduates)
- Make good academic progress toward your degree
- Do not work or intern off campus without prior written approval from OIS
- Do not work on campus more than 20 hours in any one week during the semester
- Update any address change in MyPack Portal within ten days of moving
- Update OIS immediately of any changes in name, funding, or visa status
- Consult with an OIS advisor before changing curriculum/majors, withdrawing, dropping below full-time, transferring to another school/program, etc.
- Purchase and maintain the NC State University approved Health and Accident Insurance or other insurance plan that meets the published minimum coverage requirements.
- Keep your valid passport and recently signed visa certificate (I-20 or DS-2019) with you when you travel abroad. Consult with an OIS advisor about visa and travel questions

Further information about immigration requirements, employment and travel questions, cultural opportunities, and other critical information designed to assist international students are detailed on the OIS website. For individual advising, please call (919) 515-2961 to make an appointment with an advisor or stop by during our walk-in hours of 10:00am-11:45am and 1:00pm-2:45pm on Monday, Tuesday, Thursday and Friday (no walk-ins on Wednesdays).

Office of International Services (OIS)
111 Lampe Drive
Campus Box 7222

NC State University
Raleigh, NC 27695-7222
Phone: (919) 515-2961
Email: ois@ncsu.edu
Website: http://internationalservices.ncsu.edu/

Prevention Services

NC State Prevention Services believes that information should be shared from an objective and factual perspective, without bias or an agenda to steer an individual in any one direction unless imminent harm would result. Prevention Services is a no-cost service to all students and offers consultation to parents of students, staff, and faculty. We are flexible in format and willing to work with you, your group(s), and/or your department in some of, but not limited to, the following ways:

- one-on-one conversations focused on resources
- formal/informal presentations and trainings
- formal/informal conversation facilitators
- staff/student group meeting guests
- Q & A resource
- student group leadership trainings/discussions
- event planning for risk management and problem prevention

CARES: Student Behavioral Case Management

The CARES case managers at NC State work collaboratively with campus resources to provide support for students who are in distress or crisis or who are identified as exhibiting concerning or worrisome behaviors. Effective case management ensures that the community at large remains supported and safe while the student involved gains the necessary resources to remain successful academically and personally at NC State. Services include:

- Providing comprehensive outreach and consultation services to the NC State community in order to proactively identify students with concerns
- Providing early intervention and behaviorally based assessments to determine appropriate resources and referrals to campus and community resource
- Working constructively with students to foster resilience and self-advocacy
- Monitoring student progress, seeking input from collateral resources as needed

Learn more about CARES: Student Behavioral Case Management on our website at: https://prevention.dasa.ncsu.edu/nc-state-cares/about/

Alcohol and Other Drug Prevention Education

Alcohol and Other Drug Prevention Education (AOD) is rooted in objectivity, compassion, and non-judgment. Although AOD supports community members that choose to live an abstinent lifestyle, the program does not use an abstinence based methodology or believe in telling others how to live their lives. AOD cannot condone underage drinking or illicit drug use as this would mean advocating for individuals to break the laws of North Carolina. However, our program does understand
that some community member’s personal choices do not abide by the law on this topic. Alcohol and Other Drug prevention Education is here to reduce the harm and unwanted consequences associated with alcohol and other drug use. Services include:

- Providing alcohol education programming to all first-year students prior to arriving at NC State
- Consulting with campus partners, students, alumni and faculty regarding AOD topics including risk management and prevention
- Providing training for the campus community on harm reduction strategies
- Facilitating the Howl for Help: Health intervention for AOD related emergencies without violation by the Code of Student Conduct
- Administering BASICS (Brief Alcohol Screening and Intervention for College Students)

Learn more about Alcohol and Other Drug Prevention Education on our website at: https://prevention.dasa.ncsu.edu/alcohol-prevention/about-aod/

**Suicide Prevention Services**

Suicide Prevention Services' goal is to reduce barriers to help-seeking at NC State by promoting a campus culture of caring and taking responsibility for the mental health needs of our students. This program supports individuals and groups on campus as they strive to understand the warning signs, offer guidance in talking to students, friends, and colleagues and to connect them to available resources. Suicide Prevention Services also offers support to those impacted by the loss of a loved one to suicide.

Services include:

- Providing QPR (Question, Persuade, and Refer) Suicide Prevention Training
- Creating and collaborating large scale campus events focused on suicide prevention and mental health awareness
- Developing and providing programming for faculty and staff focused on early intervention
- Supporting the Division of Academic and Student Affairs' postvention efforts following tragic events involving students, faculty or staff

Learn more about Suicide Prevention Services on our website at: https://prevention.dasa.ncsu.edu/suicide-prevention/about-suicide-prevention/

**NC State Prevention Services**

2101 Student Health Center
2815 Cates Avenue
Raleigh, NC 27695
Phone: 919-515-4405
Email: prevention-services@ncsu.edu

**Student Health**

At NC State we believe in enhancing both students individual health and the overall health of our campus community. With an understanding that Wellness is the interdependent and interactive combination of love for what is done each day, the quality of relationships, the security of finances, the vibrancy of physical health, and the pride taken in what is contributed to our communities. Student Health Services is at the cornerstone health and wellness on campus and offers non-urgent medical care and health prevention to students as an outpatient center.

We are staffed by board certified physicians, nurse practitioners, physician assistants, registered nurses and other medical support professionals. Some of our services include primary care, gynecology services, physical therapy, nutrition counseling, pharmacy, and specialty services with local dentists, orthopaedists, and gastroenterologists.

Student Health is accredited by the Accreditation Association for Ambulatory Health Care, Inc (http://www.aaahc.org/) (AAAHC) and Commission on Office Laboratory Accreditation (http://www.cola.org/) (COLA).

To learn more about the many services and benefits we offer students, visit our website at https://healthypack.dasa.ncsu.edu (https://healthypack.dasa.ncsu.edu/).

**Hours of Operation**

**Student Health Services on Main Campus** operates on the following hours:

- Monday: 8 a.m. - 5 p.m.
- Tuesday: 9 a.m. - 5 p.m.
- Wednesday: 8 a.m. - 5 p.m.
- Thursday: 8 a.m. - 5 p.m.
- Friday: 8 a.m. - 5 p.m.
- Saturday: 9 a.m. - 12 p.m. (During fall and spring semesters, excluding breaks, for illness and injury)
- Sunday: Closed

**Student Health Services on Centennial Campus** is our newly opened location in Plaza Hall on Centennial Campus. For hours of operation, please check our website.

**Physical Therapy on Main Campus** allows appointments during the following hours during the fall and spring semesters:

- Monday: 8 a.m. - 5 p.m.
- Tuesday: 9 a.m. - 5 p.m.
- Wednesday: 8 a.m. - 5 p.m.
- Thursday: 8 a.m. - 5 p.m.
- Friday: 8 a.m. - 2 p.m.
- Saturday: Closed
- Sunday: Closed

A nurse advice line is available at all other times to assure students receive qualified nurse and medical advice. During adverse weather, students should check the Student Health Services website, https://healthypack.dasa.ncsu.edu (https://healthypack.dasa.ncsu.edu/) for any variance in operating hours.

**Summer session** hours are Monday through Friday, 8 a.m. to 5 p.m. **with no weekend hours.** We accept patients for care up to 4:20 p.m to provide sufficient time for you to see your healthcare provider.

Patient appointments are typically 20 minutes.

**How to Schedule an Appointment**

Appointments can be scheduled online, via the HealthyPack Portal (https://sso.medicatconnect.com) (https://sso.medicatconnect.com) or by calling Student Health Services at 919.515.2563.
Charges

All registered students pay a health fee which provides access to care and covers most, but not all, office visits for provider services. There are charges associated with x-rays, lab tests, allergy injections, travel vaccines, physical therapy, annual physicals, some office visits and specialty clinics. Students are responsible for the cost of prescriptions and over the counter medications /supplies available at the Student Health Pharmacy, as well as expenses incurred when referred to an off-campus laboratory, physician, hospital or pharmacy. Student Health Services will file most insurances on behalf of the student for services and prescriptions received at Student Health. Charges not covered by insurance may be transferred to the student's account with University Cashiers Office. Check with us prior to your visit to determine if your insurance plan is considered in-network.

Student Health partners with several specialty groups to offer on campus care. Specialists include Dermatology, Orthopedics and Gastroenterology. Insurance is filed by the specialty group and not Student Health. Check with the specialty group prior to your visit to determine if your insurance plan is considered in-network.

Student Health, in partnership with Campus Smiles Dental Services, provides comprehensive dental care to students. Campus Smiles accepts most dental plans and will file your insurance for you. Cash discount pricing is also available. To make an appointment, contact Student Health and ask for the dental clinic. Two locations are available for your convenience - Main Campus and Centennial Campus.

Staying Healthy and Well

As a part of our mission, Student Health not only provides high quality health care but also a comprehensive disease prevention and health education program to the NC State community. Our outreach health educator and Pack Peer Educators offer a variety of information, programs and services to students on issues facing today’s young adults. Health topics include nutritional counseling, alcohol and drug education, healthy sexuality, women’s health, men’s health and much more.

Pack Peers is our student volunteer program that includes two tracks: Track I - Peer Education and Track II - Clinical Experience. Students interested in becoming engaged in our Pack Peer program should visit our website at https://healthypack.dasa.ncsu.edu/ for more information.

Required Medical Insurance

As mandated by the UNC System, NC State University requires all undergraduate students taking 6 or more credit hours to have and show evidence of a creditable health insurance policy. Students failing to provide proof of coverage by the published deadline each semester will automatically be enrolled in and billed for the university-sponsored health insurance plan through Student Blue. Note: This is a University requirement.

The University-sponsored health insurance plan (Student Blue) has a robust set of benefits at an affordable premium. Each year, complete information is available to students at the start of the fall and spring semesters. For more information regarding the health insurance requirement and/or the University-sponsored health insurance plan, please see the information at: https://healthypack.dasa.ncsu.edu/.

Confidentiality

All health and medical information is kept secure and confidential and is not divulged to anyone without the express written consent of the patient as required by Federal law.

Please Note: Parents must have the written consent of their student for the release of any protected health information (PHI). Guarantor of payment is not considered written consent for access to PHI.

Medical Insurance

NC State University requires all undergraduate degree-seeking students who are taking 6 or more credit hours to either purchase the University-sponsored health insurance plan (Student Blue) or provide evidence of an existing creditable health insurance policy. Students who are already covered by an insurance policy (i.e. through parent plans, family plans, employer-sponsored plans, or student health insurance) and wish to waive out of the university-sponsored plan must submit a waiver for each term. Students enrolled in Distance Education courses only are not eligible for health insurance and therefore are not required to submit a waiver.

Students who do not waive out by the waiver deadline will automatically be enrolled in and billed each semester for the university-sponsored health insurance plan. This university-sponsored health insurance plan has a robust set of benefits at an affordable premium. More information regarding the health insurance requirement and/or the university-sponsored health insurance plan is available on the Student Health Services website at https://healthypack.dasa.ncsu.edu/.

Student Health Center
2815 Cates Ave
Campus Box 7304
Raleigh, NC 27695-7304
Phone: 919-515-2563
Email: healthypack@ncsu.edu

Julie Casani, M.D., MPH - Director and Medical Director

Student Legal Services

University Student Legal Services (USLS) is a nonprofit corporation initiated by the Student Government at NC State which is funded by student fees. The service is free for currently enrolled NC State students who have paid their student fee. The purpose of the service is to provide education, advice and representation within the scope of the prepaid student legal services plan. The USLS plan is registered with the North Carolina State Bar. The service focuses on helping students resolve their legal problems with as little disruption as possible to their educational endeavors. The office promotes preventative law, enabling the students to make educated choices. The service provides advice, limited court representation, document creation and review as well as educational seminars and materials on legal issues affecting students. The usual areas of law that most impact students are landlord tenant, consumer matters, employment questions, immigration, traffic and DMV issues, criminal issues and expungements as well as domestic matters.

Confidentiality

The staff are not employees of the NC State or the State of North Carolina and as licensed attorneys are required to preserve the confidentiality of clients. All staff working with the office are bound by
by providing courteous and professional service. We treat each individual with dignity and respect. Financial services for the University are provided in an ethical and professional manner with a focus on fiscal integrity and accountability. The success of our students will always be our primary concern.

Maria Brown, Director

Learn more about the Student Services Center on our website at studentservices.ncsu.edu.

The Student Services Center is bound by the Family Educational Rights and Privacy Act (FERPA), which gives students certain rights to privacy of their education records and rights of access to their education records. Employees and agents of the University are expected to comply fully with this law. Please review the NC State REG 11.00.01 - Family Educational Rights and Privacy Act (FERPA) (https://policies.ncsu.edu/regulation/reg-11-00-01/) for detailed information about this federal law and what it means for our students, their families, and sharing of student information.

2000A Harris Hall
2183 Thurman Dr
Raleigh, NC 27695
Phone: 919-515-6278
Email: studentservices@ncsu.edu

The NC State Libraries

The NC State Libraries’ website (http://www.lib.ncsu.edu) is a rich source of information and serves as a gateway to resources and services. The D.H. Hill Jr. Library is open 24 hours/day in the fall and spring semesters. Branch libraries include: Harrye B. Lyons Design Library, Natural Resources Library, and William Rand Kenan, Jr. Library of Veterinary Medicine.

The Libraries’ collections reflect the strengths of the university across disciplines. We provide demand-driven, network-based collections to the campus community in support of research and teaching. We are recognized as a national leader in building extensive research holdings in the areas of engineering, science, technology, and agriculture. The collection contains over 5.3 million volumes of books, bound journals, and government documents; over 128,000 print and electronic serial subscriptions; over 1.2 million e-books; 635 full-text databases in all disciplines and extensive digital collections; numerous video, audio, and multimedia titles; unique and rare materials in the Special Collections Research Center. The Libraries’ participation in the Triangle Research Libraries Network (TRLN) provides convenient access to the collections of Duke University, UNC-Chapel Hill, and NC Central University.

Key spaces at the libraries include:

• Learning Commons, Faculty Research Commons, Graduate Student Commons
• Large-scale, immersive visualization spaces
• Digital media creation facilities
• Dataspace with advanced computing, software, training, and consultation (Hunt)
• A Game Lab for the scholarly study and enjoyment of games and for interactive workshops and demonstrations
• iPearl Immersion Theater for panoramic display of faculty and student work (Hunt)

the Rules of Professional Conduct relating to nondisclosure of any information that has been discussed. The policy is firmly followed by the office to encourage clients to speak candidly about all information necessary for effective legal representation.

To learn more about Student Legal Services and the services that we can provide, visit our website at studentlegal.dasa.ncsu.edu.

1107 Pullen Hall
210 Dan Allen Dr.
Campus Box 7123
Raleigh, NC 27695-7123
Phone: 919-515-7091
Email: studentlegal@ncsu.edu

Pamarah Gerace, Director and Staff Attorney

Student Services Center

The Student Services Center (SSC) is NC State’s one-stop center for student registration, financial aid, and billing needs. The Center was formed in 2016 to merge the resources and services of the University Cashier’s Office, Department of Registration and Records, and Office of Scholarships and Financial Aid in order to better serve the students of NC State. Students can visit the SSC in Harris Hall on Main Campus to order an official transcript, receive an enrollment verification, meet with a financial aid counselor, or discuss payment options with the university cashiers.

The Student Services Center website provides helpful information for students on how to search and register for classes, as well as everything they need to know about staying on track to graduate. Our experts are ready to help incoming, current and former members of the Wolfpack--and their families--accomplish any financial or academic task necessary.

Department of Registration and Records

The Department of Registration and Records is responsible for maintaining student records and enrollment systems, establishing the academic calendar, establishing and upholding policies on academic standards, and providing several other essential services to students and faculty on campus.

Charles Clift, University Registrar

Office of Scholarships and Financial Aid

The Office of Scholarships and Financial Aid is responsible for evaluating students’ financial need and eligibility, awarding financial aid packages, disbursing federal and state financial aid awards, and upholding policies on academic standards for financial aid recipients.

Financial aid counselors and staff at NC State are trained and highly equipped to meet the needs of all students, even those with the most exceptional of circumstances. We are dedicated to working with students as closely as possible to ensure a seamless transition to NC State without financial worry.

Krista Ringler, Associate Vice Provost and Director

University Cashier’s Office

The University Cashier’s Office projects a positive image of the University by providing courteous and professional service. We treat each individual...
• Makerspaces offering 3D printing and scanning and other specialized tools
• Special Collections Reading Room and Exhibit Gallery (Hill)

The James B. Hunt Jr. Library (http://www.ncsu.edu/huntlibrary/) on Centennial Campus is more than the 21st-century face of NC State. It's a place where ideas become reality and bold ambition forges beautiful solutions to global challenges.

The Libraries website (http://www.lib.ncsu.edu) provides information about and access to many services, including reference assistance, interlibrary loan, and electronic reserves. Library Course Tools (http://www.lib.ncsu.edu/course/) web pages are available for every course offered at NC State. These customized pages include e-reserves, article databases, librarian recommendations, citation tools, IM a Librarian for help, and more. The Libraries’ Course Books on Reserves program makes over 4,500 required texts available on Course Reserves each year.

Greg Raschke, Senior Vice Provost and Director of Libraries

Transportation

Parking Permits

All students (including Freshmen) living on or off campus may purchase a parking permit until all available student parking space is sold. Demand for permits does exceed supply. Permits are sold online on a semester basis via the Transportation website (http://www.transportation.ncsu.edu), and are available on a first-come, first served basis. Students must be enrolled in classes in order to be able to purchase a parking permit. All parking permits at NC State are virtual.

Parking Enforcement

Permitted parking areas and hourly visitor spaces are enforced: Monday - Friday: 7:00 a.m. to 5:00 p.m. except on Official University Holidays.

Exceptions include:

• Resident parking areas (“RC,” “RE,” “RW”) are enforced: Monday - Thursday: 7:00 a.m. to Midnight; Friday: 7:00 a.m. to 5:00 p.m.
• Any space or area designated as reserved 24/7, handicap parking spaces and no parking areas.

Wolfline (Buses)

Wolfline is NC State’s bus service which is tailored to student class schedules, but also serves the general public fare-free. Wolfline buses operate every day classes are in session, serving all three campuses, three park & ride lots, official NC State housing and privately-owned apartment complexes located on city streets traveled by Wolfline buses on the way to or from these areas. No university ID, pass, or fare is required to ride. Buses are red, white and black with the Wolfline logo lettering.

Wolfline buses travel along designated routes and only stop at designated Wolfline stops, some of which are shared stops with city (GoRaleigh) and regional (GoTriangle) transit providers. A few routes are designated as “limited stop.”

Please visit the Wolfline website (https://transportation.ncsu.edu/riding-the-wolfline-bus/) for the most up-to-date information about park-and-ride lots and locations, bus routes and schedules.

Alternative Transportation Options

NC State University Transportation offers the following alternative transportation options:

• Bicycling: Bicycling is an inexpensive, healthy and environmentally-friendly way to travel to, from and around campus. Bike racks are conveniently located throughout our three campuses, as well as on all Wolfline buses. Students are strongly encouraged to register their bicycles through the Transportation office; Campus Police also offers free engraving on bicycles.

• Lime Bike/Scooter Share: NC State now offers a pilot program with LimeBike, a dockless public bike share, and Lime-S, a dockless electric scooter program. LimeBike technology is integrated into smart bikes and scooters and a smart phone app. There’s no kiosk docking station so bikes and scooters can be ridden anywhere and parked at any bike rack or designated bike parking area throughout campus. Thirty-minute bike rides are $0.50 for NC State students and employees by registering with an @ncsu.edu email address. The cost for a Lime-S scooter is $1 to unlock and $0.06 per minute for NC State students and employees.

• Walking: As an urban campus, NC State University is very walkable with short distances to off-campus locations such as shopping and restaurants, as well as between campus destinations. Many students and staff choose to walk to school or work, and/or combine walking with another alternative mode to get around campus. Visit the Transportation website (https://transportation.ncsu.edu/walking/) to download a Walk Times map.

• Carpool: NC State students who participate in the student carpool program can enjoy carpooling benefits and gain access to premium parking areas. The Transportation office requires at least two commuter students to form a carpool. All registered carpool participants must show proof of vehicle registration and a local address.

• Local/Regional Transit: GoRaleigh, the City of Raleigh’s public transit services, offers city-wide bus service. Four GoRaleigh routes serve the NC State campus. GoTriangle provides regional bus service to NC State from Raleigh, Cary, Apex, Durham, Chapel Hill, Wake Forest, Zebulon, Wendell, and many points in between. GoPass (https://transportation.ncsu.edu/local-transit/) is a bus pass sponsored by NC State Transportation, at a cost of $5 per year for NC State students. GoPasses allow NC State students and staff to ride city (GoRaleigh) and regional (GoTriangle, GoCary, and GoDurham) buses to commute to campus, get to the airport, or visit friends at other nearby universities.

• Zipcar: Zipcar is a car-share program that offers the convenience of car ownership without the hassles of having a car on campus. There are six vehicles available for use at NC State which are parked in designated spots around campus: Dan Allen Drive (Bragaw Hall Carriageway), Avent Ferry Complex, and Centennial Campus. Students can join Zipcar for a $35 annual membership fee, and can reserve Zipcars at a rate of $8 per hour and $69 per day. Costs include gas, insurance and roadside assistance.

• Wolfpack Pick Up: Wolfpack Pick Up is a service designed for students with injuries or living with disabilities. Wolfpack Pick Up services students on both Main Campus and
Centennial campus. Rides are scheduled online (https://wolfpackpickup.dasa.ncsu.edu/). Questions about scheduling may be directed to wolfpackpickup@ncsu.edu.

NCSU Transportation
Administrative Services I, 2721 Sullivan Drive
Campus Box 7221
Raleigh, NC 27695
Customer service hours: Monday-Friday, 7:00 a.m. - 5:00 p.m.
Office hours: Monday-Friday, 7:30 a.m. - 5:00 p.m.

TRIO Programs

The TRIO Programs are Federal outreach and student services programs designed to serve under resourced individuals, first-generation college students, and individuals with disabilities to progress through the academic pipeline from middle school to post baccalaureate programs.

The Talent Search and Upward Bound Programs serve pre-college level students. Talent Search serves grades 6-12 and Upward Bound serves 9-12 while the Student Support Services and the Student Support Services STEM Programs support enrolled undergraduate NC State University students. These programs utilize a holistic approach in providing academic tutoring, personal counseling, mentoring, financial guidance, and other support services necessary for educational access, persistence and degree completion.

407 Gorman St
NC State Box 7319
Raleigh, NC 27695-7319
Website: http://trio.dasa.ncsu.edu

Marsha Boyd Pharr, Executive Director

Undergraduate Research (OUR)

The office of Undergraduate Research supports and promotes undergraduate opportunities in discovery-, inquiry- and creativity-based scholarship through mentored research experiences with NC State faculty and other national and international scholars and professionals. Undergraduate Research is scholarly study in any discipline in which this scholarship culminates in advancements in science, technology, engineering, business, the arts, or humanities. Students from any discipline can engage in the excitement of scholarly research and present their work at multiple annual symposia. Research and travel awards supporting both student projects and the communication of results are available.

2229 Broughton Hall
NC State Box 7576
Raleigh, NC 27695-7576
Website: http://undergradresearch.dasa.ncsu.edu
Phone: 919-515-0095 Fax: 919-513-7542

Dr. Chris Ashwell, Director

University Fellowships Office (UFO)

The University Fellowships Office (UFO)—formerly called the Fellowship Advising Office—helps NC State’s undergraduate students, graduate students, and alumni learn of and apply for nationally competitive and prestigious awards. These awards fund a wide range of opportunities, and many are connected to undergraduate and graduate degree programs or internships, overseas opportunities, and independent projects.

Some of our services include:

- Meeting with candidates to discuss their goals and interests and to help identify matching opportunities
- Reviewing and critiquing drafts of application essays and statements
- Providing institutional endorsements for applicants who receive the campus nomination (for the awards that require nominations/endorsements)
- Submitting application materials at the national level on behalf of applicants
- Staging practice interviews for applicants selected at the national level for finalist interviews

Clark Hall
221 Jensen Drive
NC State Box 8610
Raleigh, NC 27695-8610
Phone: 919-515-2237
Email: fellowship-advising@ncsu.edu
Website: https://fellowships.dasa.ncsu.edu/

Courtney Hughes, Director

University Housing

Living on Campus

Living on campus is an essential part of the Wolfpack experience: that’s why students are required to live in University Housing their first year.

When you live on campus, you’ll be at the heart of the Wolfpack nation, making it easy to be a part of all that NC State has to offer. Whether you’re looking for the close-knit community of a village (https://villages.dasa.ncsu.edu/) or the diverse social opportunity of a traditional residence hall, we have the housing option (https://housing.dasa.ncsu.edu/find-a-community/) that’s right for you. With a selection of 20 residence halls (https://housing.dasa.ncsu.edu/find-a-community/residence-hall-options/) and four on-campus apartment communities (https://housing.dasa.ncsu.edu/find-a-community/apartment-options/), you’ll enjoy the once-in-a-lifetime opportunity to live in the heart of NC State.

Get Started with University Housing

Incoming First-Year Students

1. Apply for housing: You should complete your University Housing and Living and Learning Village application as soon as possible. Students who have received acceptance for the Fall semester may access the housing application through the Campus Living section on MyPack Portal (https://mypack.ncsu.edu). If you decide not to attend NC State, you can cancel your housing application without penalties. Space is assigned in the order in which applications are received. If you have a preferred building or roommate already in mind, an early application will help you get them.

2. Choose a place to live: You have a lot of options to choose from, ranging from residence halls to our Wolf Village Apartments. Find
the ones that you like best (https://housing.dasa.ncsu.edu/find-a-community/).

Incoming Transfer Students
Due to the first-year live-on requirement that began in 2017, space is very limited for upper-class students. There are options available, however. NC State has two Living and Learning Villages that reserve space for transfer students.

1. Located in Wolf Village Apartments (https://housing.dasa.ncsu.edu/find-a-community/apartment-options/wolf-village-apartments/) on the main campus, the Second-year Transitions And Transfer Experience (S.T.A.T.E.) Village (https://villages.dasa.ncsu.edu/village-options/state-village/) connects students to a variety of campus resources and programming meant to navigate their years following their freshman experience.


Undergraduate students must be enrolled in at least 12 credit hours to be eligible to live on campus during the fall and spring terms. Students who must drop below these minimum requirements should contact University Housing to request an exception. Summer session housing (https://housing.dasa.ncsu.edu/current-residents/summer-housing/) is also available.

More Information
For more information about living on campus, visit:

University Housing
Monday - Friday | 8:00 a.m. to 5:00 p.m.
1112 Pullen Hall
201 Dan Allen Drive

Email: housing@ncsu.edu
Phone: 919.515.2440
Web: housing.ncsu.edu (https://housing.ncsu.edu/)

Living and Learning Villages
NC State’s Living and Learning Villages are interested-based living communities that engage students both inside and outside the classroom. Villages provide an unparalleled living experience where you’ll make lifelong friends and immerse yourself in the NC State community. There is currently no additional cost to join a village.


The Albright Entrepreneurs Village provides sophomores, juniors, seniors and graduate students across all academic disciplines the opportunity to live, socialize and work with entrepreneurial-minded students. Residents can explore and develop their entrepreneurial interests in an environment that fosters creativity.


Creative, vibrant and colorful only begin to describe the experiences you’ll have as you explore theater, visual arts, crafts, music, dance and more.


BMI strives to establish a brotherhood and develop leaders among black male students. By promoting academic success, personal growth, professional development, and self-responsibility, the group breaks through negative stereotypes and combats challenges facing African-American males in today’s society.


EcoVillage is a first-year student program that welcomes students from all majors, creating both a multi-disciplinary and an interdisciplinary educational experience that prepares students for lifelong sustainable leadership, engagement, advocacy, and discovery.


The Engineering Village is an extension to the College of Engineering’s First-Year Engineering (https://www.engr.ncsu.edu/academics/undergrad/first-year/) program introducing students to the field of engineering; encouraging thoughtful consideration to complex challenges facing our communities.

The Exploratory Studies Village is for students entering the university who are knowingly undecided about a major. A year of guided inquiry and exploration coupled with one-on-one sessions with their academic advisor helps move students through the career planning and decision-making process.


Global Village is a living and learning community for those interested in living and interacting with people from differing backgrounds, experiences, countries, and viewpoints.

Honors and Scholars Village (https://villages.dasa.ncsu.edu/village-options/honors-and-scholars-village/) - **Live in** Berry, Becton or Bagwell Hall (https://housing.dasa.ncsu.edu/find-a-community/residence-hall-options/berry-hall/)

Honors Village and Scholars Village merged in 2017 to become Honors and Scholars Village (https://dasa.ncsu.edu/honors-scholars/). The most noticeable change being that Scholars Village residents will be relocating from Sullivan Hall (https://housing.dasa.ncsu.edu/find-a-community/residence-hall-options/sullivan-hall/) to east campus beginning Fall 2018. Students from both the University Honors Program (https://honors.dasa.ncsu.edu/) (UHP) and the University Scholars Program (https://scholars.dasa.ncsu.edu/) (USP) will now live together in the Honors Commons. The move will provide village residents with the opportunity to live and learn in a vibrant, socially and intellectually stimulating environment that fosters mindful interaction.


ILV provides experiential learning for students who have a passion for leadership and service. Students are given the opportunity to engage in practical application of leadership to real-world issues and explore leadership development through one on one sessions with professionals.

ILV enhances students’ college experience and prepares leaders to make their personal IMPACT on the state, nation, and the world.


Students living in the Native Space community will demonstrate growth and learning along three focal points of the living experience: culture, academics and community engagement. Residents will find a deeper awareness of Native American history and drive cultural awareness through participation in Native American Heritage Month and the annual NC State Pow Wow.

Students Advocating for Youth (https://villages.dasa.ncsu.edu/village-options/students-advocating-for-youth-village/) - **Live in** Syme Hall (https://housing.dasa.ncsu.edu/find-a-community/residence-hall-options/syme-hall/)

SAY Village is a community for first-year students in any academic discipline who have a passion for working with youth. Students develop one-on-one mentoring relationships with local elementary school students and learn what it means to be a youth advocate.


Provides second-year and transfer students with opportunities to make the most of their NC State experience by focusing on the six core pillars essential to student success: academic success, career development, community and global engagement, diversity, leadership, and life skills.


Encourages and promotes the development and maintenance of a healthy body, mind, and spirit through a wide array of wellness programs and events. Students have the opportunity to experience personal growth while learning about the seven dimensions of wellness.


WISE Village was created for female freshman and sophomore students majoring in science, technology, engineering, and mathematics. Membership in WISE provides a powerful networking opportunity with other goal-oriented women as you pursue your STEM major.

WOW Village enhances women’s leadership outside the classroom through empowerment, leadership development, self-awareness and diversity/social justice. WOW creates a holistic community that fosters individual women’s growth and development while challenging residents to act as citizens of a global community.

University Tutorial Center (UTC)

The University Tutorial Center provides free academic assistance to NC State undergraduate students enrolled for credit in many challenging 100- and 200- level math, physics, and chemistry classes. Several types of assistance are available that are designed to best meet the students’ needs, including tutoring by appointment, group tutoring, and Supplemental Instruction (SI). In addition, Writing and Speaking consultations are available to both undergraduate and graduate students. They provide assistance to all students who need help at any stage of the writing process in the English language.

Students are eligible to become a tutor for the UTC if they have an established GPA of 3.25 or better and least a B+ in the course(s) they wish to tutor. All new tutors are required to take USC 210, Introduction to College Tutoring, during the first semester of employment. All tutors are trained in techniques that are designed to help students become independent learners.

101 Park Shops
101 Current Drive
NC State Box 7118
Raleigh, NC 27695-7118
Website: https://tutorial.dasa.ncsu.edu/
Phone: 919-515-3163 Fax: 919-515-4416

Barbara B. Windom, Director

Wellness and Recreation

About Wellness and Recreation

The Department of Wellness and Recreation is proud to be a leader of wellness at NC State. We value the impact of movement and inspire behaviors that improve health and well-being. Our programs, services and facilities enhance academic success by assisting students in developing skills and resilience needed for college and beyond.

Programs and Services

Take one of the more than 100 Group Fitness (https://wellrec.dasa.ncsu.edu/fitness/group-fitness-2/) classes offered each week, designed for every fitness level. Challenge yourself by taking cycling, TRX®, yoga, BODYPUMP™, Zumba® or a variety of other class formats and experience firsthand how we make fitness fun. Students can take their structured workout to the next level with Small Group Training (https://wellrec.dasa.ncsu.edu/fitness/training-services/small-group-training/), where our coaches lead workshops on Olympic lifting, boxing and more.

Receive one-on-one attention from our nationally-certified personal trainers (https://wellrec.dasa.ncsu.edu/fitness/training-services/personal-training/). Learn how to exercise, improve performance and establish fitness goals. No matter what your fitness level, we have a trainer who wants to work with you.

Our ThriveWell (https://wellrec.dasa.ncsu.edu/wellness-2/) program offers wellness coaching and health education programs for individuals and groups. Wellness coaching takes a holistic approach and discovers how personal wellness impacts student success, strengths, values and goals. Establish a wellness plan and stay accountable with a certified health coach. Learn stress management techniques, strategies and lifestyle modification tips from our team of experts.

Intramural Sports (https://wellrec.dasa.ncsu.edu/sports/intramural-sports/) offers more than 40 different leagues and events throughout the year. Sports range from flag football, basketball, soccer and volleyball to exciting and unique events such as pool battleship, bubble soccer and cricket. Create a team and compete for a championship, join a recreational league with friends or sign up for an individual/dual sport or special event to find a new favorite activity.

For students seeking a more competitive sports experience, check out one of the Club Sports (https://wellrec.dasa.ncsu.edu/sports/club-sports/) teams that include a wide variety of men’s, women’s and co-ed sports. These student-led organizations practice regularly and compete against other colleges and universities at local, state and national levels.

Outdoor Adventures (https://wellrec.dasa.ncsu.edu/outdoor-adventures/) offers students unique outdoor trips and educational clinics. Rent outdoor equipment from the Outdoor Adventures Equipment Rental Center or climb to new heights on the indoor climbing wall. Students can challenge themselves individually or build community with customized programs at our Challenge Course located in Schenck Memorial Forest.

Our Student Employment (https://wellrec.dasa.ncsu.edu/about-us-2/student-employment/) program supports more than 700 students employed annually through Wellness and Recreation. Students enhance their development by learning transferable skills that will prepare them for future careers.

Carmichael Complex

Carmichael (https://wellrec.dasa.ncsu.edu/facilities/) is a 300,000-square-foot facility designed to help students achieve their personal wellness, recreation and fitness goals.

Features include:

- Six Strength and Conditioning Centers (30,000-square-foot)
- Six Fitness/Activity Rooms
- 11 Indoor Basketball/ Multipurpose Courts
- 25-yard pool and dive well
- 50-meter pool
- Indoor climbing wall
- Indoor track
- 14 racquetball courts
- One squash court
- Personal training suite
- Men’s and women’s locker rooms
- Single occupant locker rooms
- Steam room
Wellness and Recreation manages numerous outdoor facilities that promote healthy, active living.

- Miller Outdoor Recreation Field
- Method Road Recreation Complex
- 12 outdoor tennis courts
- Four outdoor basketball courts
- FitGround outdoor functional training area
- Centennial Campus Recreation Fields
- Centennial Campus Disc Golf Course

**Wolfpack One Card**

The Wolfpack One Card is the official ID card for NC State students, faculty, staff and affiliates. The One Card allows NC State students to:

- Access meal plans
- Enter their residence hall or other buildings with restricted access
- Work out at the gym
- Check out books at the library
- Create and access their AllCampus account to make purchases at participating on-campus locations. All Campus funds are also used for Wolfprint (campus air printers). Wolfprint provides quick and easy printing at a variety of buildings across campus.

Incoming students receive their card during summer orientation. New graduate students will not receive ID cards during the New Graduate Student Orientation, and should visit the One Card office in Talley Student Union to obtain an ID card.

Students are encouraged to store their card in a safe and convenient location as they will use it often during the course of a day. Don’t hole punch it or tumble it in a dryer to extend the life of the card. Replacement cards are $20.

To report a lost or stolen card, students should call or visit the Wolfpack One Card office or go online (http://onecard.ncsu.edu/). The office is located on the main level of Talley Student Union. Students can also stop by to ask questions about the many features of the ID card during regular business hours: Monday - Friday from 8 a.m. - 6 p.m.

For more information, call us at 919.515.3090 or visit the Wolfpack One Card website (https://onecard.ncsu.edu/).
Undergraduate

The NC State Wolfpack is an ever-growing community of inventors, creators, and scholars. As a community, we not only think about how to make the world better, we also take action and make it happen. We’re quick, curious, and creative - and we want you to join us!

If you’re considering joining the NC State Wolfpack, the Undergraduate Catalog is a valuable resource to help introduce you to our university. Start exploring with the links in the sidebar. You can find information on admission requirements (p. 16), degrees offered, and academic policies (p. 67) relevant to your career as a student. You’ll also find a wealth of information on the numerous services NC State offers to students. See how NC State can help you put your ideas into action!

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Academic Policies and Procedures
It’s important to be familiar with the policies and procedures that will be relevant to you as a student. NC State wants you to be able to access and understand these procedures as easily as possible, so the list below includes plain-language summaries of some of our most important and useful policies.

If you would like more information, please visit the Policies, Regulations, and Rules website (http://policies.ncsu.edu/).

Policies about:
• Courses and Grading (p. 68)
• Getting Your Degree (p. 68)
• Student Conduct (p. 75)
• Student Records (p. 76)
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• Transfer and Exam Credit (p. 78)
Courses and Grading

A good understanding of the policies regarding course credit and grading procedures is vital for successful students. The resources below can help you make sense of what you'll see on your NC State transcript:

- Classification of Students (https://policies.ncsu.edu/regulation/reg-02-65-01/)
- Course Load (https://policies.ncsu.edu/regulation/reg-02-20-05/)
- Credit Only and Audit (https://policies.ncsu.edu/regulation/reg-02-20-15/)
- Grading (https://policies.ncsu.edu/regulation/reg-02-20-03/)
- Repeating Courses (https://policies.ncsu.edu/regulation/reg-02-20-16/)

Getting Your Degree

NC State is committed to providing students with the information they need to complete their degree programs in a timely manner. Please review the resources provided here regarding policies and procedures relevant to obtaining your degree from NC State:

- Academic Advising (p. 68)
- Adding or Changing a Program (p. 68)
- General Education Program (p. 69)
- Graduation Requirements (p. 73)
- Satisfactory Academic Progress (p. 74)

For more information about planning your degree, visit the Student Services Center website. (https://studentservices.ncsu.edu/your-degree/)

Academic Advising

Most regularly enrolled students are assigned for academic advising to a faculty member who is normally a member of the department which is, or is most likely to become, the student’s major department. Students who are admitted into programs such as Exploratory Studies will be advised by professional advisors in those programs who will aid the students in the process of selecting an appropriate major.

Responsibilities of the Student

Students have the primary responsibility for planning their individual programs and meeting graduation requirements. This involves keeping up-to-date with university, college, and department curricular requirements through materials available from the advisors or departmental coordinators of advising; keeping informed of academic deadlines and changes in academic policies; and consulting with the advisor or departmental coordinator of advising during each registration period, following notification of academic warning status, and at other times as needed and required by academic policy; and attending class and meeting class objectives and assignments.

Responsibilities of the Advisor

Although students have the primary responsibility for planning their programs, advisors are expected to:

- be available for conferences at appropriate times and places about which their advisees have been informed;
- provide accurate information about academic regulations and procedures, course prerequisites, and graduation requirements;
- assist students in planning academic programs suited to their interests, abilities and their career objectives;
- discuss with their advisees appropriate course choices in fulfilling curriculum requirements as well as possible consequences of various alternative course choices;
- inform their advisees when the advisee’s proposed course selections conflict with university academic or curricular regulations;
- assist advisees with following proper procedures for such things as Progress Toward Degree and the possible consequences of changing a letter graded course to a pass/fail status without speaking with an advisor, exceptions to the course drop deadlines, auditing a course before or after taking it for credit, taking a course under the credit by examination policy, registering for 19 or more credit hours, registering for inter-institutional courses, the availability and rules for the First Year Course Repeat Policy, and referring their advisees for special testing or counseling as needed;
- assist their advisees in considering the appropriateness of academic adjustments where these become necessary in cases of serious injury or illness, or unforeseen personal hardships.

Responsibilities of the Coordinator of Advising

Each college or department has a coordinator of advising who is responsible for: assigning, training, and supervising faculty and professional advisors; providing up-to-date, printed course and curriculum information for advisors and students; reassigning to another advisor any student who requests reassignment; and assisting any student who wants to major in the coordinator’s area of study, but is ineligible at the time to transfer into it. Students in this category keep their advisor in the department in which they are enrolled, but consult additionally with the coordinator of advising and teaching for the department offering the curriculum in which they wish to enroll. Whenever appropriate, the coordinator will advise students that they should consider alternative curricula and refer the students to Academic Advising Services (http://advising.dasa.ncsu.edu/). (https://advising.dasa.ncsu.edu/)

Adding or Changing a Program

Adding a Major (Double Degree)

Students may pursue more than one bachelor's degree while at NC State. Students are admitted to one program upon admission to the University. After satisfactorily completing 12 graded credit hours, they can apply to add an additional degree program. All academic requirements for both degrees must be satisfied, and by working with academic advisors in both programs students can maximize their course choices to take advantage of where requirements overlap. To apply to add an additional degree, students must submit a Change of Degree Application (CODA) (https://go.ncsu.edu/coda/). Once the required coursework is complete, the degrees may be awarded during the same term or different terms.

Change of Degree Application (CODA)

To apply to change to a major, a student must have attempted twelve or more graded hours at NC State, and have satisfied the transfer requirements for a specific major as listed on the CODA website (https://go.ncsu.edu/coda/).
CODA Process

Undergraduate students wishing to change from one major to another should:

1. Visit the CODA website (http://go.ncsu.edu/coda/) to check requirements for their intended major.
2. Check CODA application deadlines.
3. Submit a CODA online for the intended major.

CODA applications are accepted throughout the year (except for Engineering programs) and will be reviewed following each deadline. Candidates who meet the Preferred Qualifications for their major have a higher probability of being approved for transfer. All admission is competitive and based on academic record and space availability in the intended program and college. Meeting the preferred or minimum qualifications does not guarantee admission.

For academic advising purposes, students accepted into a new program are considered to be in the new plan once the official major change is posted.

REG 02.65.03 - Intracampus Transfers (http://policies.ncsu.edu/regulation/reg-02-65-03/) is available to view in full on the university’s Policies, Regulations and Rules website.

General Education Program

General Education at NC State provides the opportunity for a broad and informed understanding of the world, offering our students the foundation for rich and productive lives. General Education is valuable for students because logical and creative thinking are fundamental to improving the human condition; because a respect for the value of diversity and an understanding of human history and cultures are essential to true citizenship; because the development of global knowledge has become increasingly important in response to international interdependence; because knowledge of science and the ability to apply scientific reasoning provide the basis for an appreciation of the workings of the universe and the richness, variety, and ecological interconnectedness of the world around us; because well-considered moral, philosophical, aesthetic, and intellectual convictions are necessary for contributing to human thought and achievement; because effective communication is central to productive engagement in academic, professional, and civic communities; because an ability to understand and evaluate the interaction among science, technology, and society is important in a world that is changing through technological innovation and scientific discovery; and because the development of attitudes and skills for a healthy life is essential to social, mental, and physical well-being. For the most current information available, please see the GEP website (https://oucc.dasa.ncsu.edu/general-education-program-gep/).

Special Note: If a student changes a General Education course except for HES courses from a letter grade to credit-only (S/U), then the course will not satisfy the GEP requirements. Consult your academic advisor if you have questions.

Mathematical Sciences

Rationale:
A logical approach to problem solving is important for successful functioning in society. It is also important that students be able to formulate models, be critical consumers of quantitative information, communicate mathematically and solve problems.

Objectives for courses in the category of Mathematical Sciences: Each course in the Mathematical Sciences category will provide instruction and guidance that help students to:

1. improve and refine mathematical problem-solving abilities; and
2. develop logical reasoning skills.

Mathematical Sciences Requirement

(6 credit hours)
A total of six credit hours from the university approved GEP Mathematical Sciences course list. At least one course must have an MA or ST prefix.

Natural Sciences

Rationale:
The natural sciences pursue basic questions about the workings of the universe, and the richness, variety and interconnectedness of the world around us. Students today are exposed to an increasing volume of information, from a large variety of sources, in diverse and changing formats. Training in the natural sciences is essential to help students develop skills to distinguish between testable and un-testable ideas, recognize scientifically valid tests of theories, and understand how information relates to those tests. By studying the natural sciences, students learn to reason both inductively and deductively, develop and test scientific hypotheses, and understand the value and limitations of scientific studies. The development and application of new technologies require scientifically literate citizens who can understand technological issues and evaluate the role of science in society's debate of those issues.

Objectives for courses in the category of Natural Sciences: Each course in the Natural Sciences category will provide instruction and guidance that help students to:

1. Use the methods and processes of science in testing hypotheses, solving problems and making decisions; and
2. Make inferences from and articulate scientific concepts, principles, laws, and theories, and apply this knowledge to problem solving.

Natural Sciences Requirement

(7 credit hours)
A total of seven credit hours from the university approved GEP Natural Sciences course list including at least one laboratory course or course with a laboratory.

Humanities

Rationale:
The humanities comprise the subjects and disciplines that use various models of rational inquiry to understand human human nature and experience, organization and change in human societies, the nature of the world, and rational inquiry itself. An education in the humanities and social sciences requires reading significant works, gaining an exposure to a variety of methodologies, and learning to apply these in written exposition. An education in the basic humanistic disciplines is necessary to become a citizen with a broad knowledge of human cultures and with well-considered moral, philosophical, aesthetic, and intellectual convictions.

Objectives for courses in the category of Humanities:
Each course in the Humanities category will provide instruction and guidance that help students to:

1. Engage in the human experience through the interpretation of human culture; and
2. Become aware of the act of interpretation itself as a critical form of knowing in the humanities; and
3. Make academic arguments about the human experience using reasons and evidence for supporting those reasons that are appropriate to the humanities.

**Humanities Requirement**
(6 credit hours)

A total of six credit hours from the university approved GEP Humanities course list. The selected courses must be from two different disciplines.

**Social Sciences**

**Rationale:**
The study of social sciences enables students to understand individual and collective human behavior by exploring meaning within a variety of social, cultural, political, and economic contexts, analyzing the structures within which human goals are established and human choices are made, and applying theoretical and empirical models to specific cases.

**Objectives for courses in the category of Social Sciences:**
Each course in Social Sciences category will provide instruction and guidance that help students to:

1. Examine at least one of the following: human behavior, culture, mental processes, organizational processes, or institutional processes; and
2. Demonstrate how social scientific methods may be applied to the study of human behavior, culture, mental processes, organizational processes, or institutional processes; and
3. Use theories or concepts of the social sciences to analyze and explain theoretical and/or real-world problems, including the underlying origins of such problems.

**Social Sciences Requirement**
(6 credit hours)

A total of six credit hours from the university approved GEP Social Sciences course list. The selected courses must be from two different disciplines.

**Introduction to Writing**

**Rationale:**
Writing is a powerful way of understanding ourselves and the world in which we live. It is through writing that the various disciplines and professions define the knowledge and methodologies that characterize them. Mastery of writing and information skills is central to engaging in the productive life of academic and professional communities.

**Objectives for courses in the category of Introduction to Writing:**
Each course in this category will provide instruction and guidance that help students to:

1. Write effectively in specific situations, which may include various academic, professional, or civic situations, and
2. Understand and respond appropriately to the critical elements that shape written communication situations, such as audience, purpose, and genre, and
3. Demonstrate critical and evaluative thinking skills in locating, analyzing, synthesizing, and using information in written communication.

**Introduction to Writing Requirements**
(ENG 101 Academic Writing and Research - 4 credit hours)

A total of four credit hours of English (ENG 101 Academic Writing and Research) are required to fulfill this category. Successful completion of ENG 101 Academic Writing and Research requires a grade of C- or better and is required for graduation.

**Health and Exercise Studies**

**Rationale:**
The development of attitudes and skills for a healthy life is essential to a university student's education. In addition to developing and gaining an appreciation of health-related fitness and wellness concepts and fundamental motor skills, student participation in physical activities and sport significantly decreases major health risks, reduces stress from the pressures of academic life, and improves general social and mental well-being.

**Objectives for courses in the category of Health and Exercise Studies:**
Each course in the Health and Exercise Studies category will provide instruction and guidance that help students to:

1. Acquire the fundamentals of health-related fitness, encompassing cardio-respiratory and cardiovascular endurance, muscular strength and endurance, muscular flexibility and body composition; and
2. Apply knowledge of the fundamentals of health-related fitness toward developing, maintaining, and sustaining an active and healthy lifestyle; and
3. Acquire or enhance the basic motor skills and skill-related competencies, concepts, and strategies used in physical activities and sport; and
4. Gain a thorough working knowledge, appreciation, and understanding of the spirit and rules, history, safety, and etiquette of physical activities and sport.

**Health and Exercise Studies Requirement**
(2 credit hours)

A total of two credit hours/two courses including one Fitness and Wellness course from the university approved GEP Health and Exercise Studies course list. (Fitness and Wellness courses are those found in the HESF 100-level series). Students have the option of taking HES courses on a credit-only (S/U) basis.

**Interdisciplinary Perspectives**

**Rationale:**
Interdisciplinary study provides students with the opportunity to synthesize knowledge and skills, to make connections between fields of study, to consider more than one disciplinary approach or methodology, and to bring to bear the insights from two or more disciplines in examining and/or responding to complex problems.

**Objectives for courses in the category of Interdisciplinary Perspectives:**
Each course in Interdisciplinary Perspectives will provide instruction and guidance that help students to:

1. Distinguish between the distinct approaches of two or more disciplines; and
2. Identify and apply authentic connections between two or more disciplines; and
3. Explore and synthesize the approaches or views of the two or more disciplines.

**Interdisciplinary Perspectives Requirement**

(5 credit hours)

A total of five credit hours from the university approved GEP Interdisciplinary Perspectives course list.

**Additional Breadth**

Rationale:

One purpose of the General Education Program is to introduce students to a variety of disciplines. To this end, students are required to successfully complete a course from a general education category list that represents an approach to scholarship that is clearly distinct from the primary approach of their major. Determining an appropriate group of lists from which their students choose is an exercise in judgment best left to faculty in the major; accordingly, each program will select the group of lists from which their majors will choose a course to fulfill this requirement (either the group “Humanities/Social Sciences/Visual and Performing Arts” or the group “Mathematics/Natural Sciences/Engineering”). The program faculty’s selection will be reviewed through appropriate college-level mechanisms and then be subject to review by CUE.

**Additional Breadth Requirement (3 credit hours)**

A total of three credit hours in the Additional Breadth category must be selected from the university approved GEP course lists that represent an approach to scholarship that is clearly distinct from the primary approach of the Major. These two approaches are distinguished for GEP purposes as “Humanities/Social Sciences/Visual and Performing Arts” or the “Mathematics/Natural Sciences/Engineering.” Note: At this time, there is no Engineering course list.

**Visual and Performing Arts**

The Visual and Performing Arts category is part of the Additional Breadth Requirement.

Rationale:

The Visual and Performing Arts constitute a separate, unique, and independent mode of inquiry distinct from both the Humanities and Social Sciences and the Science, Technology, Engineering, and Mathematics disciplines. Being conversant in the symbolic languages of the Arts is as important as familiarity with other modes of inquiry. Many of the most profound expressions of meaning and value are embodied in the arts, and developing sensitivity and responsiveness to these through visual and performing arts courses encourages students’ aesthetic sensitivities, critical judgment, and creativity. Courses in the arts also provide students with an understanding of the cultural and historical dimensions of artistic expression.

Objectives for courses in the category of Visual and Performing Arts:

1. Deepen their understanding of aesthetic, cultural, and historical dimensions of artistic traditions; and
2. Strengthen their ability to interpret and make critical judgments about the arts through the analysis of structure, form, and style of specific works; and
3. Strengthen their ability to create, recreate, or evaluate art based upon techniques and standards appropriate to the genre.

**U.S. Diversity Co-requisite**

Rationale:

The study of diversity in the United States provides students the opportunity to consider questions of difference and culture, identity and community, privilege and oppression, and power and responsibility in our nation, and to gain an understanding of how these issues affect both individuals and communities.

Objectives for courses in the category of U.S. Diversity:

Each course in U.S. Diversity will provide instruction and guidance that help students to achieve goal 2 of the following:

1. Analyze how religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age identities are shaped by cultural and societal influences;
2. Categorize and compare historical, social, political, and/or economic processes producing diversity, equality, and structured inequalities in the U.S.;
3. Interpret and evaluate social actions by religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age groups affecting equality and social justice in the U.S.;
4. Examine interactions between people from different religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age groups in the U.S.

**Global Knowledge Co-requisite**

Rationale:

Global knowledge is necessary for students to understand the world and their place in it. The global knowledge requirement provides students the opportunity to explore the complex interrelationships among nations, to gain a deeper appreciation of other cultures and peoples, and to evaluate the impact of U.S. culture and policy on the rest of the world.

Objectives for courses in the category of Global Knowledge:

Each course in Global Knowledge will provide instruction and guidance that help students to achieve goal #1 plus at least one of #2, #3, or #4.

1. Identify and examine distinguishing characteristics, including ideas, values, images, cultural artifacts, economic structures, technological or scientific developments, and/or attitudes of people in a society or culture outside the United States.
And at least one of the following:

1. Compare these distinguishing characteristics between the non-U.S. society and at least one other society.
2. Explain how these distinguishing characteristics relate to their cultural and/or historical contexts in the non-U.S. society.
3. Explain how these distinguishing characteristics change in response to internal and external pressures on the non-U.S. society.

**Global Knowledge Requirement**

(1 course designated as a GEP GK course or an academic course taken via study abroad, 0 additional credit hours)

Choose one course from the university approved GEP Global Knowledge course list. Courses on additional GEP course lists that satisfy the Global Knowledge co-requisite will have a “GK” co-requisite indicator next to the course. Any academic course taken in a study abroad context may satisfy the GEP global knowledge requirement.

**Foreign Language Proficiency**

**Rationale:**
In a sense, languages are keys to the world. The continuous expansion of international relations makes the knowledge of foreign languages increasingly significant. In learning a foreign language and studying its literature and cultures, students acquire a body of knowledge about how humans think, view the world, express themselves, and communicate with one another. Language learning also expands one’s ability to create and discover new meaning in one’s own language and culture. Knowledge of the linguistic structures of a second language helps students to understand their own language better. Likewise, an awareness of contrasting cultural concepts sensitizes students to the differences between their own culture and others. Such awareness has become increasingly important as the communities of the world have become more interconnected and interdependent. The needs of our global society require that more citizens have access to other languages and cultures in order to cooperate in the process of improving the quality of human life.

**Foreign Language Proficiency Requirement**

To fulfill the GEP Foreign language requirement, the student must have proficiency at the FL* 102 level. This can be demonstrated by completing two years of high school study of the same language with a grade better than a C- in each of the two years, or a passing grade at the FL* 102 level, or by placement into the FL* 201 by examination. Additional Foreign Language requirements above the FL proficiency requirement (FL*102) have been established by some Colleges and programs.

American Sign Language (ASL) is accepted in satisfying the foreign language proficiency requirement with two years of ASL in high school with a grade “C” or better in each year.

The Cherokee language is an accepted language for satisfying the foreign language proficiency requirement.

**Technology Fluency**

**Rationale:**
Today’s graduate must achieve technology fluency appropriate to the needs of his/her discipline, including technologies for problem solving, empirical inquiry and research. Students will demonstrate critical thinking skills, analytical skills, proficiency and ethical use of the technology within the discipline, which includes responding to and readily adapting to change in those technologies.

**Communication In The Major**

**Rationale and Requirement:**
Writing and speaking are fundamental to all disciplinary and scholarly work, also serving as powerful ways of learning and evaluating learning in the disciplines. Each undergraduate curriculum must be designed and taught so that the Major enhances students’ learning through writing and speaking activities and helps students to communicate competently for academic and professional contexts. Because effective communication in these contexts often demands proficiency in the use of information technologies and resources, students must gain a basic understanding of how information is identified, organized, and accessed, in both the print and digital environments.

Associate deans are responsible for providing evidence that their college’s curricula are designed to comply with this requirement’s rationale and objectives and ensuring that academic programs assess and report student achievement of the objectives.

**Objectives:**
Each undergraduate curriculum must be designed to provide instruction and ample opportunities for guided practice that enable students to:

1. Learn more deeply and effectively through the use of writing and speaking activities, and
2. Master the kinds of writing and speaking that are appropriate to their academic or professional majors, and
3. Use information technologies and search strategies appropriate to their academic or professional majors to identify and access information and then to evaluate, synthesize, and incorporate that information effectively in their writing and speaking.

**GEP Thematic Track Option**

**Rationale:**
The purpose of thematic tracks is to encourage students to connect knowledge from different disciplinary areas while focusing on a unifying theme or topic. It is well suited to students who have an interest in a particular topic and who would benefit by exploring that topic from multiple disciplinary perspectives. Students will be credited with no more than one thematic track.

All students have three options for thematic tracks within the General Education Program (GEP). A student may:

1. Choose a thematic track that has been approved by the Council on Undergraduate Education (CUE). Completion of one approved thematic track will be noted in the student’s official transcript upon graduation provided that the student selects the thematic track prior to completion of degree requirements.
2. Create a thematic track of their own choice. In this case, the thematic track will not be noted in the student’s transcript.
3. Choose to complete the GEP without a thematic track.

**Objective for a thematic track:** Thematic tracks will provide educational experiences that help students to use critical thinking skills to connect multiple disciplinary perspectives around a common topic or theme.
Requirement for Completion of a Thematic Track
(12 credit hours)

Choose a total of twelve credit hours in the thematic track category as a combination of four courses or more (12 credit hours) - which are linked by a common theme or topic. At least one course must come from the university approved GEP Mathematical Sciences/Natural Sciences/Engineering lists; at least one course must come from the GEP Humanities/Social Sciences/Visual and Performing Arts lists. The remaining courses are also to be chosen from the approved GEP lists.

General Education Competencies

The assessment of General Education at NC State is coordinated through the Office of Assessment in the Division of Academic and Student Affairs (http://dasa.ncsu.edu/) (DASA). In spring 2012, five general education competencies were identified and defined by NC State faculty and were vetted through faculty senate, the Council on Undergraduate Education, and the Associate Deans.

The Office of Assessment, in partnership with faculty from across campus, uses rubrics with student work to assess oral communication and written communication. Critical and creative thinking has been assessed through testing, surveys, and rubrics applied to student projects through NC State’s Quality Enhancement Plan (https://think.dasa.ncsu.edu/the-plan-and-annual-reports/). In addition, we assess writing, reading, mathematics and critical thinking for first-year and senior students using the ETS Proficiency Profile, (http://www.ets.org/proficiencyprofile/about/) the Critical Thinking Assessment Test (CAT) (https://www.ets.org/cat/), and ETS HElighten Quantitative Literacy Assessment (https://www.ets.org/heighten/about/quantitative_literacy/).

For more information on General Education Competencies, please visit the Office of Assessment website (https://assessment.dasa.ncsu.edu/academic-assessment/general-education-assessment/).

The General Education Competencies are defined as follows:

Written Communication Competency

Definition: Written communication is the purposeful development, expression, and revision of ideas in writing for specific audiences. Effective written communication follows appropriate genre conventions and may include a combination of text and other media.

Oral Communication Competency

Definition: For the purposes of the GEP, the oral communication competency involves the ability to ethically and responsibly use verbal and nonverbal communication for clear expression of ideas and collaborative processes; engage in active listening; build, express, and justify a claim; and adapt messages to varying situations and contexts.

Critical and Creative Thinking

Definition: Critical thinking is the active, persistent and careful consideration of a belief or form of knowledge. It includes analysis and judgments about the ideas and conditions that support beliefs and the conclusions that follow. Critical thinking involves analyzing and evaluating one’s own thinking and that of others. It is subject to intellectual standards, including clarity, accuracy, precision, relevance, significance, depth, breadth, logic, and fairness.

Definition: Creative thinking is the generation of new ideas within or across disciplines. It draws upon or breaks rules and procedures in those disciplines and actively engages students in bringing together existing ideas into new configuration; developing new properties or possibilities for something that already exists; and discovering or imagining something entirely new. Standards for judging creative thinking include originality, appropriateness, flexibility, and contribution to the domain.

Quantitative Literacy

Definition (AAC&U): “also known as Numeracy or Quantitative Reasoning (QR) is a ‘habit of mind,’ competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc. as appropriate)” (Rhodes, 2010).

References

Graduation Requirements

Students are eligible for graduation when they have satisfactorily completed all of the academic requirements of their degree program as specified by their major department, their college and the university.

NC State requires that, in addition to other university, college, and departmental requirements, all students must have a cumulative grade point average (GPA) of at least 2.000, based on all courses attempted at NC State, in order to be eligible to receive a baccalaureate degree.

Minimum Hours Required for Graduation

Most baccalaureate programs require a minimum of 120 credit hours for graduation; exceptions include designated five-year programs, and programs in certain colleges. Students may complete more hours than the required minimum.

Length of Time to Graduation

The normal and expected length of time to graduation for a baccalaureate degree is four years (average of eight semesters) provided the student completes an average of slightly more than 16 credit hours each semester (for most curricula) and/or attends one or more summer sessions.

Degree-seeking undergraduate students who exceed credit hour limits toward their degree may be subject to a 50 percent Tuition Surcharge. The University of North Carolina Board of Governors defines exceeding credit hour limits as:
• more than 140 degree credit hours to complete a baccalaureate degree in a four-year program, or
• more than 110 percent of the credit hours necessary to complete a baccalaureate degree in any program officially designated by the Board of Governors as a five-year program.

In order to make continuous progress toward graduation, students are encouraged to take full advantage of the university’s advising and support services. Effective career decision-making and early, deliberate, long-range semester-by-semester planning of courses and careful selection of extra-curricular commitments can provide direction and motivation necessary for effective use of time towards graduation.

Additional factors that may assure a student’s continuous progress toward graduation include good academic performance in first-year and basic prerequisite courses, advanced placement for introductory courses and enrollment in summer sessions. Students are discouraged from taking unrealistic course loads as a means to accelerate their progress toward graduation as this may result in poor academic performance.

Students may require more than eight semesters to complete an undergraduate program at NC State. In some cases this is the result of effective decision-making on the part of the student for such things as participation in cooperative education or study abroad programs; a decision to be a part-time student with a reduced course load for reasons of health, necessary outside employment, or parental responsibilities; or attempting dual degrees, double majors or academic minors. Students are encouraged to discuss their specific situations and options with their academic advisors.

In other cases, the length of time to graduation may be prolonged beyond the eighth semester as a result of incomplete or inadequate secondary school background requiring some additional compensatory, developmental or prerequisite courses. Poor academic performance in the freshman year or early semesters, or late changes in curriculum, could also impact time to graduation.

Semester-by-Semester Plans

The Semester-by-Semester Plans listed under each College reflect an 8-semester display of the requirements for the specific degree program. Many degree audits in the Student Information System (SIS) has a corresponding semester-by-semester display.

The effective date for each plan represents the date the specific degree requirements are effective. When students are accepted into a degree program, they follow the specific requirements for the degree in effect at that time. When new requirements or significant changes are made to a degree program, a new effective date is created for those students entering the degree program under the new requirements.

Semester-by-semester plans are available throughout this catalog and on the Office of Undergraduate Courses, Curricula and Academic Standards website (https://oucc.dasa.ncsu.edu/undergraduate-academic-programs/semester-by-semester-plans/).

Limited D Grades

Some colleges and departments have established limitations on the use of D grades in certain courses or categories of courses for satisfying graduation requirements. Students should consult with their academic advisors if they have any questions.

Grade Point Average in Major

Some departments have established graduation requirements of a grade point average of 2.000 on all courses attempted in the major at NC State or a minimum letter grade requirement in some or all major courses. Such a requirement is in addition to the university grade point average total requirement of 2.000 for all courses attempted at NC State. Students are encouraged to enquire about specific requirements in majors of interest.

Residence Requirements

To be eligible for a bachelor’s degree, a student must be enrolled in a degree program at NC State, must have completed at least 25 percent of credit hours required for graduation through courses offered by NC State, and must have earned at least 30 of the last 45 hours of credit through NC State courses. In no case shall the proportion of credit hours taken at NC State and applied towards a bachelor’s degree be less than 25 percent. Individual departments and/or colleges may have additional residence requirements. Be sure to ask your advisor about any special requirements.

Note: The College of Engineering has a policy that transfer students normally must earn at least 48 of their last 60 hours of credit at NC State while enrolled as degree candidates. Students are encouraged to consult with their academic advisors regarding whether additional residency requirements apply to their major.

Satisfactory Academic Progress

Satisfactory Academic Progress (SAP) refers to the policies that require students to meet certain standards to be eligible to continue enrollment and receive financial aid. The information provided in this section details more information on the SAP policies and procedures to be able to maintain eligibility.

SAP is calculated for undergraduate students and for financial aid purposes at the end of the Spring semester (May). All students who fail to meet SAP requirements have the opportunity to submit an appeal to continue enrollment and/or for financial aid eligibility for a subsequent term.

More information about Satisfactory Academic Progress, including the appeal process and criteria, is available on the Student Services Center website (https://studentservices.ncsu.edu/your-degree/academic-progress/).

Student Services Center
2831 Thurman Dr
Raleigh, NC 27695
Phone: 919-515-6278
Email: studentservices@ncsu.edu

All undergraduate students, regardless of when they first enrolled in NC State University, will be subject to the Progress Toward Undergraduate Degree (https://policies.ncsu.edu/regulation/reg-02-05-03/) regulation.

Undergraduate and Agricultural Institute (AGI) students must be enrolled in a minimum of 12 credit hours per term to be considered full-time. Undergraduate students are encouraged to enroll in at least 15 hours per term in a degree-granting major to remain on track to graduate.
Satisfactory Academic Progress (SAP) for undergraduate students is evaluated annually at the end of the Spring semester (May).

Undergraduate and AGI students must meet the following standards for continued enrollment:

- Successfully complete at least 2/3 of all attempted hours*
- Maintain an academic standing that allows for continued enrollment.

Students must maintain a cumulative GPA of at least 2.0 or be on Academic Warning or Probation in order to be eligible to continue enrollment. View more on Academic Standing here (https://studentservices.ncsu.edu/your-degree/academic-progress/academic-standing/).

Undergraduate and AGI students applying for financial aid must also meet the standards outlined by the Satisfactory Academic Progress for Financial Aid Eligibility Policy (https://studentservices.ncsu.edu/your-money/financial-aid/eligibility/).

* Attempted hours = All hours attempted toward the degree  
* Completion rate = Hours Completed/Hours Attempted

All students are subject to the academic standards as set forth by the Department of Registration and Records, the Graduate School and the College of Veterinary Medicine.

All financial aid applicants are subject to the Eligibility for Continued Receipt of Financial Aid regulation (REG 02.70.02) (https://policies.ncsu.edu/regulation/reg-02-70-02/) in order to be eligible for receipt of financial aid.

Satisfactory Academic Progress (SAP) will be evaluated annually at the end of each Spring semester (May).

**Undergraduate and Agricultural Institute (AGI) Students**

All Undergraduate and AGI students are subject to the Progress Toward Undergraduate Degree (REG 02.05.03) (https://policies.ncsu.edu/regulation/reg-02-05-03/) and the Continuation of Undergraduate Enrollment (REG 02.05.01) (https://policies.ncsu.edu/regulation/reg-02-05-01/) regulations. More information is available here (https://studentservices.ncsu.edu/your-degree/academic-progress/ugrd/).

Undergraduate and AGI students applying for financial aid must also meet the following standards in addition to the standards to undergraduate continuation standards:

- Successfully complete at least 2/3 of all attempted hours
- Maintain a minimum cumulative 2.0 Grade Point Average (GPA)
- Graduate or be able to graduate before attempting more than 150% of the hours required for the degree program (e.g. maximum time frame of 180 hours for a 120-hour degree program.)

**Graduate Students**

All graduate students are subject to the Academic Difficulty (https://policies.ncsu.edu/regulation/reg-02-45-01-academic-difficulty/) and Time Limit for Completion of Graduate Degree (https://policies.ncsu.edu/regulation/reg-02-25-10/) regulations.

Graduate students applying for financial aid must also meet the following standards:

- Successfully complete at least 2/3 of all attempted hours
- Maintain a minimum cumulative 2.0 Grade Point Average (GPA) and not be placed on an Academic Probation or a Terminated-Reinstated status
- Graduate before exceeding the maximum time frame

**Professional Students**

All Doctor of Veterinary Medicine (DVM) professional students are subject to the academic standards established by the College of Veterinary Medicine.

DVM students applying for financial aid must also meet the following standards:

- Successfully complete at least 2/3 of all attempted hours
- Maintain a minimum cumulative 2.0 GPA
- Graduate before exceeding the maximum time frame of 6 years

**Non-Degree Studies (NDS) Students**

All NDS students are subject to the Non-Degree Studies Enrollment (https://policies.ncsu.edu/rule/rul-02-66-03/) rule.

NDS students applying for financial aid must also meet the following standards:

- Successfully complete at least 2/3 of all attempted hours
- Maintain a minimum cumulative 2.0 GPA
- Complete coursework or program before exceeding the maximum time frame as set in the Non-Degree Studies Enrollment (https://policies.ncsu.edu/rule/rul-02-66-03/) rule.

For more information on Satisfactory Academic Progress for Financial Aid Eligibility, including reinstatement of eligibility and how to appeal for eligibility, visit the Student Services Center website (https://studentservices.ncsu.edu/your-money/financial-aid/eligibility/progress/).

**Office of Scholarships and Financial Aid**

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**Student Conduct**

**Code of Student Conduct**

All students who enroll at NC State are required to adhere to the Code of Student Conduct (https://policies.ncsu.edu/policy/pol-11-35-01/). The Code serves as the basis for student conduct at NC State. It contains information related to the University’s jurisdiction over student behavior, academic and non-academic violations, potential sanctions available when a violation occurs, and information regarding interim suspension.

All students are strongly encouraged to read and understand the Code of Student Conduct.

The Student Disciplinary Procedures establish the procedures that will be used when a student has been accused of a violation. It also establishes the rights and responsibilities for individuals accused of a violation (the respondent) and those bringing an allegation on behalf of the University (the complainant). In addition, the Student Discipline...
Procedures establish and govern the rules regarding student appeals in the event that the student is found responsible for an alleged violation.

For more information, please contact the Office of Student Conduct at 919.515.2963 or access the Code through the Office of Student Conduct website (https://studentconduct.dasa.ncsu.edu/).

Student Records

Student Rights to Privacy and Records

The Family Educational Rights and Privacy Act (FERPA) (https://policies.ncsu.edu/regulation/reg-11-00-01/), a Federal law, and its corresponding regulations give students certain rights to privacy of their education records and rights of access to their education records.

Generally, students may obtain copies of their education records if circumstances make on-site inspection impractical and the student is in good standing. For example, a request for copies may be denied if the student lives within commuting distance of NC State, or there is a "hold" on the student's records, or there is an unresolved disciplinary action against the student, or the requested records include exam or test questions. When copies are provided, the student may be charged a reasonable fee for the actual copying expense.

NC State shall not disclose the education records of a student to other persons unless that student has given consent in writing or an exception exists under FERPA.

Transcripts of Academic Records

An official transcript is issued only at the authorization or written request of the student concerned. A transcript is a complete copy of a student's academic record at the time that it is issued. It contains all course work, including undergraduate, graduate and/or non-degree, taken while enrolled at NC State University. NC State will NOT issue a partial transcript. The university will automatically send all course work when a transcript is requested.

For more information on how to obtain an official transcript, please visit the Student Services Center website (https://studentservices.ncsu.edu/your-grades/transcripts/).

Directory Information

The University may disclose “directory information” without student consent. Directory information consists of a student's name, preferred email address, enrollment status (e.g., full-time or part-time), grade level (freshman, sophomore, etc.), major field of study, dates of attendance, and honors, degrees and awards received, weight and height of student-athletes, participation in officially recognized activities and sports, and most recent educational institution attended. For students residing in University-owned or leased housing facilities, the University may also designate as “directory information” a student's local and permanent addresses and age for the limited purpose of responding to requests from the United States Census Bureau as part of census data collection.

Change of Name, Address, or Telephone

It is the student's responsibility to notify the University of any changes in name, address, or telephone. Failure to do so may prevent prompt delivery of important university correspondence and correct notification of hometown newspapers of honors received. International students are required by law to notify the university of any change or correction in name or address within 10 days. Updating address changes in MyPack Portal system fulfills international students' federal requirements for maintaining status in SEVIS.

Name changes can only be completed by submitting a Name Change/ Marital Status Change Request Form, available from the Student Services Center (https://studentservices.ncsu.edu/), along with the required proof of identification.

Changes of address or telephone can be completed in MyPack Portal (http://mypack.ncsu.edu/). More information about how to update personal information can be found on the Student Services Center website (https://studentservices.ncsu.edu/your-resources/privacy/frequently-asked-questions).

Note: NC State University policies, rules and regulations are continuously being updated and reviewed as the need arises. For the most current information regarding this section, please visit the Policies, Regulations, and Rules website (http://policies.ncsu.edu/).

Student Status and Honors

Below are plain-language explanations of academic honors and academic status, as well as information about withdrawal from the university.

- Academic Honors (p. 76)
- Academic Standing (p. 77)
- Withdrawal (p. 77)

Academic Honors

Academic Honors

Students with exceptional academic performance may be recognized in the following ways at the university.

- Phi Beta Kappa, Outstanding students majoring in the College of Humanities and Social Sciences, the College of Sciences, basic science departments in the College of Agriculture and Life Sciences, and the Department of Economics in the Poole College of Management are eligible for election based on their academic achievements.
- Phi Kappa Phi, Outstanding students from all majors are eligible for election to membership in Phi Kappa Phi, the University's most prestigious campus-wide scholastic honor society. Students are invited to join based on their academic achievements.

A list of College Honor Societies can be viewed online (https://honors.dasa.ncsu.edu/honors-societies/).

Scholastic Honor Societies

The following scholastic honor societies recognize outstanding academic performance for undergraduates at the Junior level and above and graduate students:

- Phi Beta Kappa, Outstanding students majoring in the College of Humanities and Social Sciences, the College of Sciences, basic science departments in the College of Agriculture and Life Sciences, and the Department of Economics in the Poole College of Management are eligible for election based on their academic achievements.

A list of College Honor Societies can be viewed online (https://honors.dasa.ncsu.edu/honors-societies/).

Semester Dean's List

A full-time undergraduate student, who earns a semester average of (a) 3.5 or better on 12 to 14 credit hours of course work for which grade points are earned; or (b) 3.25 or better on 15 or more credit hours of course work for which grade points are earned shall be placed on the Dean's List for that semester. Students are not eligible for the Dean's List in any semester in which they receive an F, U, or IN grade. When IN
grades are resolved, however, students who are otherwise eligible shall be added retroactively to the Dean’s List for that semester. Dean’s List recognition shall be noted on the student’s semester grade report and permanent academic record.

Graduation with Honors
Undergraduate degree honor designations are:

- **Cum Laude**- for GPA 3.25 through 3.499
- **Magna Cum Laude**- for GPA 3.5 through 3.749
- **Summa Cum Laude**- for GPA 3.75 and above

To be eligible for degree honor designations students must have completed at least two semesters and at least 30 credit hours at NC State.

REG 02.30.01 - Academic Honors (https://policies.ncsu.edu/regulation/reg-02-30-01/) is available to view in full on the University’s Policies, Regulations and Rules website.

Academic Standing
Academic status will be calculated at the end of every fall, spring and summer term for all enrolled undergraduate students.

Academic Status and Continuation Criteria

Good Standing
Students must maintain a cumulative Grade Point Average (GPA) of at least 2.0 or be on Academic Warning or Academic Probation status in order to continue enrollment. Students are considered to be in Good Standing if they are eligible to continue enrollment.

Academic Warning
Students who meet either of the following criteria will be placed on Academic Warning and will be allowed to continue enrollment:

- Have a cumulative GPA less than 2.0 and a grade point deficit of 15 or less
- Have a cumulative GPA above 2.0 and a term GPA below 1.0

Students on Academic Warning must maintain a term GPA of at least 2.0 for every subsequent fall, spring and summer term of enrollment, until they achieve a cumulative GPA of at least 2.0.

Academic Probation
Students will be placed on Academic Probation for one term after an appeal to return from Academic Suspension has been approved.

Students on Academic Probation who:

- earn a term GPA of at least 2.0 during their Probation term will move to Academic Warning and will be subject to the continuation criteria described above.
- fail to earn a term GPA of at least 2.0 during their Probationary term will be suspended.

Timely Advising
Students on Academic Warning or Academic Probation are required to meet with their academic advisor during the first four (4) weeks of the fall or spring term to discuss their plan for academic success.

Academic Suspension
Students who meet either of the following criteria will be placed on Academic Suspension:

- Have a cumulative GPA less than 2.0 and a grade point deficit\(^1\) greater than 15 at the end of any term
- Students on Academic Warning or Probation who fail to maintain a term GPA of at least 2.0 for every subsequent fall, spring or summer term

Options for suspended students:

All suspended students have the right to submit an appeal to continue enrollment for a subsequent term. Information on submitting appeals is available online (https://go.ncsu.edu/academicprogress/).

Note: Students who remain on Academic Suspension will have all future term enrollments canceled and may not re-enroll.

\(^1\) Grade point deficit (GPD) is defined as the number of grade points below the required 2.0 minimum GPA. The deficit reflects the number of hours of B (3.0) grades necessary in the future to raise the GPA to the 2.0 minimum.

REG 02.05.01 - Continuation of Undergraduate Enrollment (http://policies.ncsu.edu/regulation/reg-02-05-01/) is available to view in full on the University’s Policies, Regulations, and Rules website.

Withdrawal
Withdrawal from the University
Information on the term withdrawal process and retroactive withdrawals is available on the Student Services Center website (https://studentservices.ncsu.edu/your-classes/withdrawal/process/). Information on term withdrawal for graduate students is available in the Graduate School Handbook (https://grad.ncsu.edu/students/rules-and-regulations/handbook/3-16-withdrawal-from-the-university/).

Students who wish to drop all the courses for which they are registered must withdraw from the university for the remainder of the semester or summer session in which they are enrolled. Students who have registered and prepaid are considered to be registered and must be officially withdrawn, unless they have notified the university prior to the beginning of the first day of classes that they wish to have their registration cancelled.

Undergraduate students who wish to initiate a term withdrawal should consult with their academic advisors to discuss the academic implications of the intended withdrawal. A withdrawal may impact a student’s academic eligibility, financial aid, and progress toward a degree. All withdrawals for a current or upcoming term are initiated through the self-service Term Withdraw page in the MyPack Portal. The withdrawal process will include information on refunds and financial aid and will provide contacts to University Housing and Dining. Undergraduate students who do not enroll for a fall or spring term are required to complete the readmission process before returning to classes.
Non-Degree Studies students withdraw through the self-service Term Withdraw link in MyPack Portal. NDS students may contact the Student Services Center at (919) 515-6278 if they have any questions about this process.

International students who for some reason want or need to interrupt their program of study and either withdraw completely from their program or take a semester away from their studies must consult both their academic advisor (or DGP) and an Office of International Services (OIS) advisor. There are university and departmental procedures as well as immigration consequences that must be considered before any action is taken by the student. International students who are contemplating a withdrawal should call the OIS at (919) 515-2961 for an appointment.

NC State students carrying course work at another campus under the Inter-Institutional Program arrangement must contact the Student Services Center at (919) 515-6278 or studentservices@ncsu.edu to initiate the paperwork necessary for removal from the class roll at the other institution.

Students visiting from other institutions who are registered for NC State course work under the Inter-Institutional arrangement must initiate withdrawal on their home campus.

Financial aid recipients who withdraw during the semester or summer sessions may be required to repay all or a portion of the aid received, depending on the date upon which the withdrawal is effective. Students can contact the Student Services Center during the withdrawal process to determine their individual repayment options.

**Withdrawal After the Last Day of the Official Course Drop Period**

A current semester withdrawal after the drop/revision deadline (https://studentservices.ncsu.edu/calendars/academic/) removes you from all courses in a current semester.

Withdrawals after the drop/revision deadline are approved by the university only under extenuating circumstances (https://studentservices.ncsu.edu/your-classes/withdrawal/extenuating-circumstances/). Documentation is required to support these requests. The documentation must provide evidence that the extenuating circumstances were unforeseeable and unavoidable and caused a serious disruption in academic functioning. Submission of a withdrawal request after the drop/revision deadline is not guaranteed approval. Students should have contingency plans in place in case a withdrawal request is delayed or denied.

Students who intend to withdraw after the drop/revision deadline should:

1. Consult with your advisor before initiating a withdrawal to discuss the academic implications of the intended withdrawal.
2. Organize the details of your case. It’s often helpful to write a statement detailing the grounds for your request to withdraw (for example, what occurred, when it occurred, how it affected you, and what you have done or plan to do about it).
3. Organize your documentation to verify the facts of your request. You can obtain documentation from your healthcare or mental health provider by giving them this form (https://counseling.dasa.ncsu.edu/wp-content/uploads/sites/14/2015/05/ProviderLetter.pdf).
4. Initiate your term withdrawal request through the MyPack Portal. Term withdrawal requests can be initiated through the MyPack Portal up to 30 days after the last day of the term (https://go.ncsu.edu/academiccalendar/).

5. Withdrawal requests after the Drop/Revision deadline require the approval of the Associate Dean of your college. There is no guarantee of approval so it is recommended that you have a contingency plan in mind in the event of a denial.
6. Notification of the approval or denial of withdrawal requests will be communicated to students via their NC State email address.
7. Students who are denied their request for a Term Withdrawal have the right to appeal the decision. Information regarding the process for the appeal is available via a link in the denial notification email. Appeals must be filed within ten (10) calendar days from the date of the notification of denial.

Courses for which students are officially enrolled are recorded on the transcript without grades or grade points but with a notation of “W” to indicated approval to withdraw after the withdrawal deadline.

**Transfer and Exam Credit**

**Credit by Examination**

Undergraduate students currently registered at NC State may request an examination for course credit in a course whether enrolled in that course or not, under the conditions described below. Students must initiate a request with their advisor (except when a teaching department awards credit based upon group testing for placement purposes). Should the advisor approve, the student must arrange for the examination with the department offering the course. The department may administer the examination in any manner pertinent to the materials of the course. Departments are encouraged to offer credit by examination in all courses but have the prerogative of excluding certain courses, which are demonstrably unsuited for credit by examination.

The academic standards for credit by examination will be commensurate with the academic standards for the course. If a student’s performance on the examination is judged to be of C- or higher quality, the department head will notify the Department of Registration and Records on a Grade Report Form that the student has received “credit by examination” for the course. The Department of Registration and Records will enter the appropriate number of credit hours on the student’s permanent academic record. Credits earned through examination are not used in the calculation of a student’s grade point average.

A student who receives credit by examination in a course in which that student is currently enrolled must officially drop that course no later than the last day to drop for the term enrolled. If the course credit by examination would enable a student to complete the final requirements for a degree, that student need not be registered in order to receive the credit.

Once a student has failed a course, has failed a previous credit by examination attempt, or has been enrolled in a course past the last day to drop, the student may not attempt credit by examination for that course. Under unusual circumstances, exceptions may be made upon the written recommendation of the student’s adviser and the approval of the department offering the course.

The full regulation (https://policies.ncsu.edu/regulation/reg-02-50-01/) on Credit by Examination is available on the Policies, Rules and Regulations website.
Transfer Credit

Transcripts of college course credit for new transfer students and for NC State students who have taken course work at another institution are evaluated by the Office of Undergraduate Admissions in consultation with the deans of the NC State colleges to determine how the work applies to fulfilling the graduation requirements of each student’s intended major. Only courses where the student receives a grade of C or better will be considered for transfer credit. Students admitted to an NC State undergraduate degree program who wish to take courses at another institution must obtain prior endorsement from their academic department and prior written approval from their college’s associate dean (or dean’s office) in order to insure that the transfer credits will apply toward specific graduation requirements. Transfer credit is not recorded on former students’ permanent records until after they have been readmitted and have re-enrolled at NC State. Students should not assume that transfer credits will be accepted, and should speak with their academic advisor.

Credit accepted for transfer from another institution is shown only as credit hours and is not included in the computation of the grade point average. A list of courses and how they transfer to NC State from other institutions on the Office of Undergraduate Admissions website (https://admissions.ncsu.edu/apply/credit-opportunities/). Please note this website speaks only to the general transferability of the course work. How transfer credit applies to a student’s degree is determined by the student’s academic department and college associate dean’s office.

For the most current information regarding this regulation, please view the full regulation (http://policies.ncsu.edu/regulation/reg-02-10-03/).

Centers and Institutes

NC State’s Centers and Institutes reflect the university’s commitment to interdisciplinary scholarly pursuit, including research, instruction and public service. These cutting-edge organizations are frontrunners in their field, blazing the trails for other researchers to follow. Research and innovation on topics ranging from climate change to textiles add value to the everyday lives of our state’s citizens, maintaining public trust and admiration and standing at the forefront in global excellence for research and discovery. Here, the leadership of these organizations can access the materials, procedures and policies necessary to manage their efforts responsibly, equitably and with the highest integrity.

For a full list of the NC State Centers and Institutes, as well as the centers’ administrative units and contact information, visit the Centers and Institutes website (https://research.ncsu.edu/centers/).

College of Agriculture and Life Sciences

Agriculture is a diverse industry that touches all of us in many ways. The life sciences provide foundations for studying life and the role of plants and animals in the environment. Academic programs in the college represent a unique blending of the agriculture and life sciences. The College of Agriculture and Life Sciences (CALS) offers specialized majors in agriculture and life sciences that prepares graduates for fulfilling careers in industry, academia, government, or nonprofits, or for graduate or professional programs.

The goals of the instructional programs in CALS include proving relevant, scientific, and practical knowledge of the food, agricultural, and life sciences to its students. With the support of highly qualified and accomplished faculty, students are able to achieve their greatest personal and professional potential. Central to the college’s goals is the cultivation of interdisciplinary problem-solving skills that will serve its graduates well as they pursue a lifetime of learning and professional experiences.

What sets our college apart:

- Student activities such as the representing your college and serving on the Agri-Life Council or becoming a CALS Ambassador and gaining professional and hands-on experience in the agriculture and life sciences world
- Nationally-recognized honors societies that allow academically-strong students to further their education
- Honors Program inspires students to take ownership of their education, explore their passions and pursue their academic goals beyond the classroom
- Approximately 620 scholarships awarded to CALS students each year based on merit, financial need, academic major and/or outside interests

For more information about our college, including contact information, visit our website (https://cals.ncsu.edu/).

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Faculty

Dean and Executive Director for Agricultural Programs
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Senior Associate Dean for Administration
Harry Daniels

Associate Dean and Director of Academic Programs
John M. Dole

Associate Dean and Director, NC Agricultural Research Service
Steven A. Lommel

Associate Dean and Director of NC Cooperative Extension
A. Richard Bonanno
Assistant Dean of College Advancement
Sonia Murphy

Executive Director of NC Agricultural, Dairy, and Tobacco Foundations
Kathy Kennel

Assistant Dean for Business Operations
Joyce L. Munro

Assistant Dean of CALS Human Resources
Rebecca B. Zuvich

Chief Communications Officer, CALS Communications
Richard Campbell

Interim Director of CALS Office of Diversity Affairs
Alex K. Graves

Director, Agricultural Institute and Assistant Director of Academic Programs
Elizabeth B. Wilson

Director, Information Technology
Kevin F. Lee

Director of Student Services
Tricia M. Buddin

Assistant Director of Academic Programs
Vicki J. Martin

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- North Carolina Cooperative Extension Service (p. 367)
- Prestige Department of Poultry Science (p. 368)

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- Agricultural Business Management (BS) (p. 146)
- Agricultural Business Management (BS): Biological Sciences Concentration (p. 162)
- Agricultural Education (BS): Agricultural Business Concentration (p. 93)
- Agricultural Education (BS): Agricultural Engineering Technology Concentration (p. 99)
- Agricultural Education (BS): Agronomy Concentration (p. 107)
- Agricultural Education (BS): Animal Science Concentration (p. 114)
- Agricultural Education (BS): Horticultural Science Concentration (p. 119)
- Agricultural Education (BS): Natural Resources Concentration (p. 122)
- Agricultural Education (BS): Poultry Science Concentration (p. 127)
- Agricultural Science (BS) (p. 132)
- Agroecology & Sustainable Food Systems (BS): Agroecology Research & Production Concentration (p. 285)
- Agroecology & Sustainable Food Systems (BS): Community Food Systems Concentration (p. 288)
- Agroecology & Sustainable Food Systems (BS): Urban Horticulture Concentration (p. 332)
- Animal Science (BS): Industry Concentration (p. 184)
- Animal Science (BS): Science Concentration (p. 200)
- Animal Science (BS): Veterinary Bioscience Concentration (p. 216)
- Biochemistry (BS) (p. 346)
- Biological and Agricultural Engineering Technology (BS) (p. 225)
- Biological and Agricultural Engineering Technology (BS): Agricultural Systems Management Concentration (p. 239)
- Biological and Agricultural Engineering Technology (BS): Environmental Systems Management Concentration (p. 253)
- Biological Engineering (BS) (p. 268)
- Biological Engineering (BS): Agricultural Engineering Concentration (p. 272)
- Biological Engineering (BS): Bioprocessing Engineering Concentration (p. 274)
- Biological Engineering (BS): Ecological Engineering Concentration (p. 277)
- Biological Engineering (BS): Environmental Engineering Concentration (p. 280)
- Bioprocessing Science (BS) (p. 314)
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- Crop and Soil Sciences (BS): Crop Biotechnology (p. 293)
- Crop and Soil Sciences (BS): Soil Science (p. 296)
- Field Crops Technology (AAS) (p. 84)
- Food Science (BS): Science Concentration (p. 318)
- Food Science (BS): Technology Concentration (p. 320)
• General Agriculture (AAS) (p. 86)
• Horticultural Science (BS): Landscape Design, Gardens & Urban Environments Concentration (p. 335)
• Horticultural Science (BS): Plant Breeding and Biotechnology in Horticulture Concentration (p. 337)
• Horticultural Science (BS): Production Systems and Entrepreneurship in Horticulture Concentration (p. 340)
• Horticultural Science Management (AAS): Ornamentals and Landscape Technology Concentration (p. 87)
• Horticultural Science Management (AAS): Small Scale Farming Concentration (p. 88)
• Life Sciences First Year (p. 366)
• Livestock and Poultry Management (AAS) (p. 89)
• Natural Resources (BS): Soil, Water and Land Use Concentration (p. 301)
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• Animal Science (Minor) (p. 220)
• Applied Ecology (Minor) (p. 222)
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• Biotechnology (Minor) (p. 349)
• Crop Science (Minor) (p. 299)
• Entomology (Minor) (p. 310)
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• Feed Milling (Minor) (p. 369)
• Food Science (Minor) (p. 323)
• Horticultural Science (Minor) (p. 343)
• Leadership in Agriculture and Life Sciences (Minor) (p. 144)
• Nutrition (Minor) (p. 324)
• Plant Biology (Minor) (p. 365)
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Agricultural Institute

Instructional programs of the Agricultural Institute (AGI) are organized and conducted as a part of the overall program in the College of Agriculture and Life Sciences. The Agricultural Institute is an addition to and not a substitute for the bachelor of science degree-granting program of the College of Agriculture and Life Sciences. The Institute uses the same facilities (classrooms, laboratories, farms) as the four-year program. Facilities are available for both teaching and observing how technology is applied in agriculture and other areas.

People with the kind of training offered by the Agricultural Institute are in demand in North Carolina and the nation. By adding new courses of study to keep up with rapidly changing technology, the Agricultural Institute strives constantly to meet the needs of its students. In doing so, it prepares them to be highly trained candidates for careers in agribusiness, agriculture, pest management, ornamentals, landscape, turfgrass, and other related areas.

Here are some key highlights about the Agricultural Institute:

• We offer six academic programs leading to an Associate of Applied Science (AAS) degree
• The Institute uses the same facilities (classrooms, laboratories, farms) as the four-year bachelor of science degree-granting program
• All AGI students have access to the AGI tutorial center as well as the AGI Writing website
• Student organizations like AGI Ambassadors and Delta Tau Alpha Honor Society bring AGI students together to share their passions

Admissions

The Agricultural Institute has separate admissions requirements for incoming freshman students and transfer students. Visit our website (https://cals.ncsu.edu/agricultural-institute/students/admissions/) for more information about our admissions requirements for our programs.

For more information about this department, including contact information, visit our website (https://cals.ncsu.edu/agricultural-institute/).

100 Patterson Hall
NCSU Box 7642
Raleigh, NC 27695-7642
Phone: (919) 515-3248
Fax: (919) 513-1421
E-mail: ag_institute@ncsu.edu
Plains

- Agribusiness Management (AAS) (p. 82)
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- Field Crops Technology (AAS) (p. 84)
- General Agriculture (AAS) (p. 86)
- Horticultural Science Management (AAS): Ornamentals and Landscape Technology Concentration (p. 87)
- Horticultural Science Management (AAS): Small Scale Farming Concentration (p. 88)
- Livestock and Poultry Management (AAS) (p. 89)
- Turfgrass Management (AAS) (p. 91)

Agribusiness Management (AAS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/!

Agriculture is a multifaceted and cutting-edge industry that incorporates the fundamentals of business activity, including economics, marketing, sales, law, policy, and international trade.

The agricultural business management major combines core knowledge in agricultural business and economics with skill-building in areas such as animal production and management, crop production, pest management and equipment maintenance.

You will be prepared to succeed in managerial positions in agriculture and agriculture-related businesses, including:

- Farm Management
- Entrepreneurship
- Animal Health Sales
- Agricultural Lobbying
- Agricultural Import/Export
- Advertising

For more information about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/agribusiness-management).

Dr. Melissa Hendrickson
Program Coordinator

Plan Requirements

Agribusiness Management (AAS) - 64 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>Introduction to the Agricultural Institute</td>
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<tr>
<td>ENS</td>
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<tr>
<td>WRT 111</td>
<td>Expository Writing 1</td>
<td>3</td>
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<tr>
<td>WRT 114</td>
<td>Professional Writing, Research and Reporting 1</td>
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<tr>
<td>MATH</td>
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<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences 1</td>
<td>3</td>
</tr>
<tr>
<td>MA 103A</td>
<td>Topics in Contemporary Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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</table>

**Mathematics**

- MAA 102 Mathematics in Agriculture and Related Sciences 1 3
- MA 103A Topics in Contemporary Mathematics 3

**General Requirements**

- ARE 201 Introduction to Agricultural & Resource Economics 3

<table>
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<tr>
<td>ARE 115</td>
<td>Agribusiness Accounting</td>
<td>3</td>
</tr>
<tr>
<td>SOC 203A</td>
<td>Current Social Problems</td>
<td>3</td>
</tr>
<tr>
<td>or SOC 241/Sociology of Agriculture and Rural Society</td>
<td>3</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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</table>

**HESF Requirement**

- GEP Health and Exercise Studies (p. 1422) 1

**Major Requirements**

- ARE 104 Agricultural Business Management 3
- ARE 106 Agri Business Law 3
- ARE 132 Management of Personnel 3
- ANS or PO Elective (p. 82) 3
- CS or HS Elective (p. 82) 3
- ENT Elective (p. 83) 3
- SSC 151 Fertilizers and Soil Fertility 3
- ARE Electives (p. 83) 9

**Free Electives**

Free Electives 8

Total Hours 64

1 A grade of C- or higher is required.

**ANS and PO Electives**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<td>ANS 101</td>
<td>Introduction to Livestock and Poultry Industries</td>
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<td>ANS 102</td>
<td>Animal Feeds and Nutrition</td>
<td>3</td>
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<tr>
<td>ANS 103</td>
<td>Beef Production</td>
<td>3</td>
</tr>
<tr>
<td>ANS 104</td>
<td>Swine Production</td>
<td>4</td>
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<tr>
<td>ANS 240</td>
<td>Livestock Merchandising</td>
<td>3</td>
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<tr>
<td>ANS 240A</td>
<td>Livestock Merchandising</td>
<td>3</td>
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<tr>
<td>PO 111</td>
<td>Poultry Production</td>
<td>3</td>
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<tr>
<td>PO 150</td>
<td>Poultry Management</td>
<td>3</td>
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<tr>
<td>PO 162</td>
<td>Livestock and Poultry Disease Management</td>
<td>3</td>
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<tr>
<td>PO 201</td>
<td>Poultry Science and Production</td>
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<td>PO 201A</td>
<td>Poultry Science and Production</td>
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<tr>
<td>PO 202A</td>
<td>Poultry Science and Production Laboratory</td>
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<tr>
<td>VMP 162</td>
<td>Livestock and Poultry Disease Management</td>
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**CS and HS Electives**

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<td>CS 111</td>
<td>Field Crop Production</td>
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<tr>
<td>CS 121</td>
<td>Turfgrasses and Their Uses</td>
<td>3</td>
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<td>CS 122</td>
<td>Principles of Turfgrass Management</td>
<td>3</td>
</tr>
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<td>CS 151</td>
<td>Forage Production</td>
<td>3</td>
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<tr>
<td>CS 155</td>
<td>Advanced Turf Management</td>
<td>3</td>
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<td>CS 162</td>
<td>Flue-Cured Tobacco Production</td>
<td>1</td>
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<td>CS 163</td>
<td>Peanut Production</td>
<td>1</td>
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<td>CS 164</td>
<td>Soybean Production</td>
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<td>CS 165</td>
<td>Cotton Production</td>
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<tr>
<td>CS 166 Corn Production</td>
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<td>CS 167 Wheat Production</td>
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<td>CS 190 Turf Seminar</td>
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<td>CS 191 Field Crops Seminar</td>
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<td>PP 154 Turf Weed and Disease Management</td>
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<td>HS 111 Plant ID</td>
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<td>HS 115 Plant Growth and Development</td>
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<td>HS 121 Plant Propagation</td>
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<tr>
<td>HS 131 Fruit &amp; Vegetable Production</td>
<td>3</td>
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<td>HS 141 Greenhouse Crop Production</td>
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<tr>
<td>HS 144 Weeds &amp; Diseases of Ornamentals</td>
<td>3</td>
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<td>HS 151 Nursery Production</td>
<td>3</td>
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<tr>
<td>HS 162 Landscape Maintenance</td>
<td>3</td>
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<tr>
<td>HS 171 Landscape Construction</td>
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<tr>
<td>PP 144 Weeds &amp; Diseases of Ornamentals</td>
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### ENT Electives

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<tr>
<th>Code</th>
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<tr>
<td>ENT 110</td>
<td>General Entomology</td>
<td>3</td>
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<tr>
<td>ENT 121</td>
<td>Pesticides and Their Utilization</td>
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<td>ENT 132</td>
<td>Urban Pest Management</td>
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<td>ENT 163</td>
<td>Ornamental &amp; Turf Insects</td>
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<td>ENT 190</td>
<td>Current Topics in Pest Management</td>
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### SSC Elective

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<td>SSC 151</td>
<td>Fertilizers and Soil Fertility</td>
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### ARE Electives

<table>
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<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 112</td>
<td>Agricultural &amp; Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 113</td>
<td>Principles of Salesmanship</td>
<td>3</td>
</tr>
<tr>
<td>ARE 114</td>
<td>Value Added Agriculture and Niche Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 133</td>
<td>Agricultural &amp; Environmental Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 141</td>
<td>Personal Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 194</td>
<td>International Agribusiness Management Study Abroad</td>
<td>1-6</td>
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</table>

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
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<td>First Year</td>
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<td>Fall Semester</td>
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<td>WRT 111</td>
<td>Expository Writing ¹</td>
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<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences ²</td>
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<tr>
<td>ARE 106</td>
<td>Agri Business Law</td>
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<tr>
<td>ARE 132</td>
<td>Management of Personnel</td>
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### Spring Semester

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<tr>
<td>ARE 115</td>
<td>Agribusiness Accounting</td>
<td>3</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Free Elective</td>
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<tr>
<td>ARE Elective ³</td>
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<td>Select two of the following:</td>
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<td>Select two of the following:</td>
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<tr>
<td>ARE Elective</td>
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<tr>
<td>Select two of the following:</td>
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<tr>
<td>ARE Elective</td>
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<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 104</td>
<td>Agricultural Business Management</td>
<td>3</td>
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<tr>
<td>Free Elective</td>
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<tr>
<td>ARE Elective ³</td>
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<td>Select two of the following:</td>
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<td>ENT Elective</td>
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<td>SSC Elective</td>
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### Second Year

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ARE 112</td>
<td>Agricultural &amp; Agribusiness Marketing</td>
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</tr>
<tr>
<td>ARE 133</td>
<td>Agricultural &amp; Environmental Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 141</td>
<td>Personal Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 194</td>
<td>International Agribusiness Management Study Abroad</td>
<td>1-6</td>
</tr>
</tbody>
</table>

### Total Hours

Total Hours: 64

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1 WRT 111 Expository Writing and WRT 114 Professional Writing, Research and Reporting must be completed with a C- minus or higher grade for transfer to an NC State baccalaureate program.

2 MAA 102 Mathematics in Agriculture and Related Sciences must be completed with a C- minus or higher grade.

3 ARE 112 Agricultural & Agribusiness Marketing or ARE 133 Agricultural & Environmental Policy is required. If ARE 112 Agricultural & Agribusiness Marketing is taken, student must take the ARE elective during the second year spring. If ARE 133 Agricultural & Environmental Policy is taken, student must take the ARE elective during second year fall.

---

### Agribusiness Management (Certificate) (Distance Education)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas)!
The University Associate Certificate in Agribusiness Management is available to any student enrolled as a non-degree studies (NDS) student at North Carolina State University. This certificate is not available to students enrolled in a 2-year or 4-year degree program at N.C. State University. This certificate provides individuals an opportunity to learn applied business and economic principles that are useful in career in agricultural and related industries. These could include careers in horticulture, landscaping, and chemical and farm equipment sales, as well as the production and distribution of crops and other commodities.

Program Coordinator
Dr. John S. Russ
Undergraduate Coordinator
Director of ARE Distance Education
Department of Agricultural & Resource Economics (ARE)
NC State University
Box 8109
Nelson Hall, Room 3346
Raleigh, North Carolina 27695
(919) 515-4677
russ@ncsu.edu

Admissions Requirements
- Have received a High School Diploma or a GED at least 12 months prior to applying to this program;
- Not enrolled in a degree program (2-year or 4-year) at N.C. State;
- Acceptance as a Non-Degree Studies (NDS) student through DELTA, if not already enrolled;
- Completed certificate program application that may be submitted to ARE at any time throughout the year; and
- Must be accepted into the AAS Certificate in Agribusiness Management program.

Completion Requirements
Completion of 15 credit hours from the list of required courses with a grade of C- or higher received for each course; and an overall GPA of 2.0 or higher must be achieved upon completion of all required courses.

- Three (3) years will be allowed for completion of all courses. The time limit starts with enrollment in the first course. Students will be allowed to defer no more than two semesters after acceptance into the program. Courses may be completed in any order.
- All courses must be taken through distance education unless special approval is granted for completion of an on-campus section to allow the student to successfully complete the course sequence for receipt of the certificate.
- None of the required 15 credit hours may be taken for S/U or “credit-only.”
- No pre-requisite course requirements are needed.
- No transfer credits from other institutions to fulfill certificate course requirements are allowed. Students currently enrolled in a 2-year Agribusiness Management degree program, or who would qualify for a 2-year degree AGB concentration, do not qualify for this certificate program.

Registration/Financial Aid information
Acceptance as a Non-Degree Studies (NDS) student at N.C. State University does not imply acceptance into this certificate program.

NDS students must also apply to the Department of Agricultural and Resource Economics to be accepted into this certificate program. Potential students should check to see if their financial aid will provide tuition for all courses required for this program. Financial aid may not be available for this certificate, or other non-degree programs or certificates at N.C. State University. Contact the Program Coordinator for more information.

Academic Structure
Term Effective: 1/2012
Plan Code: 32AGPCTA
CIP Code: 01.0101
Description: Associate Certificate in Agribusiness Management
Offered via Distance Education only

Additional information available on the departmental website for this certificate at http://go.ncsu.edu/agribusiness_online.

Plan Requirements
Plan Code: 32AGPCTA

Required Courses to be taken via distance education (section number 601) (15 credits):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 104</td>
<td>Agricultural Business Management</td>
<td>3</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
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<td>Select three of the following:</td>
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<tr>
<td>ARE 106</td>
<td>Agri Business Law</td>
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<tr>
<td>ARE 112</td>
<td>Agricultural &amp; Agribusiness Marketing</td>
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<tr>
<td>or ARE 113</td>
<td>Principles of Salesmanship</td>
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<tr>
<td>ARE 115</td>
<td>Agribusiness Accounting</td>
<td></td>
</tr>
<tr>
<td>ARE 132</td>
<td>Management of Personnel</td>
<td></td>
</tr>
<tr>
<td>ARE 133</td>
<td>Agricultural &amp; Environmental Policy</td>
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</tbody>
</table>

Total Hours 15

Field Crops Technology (AAS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orig.ncsu.edu/pgas/)

A growing world population and decreased arable land make it extremely important to explore new ways to grow more crops on less land.

The program focuses on sound crop and soil management practices and the wise use of farm resources. Students learn efficient and effective production strategies for the major agronomic crops based on best practices and integrated pest management principles, agricultural business principles and environmentally sound soil management.

For more information about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/field-crops-technology).

Dr. Amy Johnson
Program Coordinator
Plan Requirements
Field Crops Technology (AAS): 64 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>Orientation</td>
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<tr>
<td>CS 101</td>
<td>Field Crop and Turfgrass Management Orientation</td>
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<tr>
<td>English</td>
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<td>WRT 111</td>
<td>Expository Writing</td>
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<tr>
<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
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<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
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<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<td>General Requirements</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 115</td>
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<td>Sociology</td>
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<td>SOC 203/203A</td>
<td>Current Social Problems</td>
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<td>SOC 241/241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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Physical Education
GEP Health and Exercise Studies (p. 1422) 1

Major Requirements
CS 111 | Field Crop Production                               | 4     |
CS 152 | Weed Control in Field Crops                         | 3     |
CS 162 | Flue-Cured Tobacco Production                       | 1     |
CS 163 | Peanut Production                                   | 1     |
CS 164 | Soybean Production                                  | 1     |
CS 165 | Cotton Production                                   | 1     |
CS 166 | Corn Production                                     | 1     |
CS 167 | Wheat Production                                    | 1     |
CS 191 | Field Crops Seminar                                 | 2     |
BAE 133 | Agricultural Tractors and Machinery                | 4     |
ARE Elective |                                                  | 3     |
ARE 104 | Agricultural Business Management                   |       |
ARE 112 | Agricultural & Agribusiness Marketing              |       |
ARE 133 | Agricultural & Environmental Policy                |       |
SSC 112 | Principles of Soil Science                          | 4     |
SSC 151 | Fertilizers and Soil Fertility                      | 3     |
ENT 110 | General Entomology                                  | 3     |
or ENT 121 | Pesticides and Their Utilization                     |       |
Free Electives
Free Electives 1 6

Total Hours: 64

1. Courses graded “S” for Satisfactory are allowed. Students should consult their academic advisors to determine which courses fill this requirement.

Semester Sequence
This is a sample.
General Agriculture (AAS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The general agriculture (GNA) degree offers students the opportunity to get a degree in agriculture without having to focus on one specific area such as horticulture or animal science. The GNA degree also offers the opportunity to concentrate on specific topics. Our GNA students can choose from agribusiness management, field crop production, general livestock management, poultry management, and swine management. These areas of concentration allow students to get the broad spectrum of courses that the GNA degree offers, and also to focus on one area a little more closely. The GNA program also allows for students who come to the Agricultural Institute unsure of their specialty areas a chance to learn about our diverse fields taught here.

Jobs in this area include:

- Farm Management
- Machinery and Equipment Sales
- Agricultural Chemical Distribution

To learn more information about this major, including contact information, visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/#general-agriculture).

Dr. Amy Johnson
Program Coordinator

Plan Requirements

General Agriculture (AAS) - 64 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</table>
| Orientation
| AGI 101 | Introduction to the Agricultural Institute     | 1     |
| English
| WRT 111 | Expository Writing                              | 3     |
|        | WRT 114 | Professional Writing, Research and Reporting    | 3     |
| Mathematics
| MAA 102 | Mathematics in Agriculture and Related Sciences | 3     |
|        | MA 103  | Topics in Contemporary Mathematics              | 3     |
| General Requirements
| ARE 201 | Introduction to Agricultural & Resource Economics | 3     |
|        | ARE 115 | Agribusiness Accounting                        | 3     |
|        | SOC 203 | Current Social Problems                        | 3     |
|        | GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |
| Physical Education
| GEP Health and Exercise Studies (p. 1422) | 1     |
| Major Requirements
| CS 111  | Field Crop Production                          | 4     |
|        | ANS 101 | Introduction to Livestock and Poultry Industries | 3     |
|        | ARE 104 | Agricultural Business Management                | 3     |
|        | SSC 112 | Principles of Soil Science                      | 4     |
|        | ANS/PO Elective (p. 86)                        | 3     |
|        | CS Elective (p. 86)                            | 5     |
|        | ENT Restricted Elective                        | 3     |

1 A grade of C- or higher is required.
2 Courses graded “S” for Satisfactory are allowed.
3 Students should consult their academic advisors to determine which courses fill this requirement.

ANS/PO Electives

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<tr>
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<td>Introduction to Livestock and Poultry Industries</td>
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<td>ANS 102</td>
<td>Animal Feeds and Nutrition</td>
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<td>ANS 103</td>
<td>Beef Production</td>
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<td>ANS 104</td>
<td>Swine Production</td>
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<td>ANS 110</td>
<td>Introduction to Equine Science</td>
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<td>PO 111</td>
<td>Poultry Production</td>
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<td>PO 150</td>
<td>Poultry Management</td>
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<td>PO 162</td>
<td>Livestock and Poultry Disease Management</td>
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<td>Livestock and Poultry Disease Management</td>
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CS Electives

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<td>CS 121</td>
<td>Turfgrasses and Their Uses</td>
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<td>CS 122</td>
<td>Principles of Turfgrass Management</td>
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<td>CS 151</td>
<td>Forage Production</td>
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<tr>
<td>CS 152</td>
<td>Weed Control in Field Crops</td>
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<td>CS 153</td>
<td>Turfgrass and Ornamental Weed Control</td>
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<td>CS 154</td>
<td>Turf Weed and Disease Management</td>
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<td>CS 155</td>
<td>Advanced Turf Management</td>
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<td>CS 162</td>
<td>Flue-Cured Tobacco Production</td>
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<td>CS 163</td>
<td>Peanut Production</td>
<td>1</td>
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<td>CS 164</td>
<td>Soybean Production</td>
<td>1</td>
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<td>CS 165</td>
<td>Cotton Production</td>
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<tr>
<td>CS 166</td>
<td>Corn Production</td>
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<td>CS 167</td>
<td>Wheat Production</td>
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<tr>
<td>CS 190</td>
<td>Turf Seminar</td>
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<td>CS 191</td>
<td>Field Crops Seminar</td>
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<tr>
<td>PP 154</td>
<td>Turf Weed and Disease Management</td>
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</table>

Semester Sequence

This is a sample.
Horticultural Science Management (AAS): Ornamentals and Landscape Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! The horticultural science management major is for students interested in growing, installing, and/or maintaining ornamentals, landscape plants and edibles. This program provides a foundation of science-based horticultural knowledge while emphasizing artistic and nutritional principles of plant use. Internships are required to reinforce classroom principles and vary based on the individual. The horticultural science management major offers concentrations in ornamentals and landscape technology and small-scale farming.

With this major, graduates can pursue careers in:

- Production Manager
- Horticulture Entrepreneur
- Landscape Foreman
- Pest Management Technician
- Small Farm Manager

To learn more about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/#horticultural-science-management).

Mr. Lee Ivy
Program Coordinator
Email: rlviv@ncsu.edu

Plan Requirements

Horticultural Science Management (AAS): Ornamentals & Landscape Technology: 65 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Orientation</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>HS 101</td>
<td>Introduction to Ornamentals and Landscape Technology</td>
<td>1</td>
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<tr>
<td>English</td>
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<tr>
<td>WRT 111</td>
<td>Expository Writing</td>
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<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
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<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<td>HSMS Degree Requirements</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
<td></td>
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<tr>
<td>ARE 115</td>
<td>Agribusiness Accounting</td>
<td>3</td>
<td></td>
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<tr>
<td>SOC 203A</td>
<td>Current Social Problems or Sociology of Agriculture and Rural Society</td>
<td>3</td>
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<tr>
<td>or SOC 241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
<td>3</td>
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</table>

1 MAA 102 Mathematics in Agriculture and Related Sciences must be completed with a C- minus or higher grade.

2 WRT 111 Expository Writing and WRT 114 Professional Writing, Research and Reporting must be completed with a C-minus or higher grade for transfer to an NC State baccalaureate program.

3 If BAE 123 Light Equipment Technology is taken, student must take one additional credit hour of free electives.

To learn more about this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
### Horticultural Science Management (AAS): Small Scale Farming Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The horticultural science management major is for students interested in growing, installing, and/or maintaining ornamentals, landscape plants and edibles. This program provides a foundation of science-based horticultural knowledge while emphasizing artistic and nutritional principles of plant use. Internships are required to reinforce classroom principles and vary based on the individual. The horticultural science management major offers concentrations in small-scale farming and ornamentals and landscape technology.

With this major, graduates can pursue careers in:

- Production Manager
- Horticulture Entrepreneur
- Landscape Foreman
- Pest Management Technician
- Small Farm Manager

To learn more about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/#horticultural-science-management).

Mr. Lee Ivy
Program Coordinator
Email: rlivy@ncsu.edu

### Plan Requirements

#### Horticultural Science Management (AAS): Small Scale Farming

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<tbody>
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<td>HS 101</td>
<td>Introduction to Ornamentals and Landscape Technology</td>
<td>1</td>
</tr>
<tr>
<td>MA 103A</td>
<td>Topics in Contemporary Mathematics</td>
<td>3</td>
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<tr>
<td>HS 121</td>
<td>Plant Propagation</td>
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<td>GEP</td>
<td>Health and Exercise Studies (p. 1422)</td>
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<td>AGI 191</td>
<td>Professional Development</td>
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#### Spring Semester

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ARE 115</td>
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<tr>
<td>BAE 123</td>
<td>Light Equipment Technology</td>
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<tr>
<td>ENT 163</td>
<td>Ornamental &amp; Turf Insects</td>
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<td>Free Elective</td>
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<tr>
<td>Hours</td>
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#### Total Hours

63

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1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

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### Semester Sequence

This is a sample.

#### Course Title Hours

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<td>WRT 111</td>
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<td>HS 111</td>
<td>Plant ID</td>
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<td>HS 115</td>
<td>Plant Growth and Development</td>
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<td>SOC 203A</td>
<td>Current Social Problems</td>
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| Spring Semester | Professional Writing, Research and Reporting | 3     |
| WRT 114        |                      |       |
| MA 103A        | Topics in Contemporary Mathematics                  | 3     |
| HS 121         | Plant Propagation                                      | 3     |
| GEP            | Health and Exercise Studies (p. 1422)                 | 1     |
| HS Advised Courses |                                         | 1     |
| Free Elective  |                                                | 3     |
| AGI 191        | Professional Development                              | 1     |
|                | Hours                                                    | 15    |

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<th>Second Year</th>
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<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 115</td>
<td>Agribusiness Accounting</td>
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<tr>
<td>SOC 203A</td>
<td>Current Social Problems</td>
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<tr>
<td>or SOC 241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Physical Education</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Beef Production</td>
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<td>ANS 104</td>
<td>Swine Production</td>
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<td>PO 150</td>
<td>Poultry Management</td>
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<tr>
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<td>General Entomology</td>
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<td>Pesticides and Their Utilization</td>
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<td>HS 131</td>
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<td>Plant Growth and Development</td>
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<td>Principles of Soil Science</td>
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<td>Plant Propagation</td>
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<td>HS 144</td>
<td>Weeds &amp; Diseases of Ornamentals</td>
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<td>CS 152</td>
<td>Weed Control in Field Crops</td>
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</tbody>
</table>

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRT 111</td>
<td>Expository Writing</td>
<td>3</td>
</tr>
<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
<td>3</td>
</tr>
<tr>
<td>HS 101</td>
<td>Introduction to Ornamentals and Landscape Technology</td>
<td>1</td>
</tr>
</tbody>
</table>

### Livestock and Poultry Management (AAS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Associate of Applied Science (AAS) degree in Livestock and Poultry Management is designed for students with an interest in working with various livestock (dairy, beef, and swine) and poultry (broiler, turkey, and commercial egg) species after graduation. This program prepare graduates for entry-level management positions in live production, technical consultation or with allied industries. The curriculum includes technical courses such as beef, swine, and poultry management courses; agricultural business courses; and General Education Program (GEP) courses which include English, math, humanities, and social sciences.

Career possibilities include:

- Poultry Management
- Livestock Management
- Feed and Equipment Sales
To learn more about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/#livestock-and-poultry-management).

Mr. Gary Gregory and Dr. Lynn Worley-Davis
Program Coordinators

**Plan Requirements**

**Livestock & Poultry Management (AAS) - 64 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGI 101</td>
<td>Introduction to the Agricultural Institute</td>
<td>1</td>
</tr>
<tr>
<td>WRT 111</td>
<td>Expository Writing</td>
<td>3</td>
</tr>
<tr>
<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
<td>3</td>
</tr>
<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
<td>3</td>
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<tr>
<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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**English**

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<tr>
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<tbody>
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<td>WRT 111</td>
<td>Expository Writing</td>
<td>3</td>
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<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
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**Mathematics**

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<td>Mathematics in Agriculture and Related Sciences</td>
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<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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**General Requirements**

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<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
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<tr>
<td>ARE 115</td>
<td>Agribusiness Accounting</td>
<td>3</td>
</tr>
<tr>
<td>AGI 191</td>
<td>Professional Development</td>
<td>1</td>
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<tr>
<td>SOC 203</td>
<td>Current Social Problems</td>
<td>3</td>
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<tr>
<td>SOC 203A</td>
<td>Current Social Problems</td>
<td>3</td>
</tr>
<tr>
<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
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<tr>
<td>SOC 241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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**GEP Additional Breadth**

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<tbody>
<tr>
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<td>Humanities/Social Sciences/ Visual and Performing Arts</td>
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**Physical Education**

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<tr>
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**Major Requirements**

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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ANS 102</td>
<td>Animal Feeds and Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>ANS 103</td>
<td>Beef Production</td>
<td>3</td>
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<tr>
<td>ANS 104</td>
<td>Swine Production</td>
<td>4</td>
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<tr>
<td>PO 201A</td>
<td>Poultry Science and Production</td>
<td>3</td>
</tr>
<tr>
<td>PO 202A</td>
<td>Poultry Science and Production Laboratory</td>
<td>1</td>
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<tr>
<td>PO 150</td>
<td>Poultry Management</td>
<td>3</td>
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<tr>
<td>PO 162</td>
<td>Livestock and Poultry Disease Management</td>
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**Select two of the following ARE Electives:**

<table>
<thead>
<tr>
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<th>Hours</th>
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<tbody>
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<td>ARE 104</td>
<td>Agricultural Business Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 106</td>
<td>Agri Business Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 112</td>
<td>Agricultural &amp; Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 113</td>
<td>Principles of Salesmanship</td>
<td>3</td>
</tr>
<tr>
<td>ARE 132</td>
<td>Management of Personnel</td>
<td>3</td>
</tr>
<tr>
<td>ARE 133</td>
<td>Agricultural &amp; Environmental Policy</td>
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<td>ARE 141</td>
<td>Personal Financial Management</td>
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**Free Electives**

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**Total Hours**

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<tbody>
<tr>
<td>Total</td>
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<td>62</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

### Semester Sequence

**First Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGI 101</td>
<td>Introduction to the Agricultural Institute</td>
<td>1</td>
</tr>
<tr>
<td>WRT 111</td>
<td>Expository Writing</td>
<td>3</td>
</tr>
<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ANS 101</td>
<td>Introduction to Livestock and Poultry Industries</td>
<td>3</td>
</tr>
<tr>
<td>SOC 203A or SOC 241A</td>
<td>Current Social Problems or Sociology of Agriculture and Rural Society</td>
<td>3</td>
</tr>
<tr>
<td>PO 201A</td>
<td>Poultry Science and Production</td>
<td>3</td>
</tr>
<tr>
<td>PO 202A</td>
<td>Poultry Science and Production Laboratory</td>
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**Hours**

<table>
<thead>
<tr>
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<th>Title</th>
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<tr>
<td></td>
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**Spring Semester**

<table>
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<tr>
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<tbody>
<tr>
<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
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<tr>
<td>MA 103A</td>
<td>Topics in Contemporary Mathematics</td>
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<tr>
<td>ANS 104</td>
<td>Swine Production</td>
<td>4</td>
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<td>ARE 1xx</td>
<td>Ag &amp; Resource Economics Elective</td>
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<td>AGI 191</td>
<td>Professional Development</td>
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<td>PO 150</td>
<td>Poultry Management</td>
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**Hours**

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<th>Title</th>
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**Second Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<td>Beef Production</td>
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<td>ANS 102</td>
<td>Animal Feeds and Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td>Humanities/Social Sciences/ Visual and Performing Arts</td>
<td>3</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>AGI 191</td>
<td>Professional Development</td>
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**Hours**

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**Spring Semester**

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<tr>
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<td>ARE 115</td>
<td>Agribusiness Accounting</td>
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<tr>
<td>PO 162</td>
<td>Livestock and Poultry Disease Management</td>
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**Free Elective**

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**Hours**

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**Total Hours**

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>62-64</td>
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</table>

1 WRT 111 Expository Writing and WRT 114 Professional Writing, Research and Reporting must be completed with a C-minus or higher grade for transfer to an NC State baccalaureate program.
Turfgrass Management (AAS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

Turfgrass managers establish and maintain grasses for functional (erosion control), recreational, and ornamental purposes. They manage people and budgets and use their knowledge of plants and soils to produce high-quality, visually-appealing turfgrass areas. There are ample employment opportunities for well-trained managers in this industry.

Career possibilities include:

- Lawn Care
- Athletic Field Manager
- Golf Course Superintendent
- Parks and Recreation Management
- Sod Production and Installation

To learn more about this major, including contact information, please visit our website (https://cals.ncsu.edu/agricultural-institute/students/majors/#turfgrass-management).

Mrs. Emily Erickson
Program Coordinator and Advisor

Plan Requirements

Turfgrass Management (AAS) - 64 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>CS 101</td>
<td>Field Crop and Turfgrass Management Orientation</td>
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</tr>
<tr>
<td>WRT 111</td>
<td>Expository Writing</td>
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<td>WRT 114</td>
<td>Professional Writing, Research and Reporting</td>
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</tr>
<tr>
<td>MAA 102</td>
<td>Mathematics in Agriculture and Related Sciences</td>
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<tr>
<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 115</td>
<td>Agribusiness Accounting</td>
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<tr>
<td>SOC 203</td>
<td>Current Social Problems</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>HS 111</td>
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<table>
<thead>
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<td>Total Hours</td>
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Semester Sequence

This is a sample.

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<th>Hours</th>
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<td>WRT 111</td>
<td>Expository Writing</td>
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</tr>
<tr>
<td>CS 101</td>
<td>Field Crop and Turfgrass Management Orientation</td>
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</tr>
<tr>
<td>CS 121</td>
<td>Turfgrasses and Their Uses</td>
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<td>HS 111</td>
<td>Plant Growth and Development</td>
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<td>Plant ID</td>
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<td>SSC 112</td>
<td>Principles of Soil Science</td>
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<tr>
<td></td>
<td>Hours</td>
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<td>Spring</td>
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<td>WRT 114</td>
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<td>ARE 115</td>
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<td>CS 122</td>
<td>Principles of Turfgrass Management</td>
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<td>MA 103A</td>
<td>Topics in Contemporary Mathematics</td>
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<td>CS 154</td>
<td>Turf Weed and Disease Management</td>
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<td>Pesticides and Their Utilization</td>
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<td>HS 162</td>
<td>Landscape Maintenance</td>
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<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>ENT 163</td>
<td>Ornamental &amp; Turf Insects</td>
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</tr>
</tbody>
</table>
Agricultural and Extension Education is a broad field of study and practice representing the blending of agricultural and social and behavioral sciences into educational programs for youth and adults. Central to the department’s goals is the formal and non-formal teaching of problem-solving and learning skills for a lifetime of growing, evolving, and changing. The program awards a Bachelor of Science degree in Agricultural Science, which provides graduates with the necessary knowledge, skills, and experiences for teacher licensure in agriculture for grades 7-12. Additionally, the agriculture industry loves our graduates because of their combination of agriculture and people knowledge and skills. The Agricultural Science degree also provides graduates with knowledge and skills in both agriculture and leadership skills that are essential to success in the food, agriculture, and natural resources industries.

Key highlights about our department:

- Students in the department complete a specialty area or a concentration in at least one area of agriculture
- Graduates may plan for teaching, administrative leadership and public relations positions in secondary schools, community colleges, universities, Cooperative Extension Service, and agribusinesses
- Graduates are highly qualified to enter agricultural careers in all areas of food, agriculture, and natural resources
- Career placement assistance is provided to all graduates

Curricula

The Agricultural Education curriculum encompasses areas of study that will enable students to participate effectively in planning, promoting, and initiating educational programs in agriculture. The program leads to a Bachelor of Science degree and prepares teachers of agriculture for secondary schools and community and technical colleges. The demand for agricultural education teachers exceeds present supply in the Carolinas, Virginia, and throughout the nation.

The Agricultural Science curriculum prepares graduates for careers in a wide variety of agricultural industry positions. The program leads to a Bachelor of Science degree in Agricultural Science. Students complete a minimum of two agricultural specialty areas, increasing their options for careers in agriculture. Students also complete a series of leadership courses to prepare them for leadership positions within the agricultural industries. Internships are not required in this curriculum, but are strongly encouraged.

For more information about this department, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Faculty

Department Head
Carolyn Dunn

Director of Graduate Programs
Kim I. Allen
Jackie A. Bruce

Director of Undergraduate Programs
Travis D. Park

Department Extension Leader
Sarah D. Kirby

Professors

C.L. Bird
B.J. Chapman
K.S.U. Jayaratne
B.M. Kirby
S.D. Kirby
M.D. Schulman
B. Silliman

Professors Emeriti

G.W. Bostick
D.B. Croom
J.L. Flowers
G.E. Moore
R.D. Mustian
R.W. Shearon
Agricultural Education (BS): Agricultural Business Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Agricultural Business concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Plan Requirements

Agricultural Education: Agricultural Business Concentration: 120 Total Units
### Orientation
Select one of the following:

- AEE 103 Fundamentals of Agricultural and Extension Education
- ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences
- ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences

### Communication
- COM 110 Public Speaking 3

### Sciences
- BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
- BIO 183 Introductory Biology: Cellular and Molecular Biology 4
- CH 101 Chemistry - A Molecular Science 3
- CH 102 General Chemistry Laboratory 1

### Agricultural Education
- AEE 101 Introduction to Career and Technical Education 1
- AEE 206 Introduction to Teaching Agriculture 3
- AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 3
- AEE 303 Administration and Supervision of Student Organizations 3
- AEE 322 Experiential Learning in Agriculture 3
- AEE 326 Teaching Diverse Learners in AED 3
- AEE 327 Conducting Summer Programs in Agricultural Education 1
- AEE 424 Planning Agricultural Educational Programs 3
- AEE 426 Methods of Teaching Agriculture 3
- AEE 427 Student Teaching in Agriculture 8
- AEE 491 Seminar in Agricultural Education 1

### Teaching Content Courses
- BAET 201 Shop Processes and Management or TDE 110 Materials & Processes Technology 3
- Plant Science Elective (p. 94) 3
- ANS 150 Introduction to Animal Science 3
- ANS 151 Introduction to Animal Science Lab 1
- SSC 200 Soil Science 4
- & SSC 201 and Soil Science Laboratory

### Professional Education
- EDP 304 Educational Psychology 3
- ELP 344 School and Society 3
- ED 311 Classroom Assessment Principles and Practices 2
- ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1

### Concentration Electives
- ARE 215 Small Business Accounting or BUS 225 Personal Finance 3
- ARE 303 Farm Management or ARE 304 Agribusiness Management 3
- ARE 306 Agricultural Law or ARE 309 Environmental Law & Economic Policy 3

### ARE 311 Agricultural Markets 3
or ARE 312 Agribusiness Marketing

### ARE 321 Agricultural Financial Management 3
or ARE 332 Human Resource Management for Agribusiness

### ARE, BUS or EC Elective (p. 96) 3

Select one of the following Economics electives:

- ARE 201 Introduction to Agricultural & Resource Economics
- ARE 201A Introduction to Agricultural & Resource Economics
- EC 201 Principles of Microeconomics
- EC 205 Fundamentals of Economics

### GEP Courses
- ENG 101 Academic Writing and Research 4
- GEP Humanities (p. 1423) 6
- GEP Mathematical Sciences (p. 1428) 6
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)

Foreign Language Proficiency (p. 1417) (verify requirement)

### Free Electives
Free Electives (12 Hr S/U Lmt) 2

Total Hours 120

1. A grade of C- or higher is required.
2. Courses graded “S” for Satisfactory are allowed.
3. Students should consult their academic advisors to determine which courses fill this requirement.

### Plant Science Electives

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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>ANS 215</td>
<td>Agricultural Genetics</td>
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<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
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<td>CS 210</td>
<td>Lawns and Sports Turf</td>
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<td>Plant Genetics</td>
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<td>CS 213</td>
<td>Crop Science</td>
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<td>CS 214</td>
<td>Crop Science Laboratory</td>
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<td>CS 216</td>
<td>Southern Row Crop Production - Cotton, Peanuts, and Tobacco</td>
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<td>CS 218</td>
<td>Southern Row Crop Production - Corn, Small Grains and Soybeans</td>
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<td>CS 224</td>
<td>Seeds, Biotechnology and Societies</td>
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<td>CS 230</td>
<td>Introduction to Agroecology</td>
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<td>CS 312</td>
<td>Grassland Management for Natural Resources Conservation</td>
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<td>Turf Cultural Systems</td>
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<td>Community Food Systems</td>
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CS 411 Crop Ecology 3
CS 413 Plant Breeding 2
CS 414 Weed Science 4
CS 415 Integrated Pest Management 3
CS 418 Introduction to Regulatory Science in Agriculture 3
CS 424 Seed Physiology 3
CS 430 Advanced Agroecology 4
CS 465 Turf Management Systems and Environmental Quality 3
CS 470 Advanced Turfgrass Pest Management 2
CS 480 Sustainable Food Production (capstone) 1
CS 502 Plant Disease: Methods & Diagnosis 2
CS 518 Introduction to Regulatory Science in Agriculture 3
CS 524 Seed Physiology 3
CS 541 Plant Breeding Methods 3
CS 565 Turf Management Systems and Environmental Quality 3
CS 590 Special Topics 1-6
CS 591 Special Problems 1-6
CSSC 290 Professional Development in Crop & Soil Sciences 1
CSSC 490 Senior Seminar in Crop Science and Soil Science 1
CSSC 491 Professional Internship Experience in Crop and Soil Sciences 1-3
CSSC 493 Research Experience in Crop and Soil Sciences 1-3
CSSC 495 Special Topics in Crop and Soil Sciences 1-6
ENT 402 Forest Entomology 3
ENT 470 Advanced Turfgrass Pest Management 2
FOR 150 Critical Thinking and Data Analysis 2
FOR 172 Forest System Mapping and Mensuration I 2
FOR 204 Silviculture 2
FOR 248 Forest History, Technology and Society 3
FOR 250 Professional Development II: Communications in Natural Resources 1
FOR 252 Introduction to Forest Science 3
FOR 260 Forest Ecology 4
FOR 261 Forest Communities 2
FOR 264 Forest Wildlife 1
FOR 265 Fire Management 1
FOR 273 Forest System Mapping and Mensuration II 3
FOR 289 Independent Study in Forest Management 1-6
FOR 294 Independent Study in Forest Management 1-6
FOR 295 Special Topics in Forestry 1-6
FOR 303 Silvics and Forest Tree Physiology 3
FOR 304 Theory of Silviculture 4
FOR 318 Forest Pathology 3
FOR 319 Forest Economics 3
FOR 330 North Carolina Forests 3
FOR 334 Operations Research Applications in Natural Resources 1
FOR 339 Dendrology 4
FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management 1
FOR 353 GIS and Remote Sensing for Environmental Analysis and Assessment 3
FOR 374 Forest Measurement, Modeling, and Inventory 3
FOR 402 Forest Entomology 3
FOR 405 Forest Management 4
FOR 406 Forest Inventory, Analysis and Planning 4
FOR 408 Hardwood Management 3
FOR 411 Forest Tree Genetics and Biology 3
FOR 414 World Forestry 3
FOR 415 World Forestry Study Tour 1
FOR 420 Watershed and Wetlands Hydrology 4
FOR 422 Consulting Forestry 3
FOR 430 Forest Health and Protection 3
FOR 434 Forest Operations and Analysis 3
FOR 472 Forest Soils 4
FOR 491 Special Topics in Forestry and Related Natural Resources 1-4
FOR 493 Independent Study in Forest Management 1-6
FOR 494 Independent Study in Forest Management 1-6
FOR 501 Dendrology 3
FOR 502 Forest Measurements 1
FOR 503 Tree Physiology 1
FOR 504 The Practice of Silviculture 3
FOR 505 Forest Management 4
FOR 506 Silviculture Laboratory 1
FOR 507 Silviculture Mini Course 1
FOR 508 Hardwood Management 3
FOR 509 Forest Resource Policy 1
FOR 510 Introduction to GPS 1
FOR 513 Silviculture for Intensively Managed Plantations 3
FOR 514 Woodland Stewardship 3
FOR 519 Forest Economics 3
FOR 520 Watershed and Wetlands Hydrology 4
FOR 522 Consulting Forestry 3
FOR 531 Wildland Fire Science 3
FOR 532 Wildland Firefighter 3
FOR 534 Forest Operations and Analysis 3
FOR 540 Advanced Dendrology 3
FOR 561 Forest Communities of the Southeastern Coastal Plain 1
FOR 562 Forest Communities of the Southern Appalachians 1
FOR 565 Plant Community Ecology 4
FOR 574 Forest Mensuration and Modeling 3
FOR 575 Advanced Terrestrial Ecosystem Ecology 3
FOR 583 Tropical Forestry 3
FOR 595 Special Topics 1-6
FS 462 Postharvest Physiology 3
FS 562 Postharvest Physiology 3
FW 221 Conservation of Natural Resources 3
FW 404 Wildlife Habitat Management 3
GIS 512 Introduction to Environmental Remote Sensing 3
HS 131 Fruit & Vegetable Production 3
HS 144 Weeds & Diseases of Ornamentals 3
Agricultural Education (BS): Agricultural Business Concentration

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<td>The World of Horticulture: Principles and Practices</td>
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<td>Home Plant Identification</td>
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<td>Home Plant Propagation</td>
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<td>Home Landscape Maintenance</td>
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<td>Home Landscape Design: Creating Garden Spaces</td>
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<td>Landscape Graphic Communication</td>
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<td>Hands-On-Horticulture</td>
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<td>Gardening with Herbaceous Perennials</td>
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<td>Landscape Grading and Drainage</td>
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<td>Residential Landscaping</td>
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<td>Digital Media Graphic for Landscape Designers</td>
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<td>Public Garden Administration</td>
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<td>Floriculture Crop Production</td>
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<td>HS 476</td>
<td>Crop Physiology and Production in Controlled Environments</td>
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<td>Experimental Courses in Horticultural Science</td>
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<td>Plant Disease: Methods &amp; Diagnosis</td>
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<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<td>Public Garden Administration</td>
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<td>Plant Breeding Methods</td>
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<td>HS 550</td>
<td>Environmental Nursery Production</td>
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<td>HS 551</td>
<td>Plant Nutrition</td>
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<td>HS 562</td>
<td>Postharvest Physiology</td>
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<td>HS 576</td>
<td>Crop Physiology and Production in Controlled Environments</td>
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<td>HS 583</td>
<td>Advanced Floral Crop Production and Handling</td>
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<td>HS 590</td>
<td>Special Problems in Horticultural Science</td>
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<td>NR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>PP 144</td>
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<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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**ARE/BUS/EC Electives**

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<td>ARE 260</td>
<td>Marketing and Risk Management in the Pork Industry</td>
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<td>ARE 270</td>
<td>Principles of Agribusiness Entrepreneurship</td>
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<td>ARE 295</td>
<td>Special Topics in Agricultural &amp; Resource Economics (200 Level)</td>
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<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
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<td>ARE 303</td>
<td>Farm Management</td>
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<td>ARE 306</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 332</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>ARE 345</td>
<td>Global Agribusiness Management</td>
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<td>ARE 370</td>
<td>Agribusiness New Venture Development</td>
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BUS 468  Marketing Strategy  3
BUS 469  Digital Marketing Practicum  3
BUS 470  Operations Modeling and Analysis  3
BUS 472  Operations Planning and Control Systems  3
BUS 473  Supply Chain Strategy  3
BUS 474  Logistics Management  3
BUS 475  Purchasing and Supply Management  3
BUS 476  Decision Modeling and Analysis  3
BUS 479  Supply Chain Management Undergraduate Practicum  3
BUS 495  Special Topics in Business Management  1-6
BUS 498  Independent Study in Business Management  1-6
BUS 501  Strategic Management Foundations  3
BUS 554  Project Management  3
BUS 571  High Growth Entrepreneurship  3
BUS 585  Market Research In Textiles  3
BUS 590  Special Topics In Business Management  1-6
EC 202  Principles of Macroeconomics  3
EC 301  Intermediate Microeconomics  3
EC 302  Intermediate Macroeconomics  3
EC 305  A Closer Look at Capitalism  3
EC 336  Introduction to Resource and Environmental Economics  3
EC 348  Introduction to International Economics  3
EC 351  Econometrics I  3
EC 404  Money, Financial Markets, and the Economy  3
EC 410  Public Finance  3
EC 413  Industrial Organization  3
EC 431  Labor Economics  3
EC 437  Health Economics  3
EC 449  International Finance  3
EC 451  Econometrics II  3
EC 468  Game Theory  3
EC 474  Economics of Financial Institutions and Markets  3
EC 480  Introduction to Economic Research  3
EC 490  Research Seminar in Economics  3
EC 495  Special Topics in Economics  1-6
EC 498  Independent Study in Economics  1-6
ECG 512  Law and Economics  3
FTM 482  Advanced Textile Brand Management and Marketing  3
M 100  Personal and Professional Identity Development  1
MBA 577  Technology Entrepreneurship and Commercialization II  3
MIE 201  Introduction to Business Processes  3
MIE 305  Legal and Regulatory Environment  3
MIE 310  Introduction to Entrepreneurship  3
MIE 330  Human Resource Management  3
MIE 335  Organizational Behavior  3
MIE 412  Finance and Accounting for Entrepreneurs  3
MIE 413  New Venture Planning  3
MIE 419  Entrepreneurship Practicum  3
MIE 432  Labor and Employee Relations  3
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<td>Leadership and Management</td>
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<td>MIE 436</td>
<td>Training and Development</td>
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<td>MIE 438</td>
<td>Staffing</td>
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<td>MIE 480</td>
<td>Business Policy and Strategy</td>
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<td>MSE 577</td>
<td>Technology Entrepreneurship and Commercialization II</td>
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<td>PRT 406</td>
<td>Sports Law</td>
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<td>ST 350</td>
<td>Economics and Business Statistics</td>
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<td>TTM 585</td>
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**Semester Sequence**

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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¹ A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.
² Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.
Agricultural Education (BS): Agricultural Engineering Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Agricultural Engineering Technology concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State.
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry.

Teacher Licensure


For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Plan Requirements

Agricultural Education (BS): Agricultural Engineering Technology Concentration: 120 Total Units

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<td>Administration and Supervision of Student Organizations</td>
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GEP Courses

Total hours of free electives vary in order to allow the minimum hours required for the degree to equal 120 credit hrs.
Plant Science Electives

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<td>CS 210</td>
<td>Lawns and Sports Turf</td>
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<tr>
<td>CS 213</td>
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<td>Southern Row Crop Production - Cotton, Peanuts, and Tobacco</td>
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<td>CS 218</td>
<td>Southern Row Crop Production - Corn, Small Grains and Soybeans</td>
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<td>Seeds, Biotechnology and Societies</td>
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<td>Grassland Management for Natural Resources Conservation</td>
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<td>Turf Cultural Systems</td>
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<td>Live Poultry and Poultry Product Evaluation, Grading, and Inspection</td>
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<td>Production and Management of Game Birds in Confinement</td>
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<td>PP 315</td>
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<td>Role of Soils in Environmental Management</td>
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<td>SSC 570</td>
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<td>Poisons, People and the Environment</td>
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<td>TOX 415</td>
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**Course**

**First Year**

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| Hours | 17 |

**Spring Semester**

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<td>ANS 150</td>
<td>Introduction to Animal Science</td>
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<td>&amp; ANS 151</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>&amp; CH 102</td>
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| Hours | 15 |

**Second Year**

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<td>BAET 201</td>
<td>Shop Processes and Management</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>GEP Humanities (p. 1423)</td>
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| Hours | 16 |

**Spring Semester**

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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>Fundamentals of Economics</td>
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<td>Plant Science Elective</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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| Hours | 15 |

**Third Year**

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<td>BAE 325</td>
<td>Introductory Geomatics</td>
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<td>BAET 343</td>
<td>Agricultural Electrification</td>
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<td>EDP 304</td>
<td>Educational Psychology</td>
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<td>GEP Humanities (p. 1423)</td>
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| Hours | 16 |

**Semester Sequence**

This is a sample.
Agricultural Education (BS): Agronomy Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)!  

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Agronomy concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State.
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry.

1 A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.
2 Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn  
Department Head  
Phone: 919-515-9142  
Email: pcduenn@ncsu.edu

Plan Requirements

Agricultural Education (BS): Agronomy Concentration: 120 Total Units

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<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Writing and Speaking

| COM 110 | Public Speaking | 3     |

Sciences

| BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4     |
| BIO 183 | Introductory Biology: Cellular and Molecular Biology     | 4     |
| CH 101  | Chemistry - A Molecular Science                           | 4     |
| CH 102  | General Chemistry Laboratory                             | 4     |

Agricultural Education

| AEE 101 | Introduction to Career and Technical Education ¹       | 1     |
| AEE 206 | Introduction to Teaching Agriculture ¹                 | 3     |
| AEE 226 | Computer Applications and Information Technology in Agricultural & Extension Ed ¹ | 3     |
| AEE 303 | Administration and Supervision of Student Organizations ¹ | 3     |
| AEE 322 | Experiential Learning in Agriculture ¹                 | 3     |
| AEE 326 | Teaching Diverse Learners in AED ¹                     | 3     |
| AEE 327 | Conducting Summer Programs in Agricultural Education   | 1     |
| AEE 424 | Planning Agricultural Educational Programs ¹            | 3     |
| AEE 426 | Methods of Teaching Agriculture ¹                       | 3     |
| AEE 427 | Student Teaching in Agriculture ¹                       | 8     |
| AEE 491 | Seminar in Agricultural Education                      | 1     |

1 A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.
EDP 304 Educational Psychology 1 3
ELP 344 School and Society 1 3
ED 311 Classroom Assessment Principles and Practices and Classroom Assessment Principles and Practices Professional Learning Lab 1 3 & ED 312 Teaching Content Courses
BAET 201 Shop Processes and Management 3 or TDE 110 Materials & Processes Technology 3
ANS 150 Introduction to Animal Science 4 & ANS 151 and Introduction to Animal Science Lab 3 Agriculture Elective (p. 108) 3
Select one of the following Economics Electives: 3
ARE 201 Introduction to Agricultural & Resource Economics 3
EC 201 Principles of Microeconomics 3
EC 205 Fundamentals of Economics 3
Agronomy Concentration
CS 213 Crop Science 3
CS 230 Introduction to Agroecology 3
CS 411 Crop Ecology 3
SSC 200 Soil Science 4 & SSC 201 and Soil Science Laboratory 3
SSC 341 Soil Fertility and Nutrient Management 3
SSC 342 Soil and Plant Nutrient Analysis 1 CS *** or SSC *** Elective (p. 112) 3
GEP Courses In The Major
ENG 101 Academic Writing and Research 1 4
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Mathematical Sciences (p. 1428) 6
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement) 3
GEP Global Knowledge (p. 1419) (verify requirement) 3
Foreign Language Proficiency (p. 1417) (verify requirement) 3
Free Electives 4
Total Hours 120

1 A grade of C- or higher is required.
2 Courses graded “S” for Satisfactory are allowed.

Agriculture Electives

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<td>Small Business Accounting</td>
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<td>ARE 260</td>
<td>Marketing and Risk Management in the Pork Industry</td>
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<td>ARE 270</td>
<td>Principles of Agribusiness Entrepreneurship</td>
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<td>ARE 295</td>
<td>Special Topics in Agricultural &amp; Resource Economics (200 Level)</td>
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<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
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<td>ARE 303</td>
<td>Farm Management</td>
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ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
ARE 323 Agribusiness Finance 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 345 Global Agribusiness Management 3
ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 3
ARE 492 External Learning Experience 1-6
ARE 493 Special Problems/Research Exploration 1-6
ARE 494 Agribusiness Study Abroad 1-6
ARE 495 Special Topics in Agricultural and Resource Economics 1-6
ARE 590 Special Topics in ARE 1-99
EC 301 Intermediate Microeconomics 3
EC 336 Introduction to Resource and Environmental Economics 3

Group C - Applied Sci & Tech

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<td>Introduction to Teaching Agriculture</td>
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<td>AEE 208</td>
<td>Agricultural Biotechnology: Issues and Implications</td>
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<td>AEE 230</td>
<td>Introduction to Cooperative Extension</td>
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<td>Administration and Supervision of Student Organizations</td>
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<td>Communication Methods and Media</td>
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<td>Experiential Learning in Agriculture</td>
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<td>Leadership Development in Agriculture and Life Sciences</td>
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<td>Planning and Delivering Non-Formal Education</td>
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<td>Leadership and Management of Volunteers in Agricultural and Extension Education</td>
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<td>Introduction to Equine Science</td>
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<td>Techniques of Animal Care</td>
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HS 302  Gardening with Herbaceous Perennials  3
HS 303  Ornamental Plant Identification I  3
HS 304  Ornamental Plant Identification II  3
HS 357  Landscape Grading and Drainage  4
HS 400  Residential Landscaping  6
HS 411  Nursery Management  3
HS 416  Planting Design  4
HS 421  Temperate-Zone Tree Fruits: Physiology and Culture  3
HS 422  Small Fruit Production  3
HS 423  Viticulture  3
HS 431  Vegetable Production  4
HS 440  Greenhouse Management  3
HS 442  Floriculture Crop Production  3
HS 462  Postharvest Physiology  3
HS 471  Landscape Ecosystem Management  4
HS 516  Planting Design  4
HS 521  Temperate-Zone Tree Fruits: Physiology and Culture  3
HS 523  Viticulture  3
HS 562  Postharvest Physiology  3
IDS 303  Humans and the Environment  3
NR 300  Natural Resource Measurements  4
NR 303  Humans and the Environment  3
NR 400  Natural Resource Management  4
NR 420  Watershed and Wetlands Hydrology  4
NR 421  Wetland Assessment, Delineation and Regulation  3
NR 460  Renewable Natural Resource Management and Policy  3
NR 484  Environmental Impact Assessment  4
NR 500  Natural Resource Management  4
NR 520  Watershed and Wetlands Hydrology  4
NR 521  Wetland Assessment, Delineation and Regulation  3
NR 560  Renewable Natural Resource Management and Policy  3
NTR 420  Applied Nutrition Education  3
NTR 425  Feed Manufacturing Technology  3
NTR 525  Feed Manufacturing Technology  3
PO 201  Poultry Science and Production  3
PO 201A  Poultry Science and Production  3
PO 202  Poultry Science and Production Laboratory  1
PO 202A  Poultry Science and Production Laboratory  1
PO 290  Poultry Seminar  1
PO 322  Muscle Foods and Eggs  3
PO 340  Live Poultry and Poultry Product Evaluation, Grading, and Inspection  3
PO 410  Production and Management of Game Birds in Confinement  3
PO 411  Agrosecurity  3
PO 421  Commercial Egg Production  3
PO 425  Feed Manufacturing Technology  3
PO 433  Poultry Processing and Products  3
PO 525  Feed Manufacturing Technology  3
PO 533  Poultry Processing and Products  3
PP 315  Principles of Plant Pathology  4
PP 318  Forest Pathology  3
PP 470  Advanced Turfgrass Pest Management  2
SSC 185  Land and Life  3
SSC 341  Soil Fertility and Nutrient Management  3
SSC 342  Soil and Plant Nutrient Analysis  1
SSC 421  Role of Soils in Environmental Management  3
SSC 440  Geographic Information Systems (GIS) in Soil Science and Agriculture  3
SSC 442  Soil and Environmental Biogeochemistry  3
SSC 452  Soil Classification  4
SSC 461  Soil Physical Properties and Plant Growth  3
SSC 462  Soil-Crop Management Systems  3
SSC 470  Wetland Soils  3
SSC 540  Geographic Information Systems (GIS) in Soil Science and Agriculture  3
SSC 570  Wetland Soils  3
TOX 201  Poisons, People and the Environment  3
TOX 401  Principles of Toxicology  4
TOX 415  Environmental Toxicology and Chemistry  4
TOX 501  Principles of Toxicology  4

**CS *** or SSC *** Electives**

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### Semester Sequence

This is a sample.

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Shop Processes and Management</td>
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Agricultural Education (BS): Animal Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Animal Science concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Plan Requirements

Agricultural Education (BS): Animal Science Concentration: 120 Total Units

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<td>PB 321</td>
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Total Hours: 17

Third Year
Fall Semester

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Spring Semester

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<td>EDP 344</td>
<td>School and Society</td>
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Total Hours: 3

Agriculture Electives

Total Hours: 15

Fourth Year
Fall Semester

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<td>Methods of Teaching Agriculture</td>
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Total Hours: 14

Spring Semester

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Total Hours: 12

Total Hours: 120

1 A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.

2 Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.

3 Total hours of free electives vary in order to allow the minimum hours required for the degree to equal 120 credit hrs.
BIO 183 Introductory Biology: Cellular and Molecular Biology 4
CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1

Agricultural Education
AEE 101 Introduction to Career and Technical Education 1 1
AEE 206 Introduction to Teaching Agriculture 1 3
AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 1 3
AEE 303 Administration and Supervision of Student Organizations 1 3
AEE 322 Experiential Learning in Agriculture 1 3
AEE 326 Teaching Diverse Learners in AED 1 3
AEE 327 Conducting Summer Programs in Agricultural Education 1
AEE 424 Planning Agricultural Educational Programs 1 3
AEE 426 Methods of Teaching Agriculture 1 3
AEE 427 Student Teaching in Agriculture 1 8
AEE 491 Seminar in Agricultural Education 1

Other Professional Education
EDP 304 Educational Psychology 1 3
ELP 344 School and Society 1 3
ED 311 Classroom Assessment Principles and Practices 1 2
ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1

Teaching Content Courses
BAET 201 Shop Processes and Management 3
or TDE 110 Materials & Processes Technology
Plant Science Elective (p. 115) 3
SSC 200 Soil Science 4
& SSC 201 and Soil Science Laboratory

Select one of the following Economics Electives: 3
ARE 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics

Animal Science Concentration
ANS 150 Introduction to Animal Science 3
ANS 151 Introduction to Animal Science Lab 1
Select one of the following Evaluation of Farm Animals courses: 2
ANS 205 Physiology of Domestic Animals
ANS 303 Principles of Equine Evaluation
ANS 304 Dairy Cattle Evaluation
ANS 309 Livestock Evaluation
ANS 225 Principles of Animal Nutrition 3
or ANS 230 Animal Nutrition
ANS 215 Agricultural Genetics 3
or GN 301 Genetics in Human Affairs
Animal Science Elective (p. 117) 2
ANS Restricted Elective (p. 118) 6

GEP Courses In The Major
ENG 101 Academic Writing and Research 1 4
GEP Humanities (p. 1423) 6

GEP Mathematical Sciences (p. 1428) 6
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)
Free Electives 4

Total Hours 120

1 A grade of C- or higher is required.
2 Courses graded "S" for Satisfactory are allowed.

Plant Science Electives

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<td>CS 210</td>
<td>Lawns and Sports Turf</td>
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**Semester Sequence**

This is a sample.

- **Course**
- **Title**
- **Hours**

### First Year

#### Fall Semester

- AEE 101 | Introduction to Career and Technical Education ¹ | 1
- AEE 103 | Fundamentals of Agricultural and Extension Education ² | 1
- BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
- COM 110 | Public Speaking | 3
- ENG 101 | Academic Writing and Research | 4
- GEP Mathematical Sciences (p. 1428) | 3
- GEP Health and Exercise Studies (p. 1422) | 1

**Hours Total: 17**

#### Spring Semester

- AEE 226 | Computer Applications and Information Technology in Agricultural & Extension Ed | 3
- ANS 150 | Introduction to Animal Science | 3
- ANS 151 | Introduction to Animal Science Lab | 1
- BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4
- GEP Mathematical Sciences (p. 1428) | 3
Agricultural Education (BS): Horticultural Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Horticultural Science concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Plan Requirements

Agricultural Education (BS): Horticultural Science Concentration:
120 Total Units
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<td>AEE 303</td>
<td>Administration and Supervision of Student Organizations</td>
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<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
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<td>AEE 326</td>
<td>Teaching Diverse Learners in AED</td>
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<td>Conducting Summer Programs in Agricultural Education</td>
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<td>Planning Agricultural Educational Programs</td>
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<td>Methods of Teaching Agriculture</td>
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<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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A grade of C- or higher is required.

**GEP Courses In The Major**

- **ENG 101** Academic Writing and Research
- **GEP Humanities (p. 1423)**
- **GEP Mathematical Sciences (p. 1428)**
- **GEP Health and Exercise Studies (p. 1422)**
- **GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)**
- **GEP Interdisciplinary Perspectives (p. 1426)**
- **GEP U.S. Diversity (p. 1431) (verify requirement)**
- **GEP Global Knowledge (p. 1419) (verify requirement)**
- **Foreign Language Proficiency (p. 1417) (verify requirement)**

**Horticulture Science Electives**

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<td>Plant Disease: Methods &amp; Diagnosis</td>
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<td>Home Plant Propagation</td>
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<td>HS 410</td>
<td>Community Food Systems</td>
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<td>HS 411</td>
<td>Nursery Management</td>
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<tr>
<td>HS 416</td>
<td>Planting Design</td>
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<td>HS 418</td>
<td>Digital Media Graphic for Landscape Designers</td>
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<tr>
<td>HS 420</td>
<td>Green Infrastructure</td>
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<tr>
<td>HS 421</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<tr>
<td>HS 422</td>
<td>Small Fruit Production</td>
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<td>HS 423</td>
<td>Viticulture</td>
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<td>HS 428</td>
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<td>HS 431</td>
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<td>HS 433</td>
<td>Public Garden Administration</td>
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<td>HS 440</td>
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<td>HS 442</td>
<td>Floriculture Crop Production</td>
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<td>HS 451</td>
<td>Plant Nutrition</td>
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<td>HS 462</td>
<td>Postharvest Physiology</td>
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<td>HS 471</td>
<td>Landscape Ecosystem Management</td>
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<td>HS 475</td>
<td>Horticulture Entrepreneurship</td>
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<td>HS 476</td>
<td>Crop Physiology and Production in Controlled Environments</td>
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<td>HS 480</td>
<td>Sustainable Food Production (capstone)</td>
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<td>Sustainable Agriculture Entrepreneurship Study</td>
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<td>HS 492</td>
<td>Horticulture Internship</td>
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<td>HS 493</td>
<td>Research Experience in Horticultural Science</td>
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<td>HS 494</td>
<td>Teaching Experience in Horticultural Science</td>
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<td>HS 495</td>
<td>Experimental Courses in Horticultural Science</td>
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<tr>
<td>HS 502</td>
<td>Plant Disease: Methods &amp; Diagnosis</td>
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<td>HS 516</td>
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<td>HS 520</td>
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<td>HS 521</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<td>HS 523</td>
<td>Viticulture</td>
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<td>HS 532</td>
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<td>HS 533</td>
<td>Public Garden Administration</td>
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<td>HS 541</td>
<td>Plant Breeding Methods</td>
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<td>HS 550</td>
<td>Environmental Nursery Production</td>
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<td>HS 551</td>
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<td>HS 562</td>
<td>Postharvest Physiology</td>
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<td>HS 576</td>
<td>Crop Physiology and Production in Controlled Environments</td>
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<td>HS 583</td>
<td>Advanced Floral Crop Production and Handling</td>
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<td>Special Problems in Horticultural Science</td>
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<td>PP 144</td>
<td>Weeds &amp; Diseases of Ornamentals</td>
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<td>Plant Disease: Methods &amp; Diagnosis</td>
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<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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## Semester Sequence

This is a sample.

### First Year

#### Fall Semester

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>AEE 101</td>
<td>Introduction to Career and Technical Education</td>
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<td>AEE 103</td>
<td>Fundamentals of Agricultural and Extension Education</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
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<td>COM 110</td>
<td>Public Speaking</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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#### Spring Semester

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<td>Computer Applications and Information Technology in Agricultural &amp; Extension Ed</td>
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<td>ANS 150</td>
<td>Introduction to Animal Science</td>
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<td>ANS 151</td>
<td>Introduction to Animal Science Lab</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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### Second Year

#### Fall Semester

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<tbody>
<tr>
<td>AEE 206</td>
<td>Introduction to Teaching Agriculture</td>
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<tr>
<td>HS 201</td>
<td>The World of Horticulture</td>
<td>3</td>
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<tr>
<td>BAET 201 or TDE 110</td>
<td>Shop Processes and Management or Materials &amp; Processes Technology</td>
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<tr>
<td>Economics Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
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#### Spring Semester

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<thead>
<tr>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>CS 211</td>
<td>Plant Genetics</td>
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<tr>
<td>HS 215</td>
<td>Agricultural Genetics</td>
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<tr>
<td>ANS 215</td>
<td>Agricultural Genetics</td>
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<tr>
<td>Horticultural Science Elective</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)</td>
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### Third Year

#### Fall Semester

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
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<tr>
<td>HS 301</td>
<td>Plant Propagation</td>
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</tbody>
</table>
Agricultural Education (BS): Natural Resources Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The Agricultural Education major within the Department of Agricultural and Human Sciences prepares graduates to teach agriculture and be FFA advisors in public and private schools.

The Natural Resources concentration is one of seven concentrations offered for the Bachelor of Science in Agricultural Education.

- Students interested in Agricultural Education may be eligible to apply for the North Carolina Teaching Fellows Program at NC State
- Many alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

For more information about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-education-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

Plan Requirements

Agricultural Education (BS), Natural Resources Concentration: 126 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>EDP 304</td>
<td>Educational Psychology</td>
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<tr>
<td>SSC 200</td>
<td>Soil Science</td>
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<tr>
<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>AEE 303</td>
<td>Administration and Supervision of Student Organizations</td>
<td>3</td>
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<tr>
<td>AEE 326</td>
<td>Teaching Diverse Learners in AED</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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<tr>
<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab</td>
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<td>ELP School and Society</td>
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<td>Horticulture Elective</td>
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<tr>
<td>AEE 327</td>
<td>Conducting Summer Programs in Agricultural Education</td>
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<td>AEE 426</td>
<td>Methods of Teaching Agriculture</td>
<td>3</td>
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<tr>
<td>HS 411</td>
<td>Nursery Management</td>
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<tr>
<td>or HS 440</td>
<td>Greenhouse Management</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>Free Electives</td>
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<td>AEE 424</td>
<td>Planning Agricultural Educational Programs</td>
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<td>AEE 427</td>
<td>Student Teaching in Agriculture</td>
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<td><strong>Total Hours</strong></td>
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</table>

1 A minimum grade of C is required for teacher licensure.
2 Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.
3 Total hours of free electives vary in order to allow the minimum hours required for the degree to equal 120 credit hrs.

Writing and Speaking

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<td>COM 110</td>
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Sciences

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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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Agricultural Education

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<td>AEE 206</td>
<td>Introduction to Teaching Agriculture</td>
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<td>AEE 226</td>
<td>Computer Applications and Information Technology in Agricultural &amp; Extension Ed</td>
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<td>Administration and Supervision of Student Organizations</td>
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<tr>
<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
<td>3</td>
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<td>Teaching Diverse Learners in AED</td>
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### Agriculture Electives

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<td>Small Business Accounting</td>
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<td>ARE 260</td>
<td>Marketing and Risk Management in the Pork Industry</td>
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<td>ARE 270</td>
<td>Principles of Agribusiness Entrepreneurship</td>
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<tr>
<td>ARE 295</td>
<td>Special Topics in Agricultural &amp; Resource Economics (200 Level)</td>
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<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
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<tr>
<td>ARE 303</td>
<td>Farm Management</td>
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<td>ARE 304</td>
<td>Agribusiness Management</td>
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<td>ARE 306</td>
<td>Agricultural Law</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 311</td>
<td>Agricultural Markets</td>
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<td>ARE 312</td>
<td>Agribusiness Marketing</td>
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<td>ARE 321</td>
<td>Agricultural Financial Management</td>
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<td>ARE 323</td>
<td>Agribusiness Finance</td>
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<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>ARE 345</td>
<td>Global Agribusiness Management</td>
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<td>ARE 370</td>
<td>Agribusiness New Venture Development</td>
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<td>ARE 404</td>
<td>Advanced Agribusiness Management</td>
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<td>ARE 412</td>
<td>Advanced Agribusiness Marketing</td>
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<td>ARE 413</td>
<td>Applied Agribusiness Marketing</td>
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<td>ARE 415</td>
<td>Introduction to Commodity Futures Markets</td>
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<td>ARE 420</td>
<td>Taxation in Agriculture, Production, and Agribusiness</td>
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<td>ARE 425</td>
<td>Contracts and Organizations in Agriculture</td>
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<td>ARE 433</td>
<td>U.S. Agricultural Policy</td>
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<td>ARE 444</td>
<td>Ethics in Agribusiness</td>
<td>3</td>
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<td>ARE 448</td>
<td>International Agricultural Trade</td>
<td>3</td>
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<td>ARE 455</td>
<td>Agribusiness Analytics</td>
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<td>ARE 470</td>
<td>Agribusiness Entrepreneurship Clinical Skills Development</td>
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<td>ARE 475</td>
<td>Food Policy</td>
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<td>ARE 490</td>
<td>Career Seminar in Agriculture &amp; Resource Economics</td>
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<td>ARE 492</td>
<td>External Learning Experience</td>
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<td>ARE 493</td>
<td>Special Problems/Research Exploration</td>
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<td>Agribusiness Study Abroad</td>
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### Group C - Applied Sci & Tech

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<tr>
<td>AEE 206</td>
<td>Introduction to Teaching Agriculture</td>
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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.
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<td>AEE 230</td>
<td>Introduction to Cooperative Extension</td>
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<td>AEE 303</td>
<td>Administration and Supervision of Student Organizations</td>
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<td>AEE 311</td>
<td>Communication Methods and Media</td>
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<tr>
<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
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<td>AEE 323</td>
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**Semester Sequence**

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**Second Year**

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<td>CS 230</td>
<td>Introduction to Agroecology</td>
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¹ These courses are offered online and require students to purchase textbooks and materials separately.
### Plan Requirements

**Agricultural Education (BS): Poultry Science Concentration: 120 Total Unit**

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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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**Writing and Speaking**

---

1. A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.

2. Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.

3. Total hours of free electives vary in order to allow the minimum hours required for the degree to equal 120 credit hrs.

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**Dr. Carolyn Dunn**

Department Head

Phone: 919-515-9142

Email: pcdunn@ncsu.edu
Agricultural Education

AEE 101 Introduction to Career and Technical Education 1 1
AEE 206 Introduction to Teaching Agriculture 1 3
AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 1 3
AEE 303 Administration and Supervision of Student Organizations 1 3
AEE 322 Experiential Learning in Agriculture 1 3
AEE 326 Teaching Diverse Learners in AED 1 3
AEE 327 Conducting Summer Programs in Agricultural Education 1
AEE 424 Planning Agricultural Educational Programs 1 3
AEE 426 Methods of Teaching Agriculture 1 3
AEE 427 Student Teaching in Agriculture 1 8
AEE 491 Seminar in Agricultural Education 1

Other Professional Education

ELP 344 School and Society 1 3
EDP 304 Educational Psychology 1 3
ED 311 Classroom Assessment Principles and Practices 1 2
ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1

Teaching Content Courses

BAET 201 Shop Processes and Management 3
or TDE 110 Materials & Processes Technology Plant Science Elective (p. 128) 3

SCE 200 Soil Science 4
& SSC 201 and Soil Science Laboratory

ANS 150 Introduction to Animal Science 4
& ANS 151 and Introduction to Animal Science Lab

Select one of the following Economics Electives: 3

AEC 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics

Poultry Science Concentration

PO 201 Poultry Science and Production 4
& PO 202 and Poultry Science and Production Laboratory
PO 290 Poultry Seminar 1
PO 340 Live Poultry and Poultry Product Evaluation, Grading, and Inspection 3
PO 421 Commercial Poultry Production 3
PO 424 Poultry Meat Production 3
PO 435 Poultry Incubation & Breeding 4
Poultry Science Elective (p. 130) 3

GEP Courses In The Major

ENG 101 Academic Writing and Research 1 4
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<td>Green Infrastructure</td>
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<td>HS 421</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<td>Small Fruit Production</td>
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<td>Greenhouse Management</td>
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<td>Floriculture Crop Production</td>
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<td>Plant Disease: Methods &amp; Diagnosis</td>
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### Poultry Science Electives

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<td>Production and Management of Game Birds in Confinement</td>
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### Semester Sequence

This is a sample.

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<td>ANS 525</td>
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<td>FM 425</td>
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<tr>
<td>FM 525</td>
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<td>NTR 425</td>
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<tr>
<td>PO 406</td>
<td>Physiological Aspects of Poultry Management</td>
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</tr>
<tr>
<td>PO 410</td>
<td>Production and Management of Game Birds in Confinement</td>
<td>3</td>
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<tr>
<td>PO 411</td>
<td>Agrosecurity</td>
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<td>PO 425</td>
<td>Feed Manufacturing Technology</td>
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<td>PO 506</td>
<td>Physiological Aspects of Poultry Management</td>
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<td>Feed Manufacturing Technology</td>
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GEP Health and Exercise Studies (p. 1422) 1

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**Second Year**

**Fall Semester**

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<td>AEE 206</td>
<td>Introduction to Teaching Agriculture</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>BAET 201</td>
<td>Shop Processes and Management or Materials &amp; Processes Technology</td>
<td>3</td>
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<tr>
<td>Economics Elective</td>
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<tr>
<td>PO 290</td>
<td>Poultry Seminar</td>
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<tr>
<td>PO 340</td>
<td>Live Poultry and Poultry Product Evaluation, Grading, and Inspection</td>
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**Spring Semester**

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<tbody>
<tr>
<td>AEE 103</td>
<td>Fundamentals of Agricultural and Extension Education</td>
<td>3</td>
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<tr>
<td>PO 424</td>
<td>Poultry Meat Production</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>3</td>
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<tr>
<td>Plant Science Elective</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Third Year**

**Fall Semester**

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<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
<td>3</td>
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<tr>
<td>EDP 304</td>
<td>Educational Psychology</td>
<td>3</td>
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<td>PO 421</td>
<td>Commercial Egg Production</td>
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<tr>
<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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**Spring Semester**

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<tbody>
<tr>
<td>AEE 303</td>
<td>Administration and Supervision of Student Organizations</td>
<td>3</td>
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<tr>
<td>AEE 326</td>
<td>Teaching Diverse Learners in AED</td>
<td>3</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices 1</td>
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<tr>
<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab 1</td>
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<tr>
<td>ELP 344</td>
<td>School and Society 1</td>
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<td>PO 435</td>
<td>Poultry Incubation &amp; Breeding</td>
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**Fourth Year**

**Fall Semester**

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<tr>
<td>AEE 327</td>
<td>Conducting Summer Programs in Agricultural Education</td>
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<tr>
<td>AEE 426</td>
<td>Methods of Teaching Agriculture</td>
<td>3</td>
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<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>2</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)</td>
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**Spring Semester**

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<tr>
<td>AEE 424</td>
<td>Planning Agricultural Educational Programs</td>
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<tr>
<td>AEE 427</td>
<td>Student Teaching in Agriculture</td>
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<tr>
<td>AEE 491</td>
<td>Seminar in Agricultural Education</td>
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<table>
<thead>
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<tr>
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</table>

1. A minimum grade of C- is required for graduation. A minimum grade of C is required for teacher licensure.

2. Incoming freshmen complete AEE 103 Fundamentals of Agricultural and Extension Education. Transfer students may complete ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences.

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**Agricultural Leadership (Certificate)**

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/]

The Agricultural Leadership Certificate is a program designed for individuals interested in advancing both their personal and organizational leadership skills. The Certificate in Agricultural Leadership will provide participants with the opportunity to develop leadership skills in a series of in-depth, semester-length courses that are programmatic in nature. Coursework includes topics covering personal leadership, team leadership, organizational leadership as well as professional presentations. The certificate program seeks to motivate present and future leaders to develop those leadership skills needed by colleges, universities and the agricultural industry.

**Program Coordinator**

Dr. Jackie Bruce – Associate Professor
Department of Agricultural and Extension Education
Box 7607, 213 Ricks Hall
North Carolina State University
Raleigh, NC 27695-7607
919-515-8801
jackie_bruce@ncsu.edu

**Admissions Requirements**

Students enrolled at North Carolina State University who are in good academic standing are eligible for admission to this certificate program. In addition, non-degree students in good academic standing may enroll in the program. Students who complete the minor in Leadership in Agriculture and Life Sciences are not eligible for the Certificate in Agricultural Leadership.

**Plan of Study**

Contact the Program Coordinator.

**Registration Information**

Contact the Program Coordinator.

**Academic Structure**

Term Effective: 1/2009
Plan Requirements

The University Certificate in Leadership in Agriculture requires a minimum of 12 credit hours and is offered both on-campus and online via DELTA Distance Education. The minimum grade required for courses counting toward the certificate program is a 'C-'.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
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</table>

**Elective Courses**

Select three of the following:

- AEE 311 Communication Methods and Media
- AEE 350 Personal Leadership Development in Agriculture and Life Sciences
- AEE 360 Developing Team Leadership in Agriculture and Life Sciences
- AEE 435 Professional Presentations in Agricultural Organizations
- AEE 460 Organizational Leadership Development in Agriculture and Life Sciences

Total Hours: 12

**Agricultural Science (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

In the agricultural industry, a growing need exists for professionals with extensive knowledge and experience in the agricultural sciences. Students pursuing a Bachelor of Science (B.S.) in Agricultural Science study the dynamic aspects of the food and fiber industry and specialize in two agricultural areas.

Students who major in Agricultural Science will:

- have opportunities to develop skills necessary to work independently and as part of a team, communicate effectively, solve problems, and understand basic business concepts
- select two of the following specialty areas to study: Animal Science, Agricultural Business Management, Agricultural Environmental Technology, Crop Science, Horticultural Science, Poultry Science, Soil Science, and Feed Mill Management.
- graduate and succeed as teachers, extension agents or leaders in the agricultural industry

For more information more about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#agricultural-science-major).

Dr. Carolyn Dunn
Department Head
Phone: 919-515-9142
Email: pcdunn@ncsu.edu

**Plan Requirements**

**Agricultural Science (BS): 120 Total Units**

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<tbody>
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**Communication and Social Sciences**

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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
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<td>or COM 112</td>
<td>Interpersonal Communication</td>
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**Mathematical and Natural Sciences**

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<tr>
<td>MA 107</td>
<td>Precalculus I</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>or MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>General Chemistry Laboratory</td>
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<tr>
<td>Physical Science Elective (p. 133)</td>
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</table>

**Professional Content Courses**

Select one of the following Economics Electives:

- ARE 201 Introduction to Agricultural & Resource Economics
- ARE 201A Introduction to Agricultural & Resource Economics
- EC 201 Principles of Microeconomics
- EC 205 Fundamentals of Economics

Select one of the following Writing Electives:

- AEE 311 Communication Methods and Media
- ENG 332 Communication for Science and Research
- ENG 333 Communication for Business and Management

Select one of the following sequences:

- ANS 150 Introduction to Animal Science & ANS 151 and Introduction to Animal Science Lab
- PO 201 Poultry Science and Production & PO 202 and Poultry Science and Production Laboratory
- CS 213 Crop Science or HS 201 The World of Horticulture: Principles and Practices

Select one of the following Introductory Agricultural Electives:

- BAET 201 Shop Processes and Management
- ES 100 Introduction to Environmental Sciences
- FS 201 Introduction to Food Science
- SSC 200 Soil Science & SSC 201 and Soil Science Laboratory

**Agricultural Extension Education**
**Agricultural Specialization 1**

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<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
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<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
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<td>AEE 360</td>
<td>Developing Team Leadership in Agriculture and Life Sciences</td>
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<td>AEE 435</td>
<td>Professional Presentations in Agricultural Organizations</td>
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<td>AEE 460</td>
<td>Organizational Leadership Development in Agriculture and Life Sciences</td>
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<td>AEE 490</td>
<td>Seminar in Agricultural and Extension Education</td>
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**Restricted Elective Option 1**

Agricultural Specialization 1 (p. 133) 12

**Restricted Elective Option 2**

Agricultural Specialization 2 (p. 137) 12

**GEP Courses**

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<td>ENG 101</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Total Hours 120

1 A grade of C- or higher is required.

**Physical Science Electives**

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<td>Chemistry - A Quantitative Science</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>Organic Chemistry I Lab</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>MEA 110</td>
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<td>PY 131</td>
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**Agricultural Specialization 1**

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<td>ANS 215</td>
<td>Agricultural Genetics</td>
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<td>ANS 220</td>
<td>Reproductive Physiology</td>
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<td>ANS 221</td>
<td>Reproductive Physiology Lab</td>
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<td>ANS 225</td>
<td>Principles of Animal Nutrition</td>
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<td>ANS 230</td>
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<td>Animal Nutrition Lab</td>
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<td>ANS 240</td>
<td>Livestock Merchandising</td>
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<td>ANS 260</td>
<td>Basic Swine Science</td>
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<td>ANS 261</td>
<td>Swine Health and Biosecurity</td>
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<td>ANS 262</td>
<td>Swine Breeding and Gestation Management</td>
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<td>ANS 263</td>
<td>Farrowing Management</td>
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<td>ANS 264</td>
<td>Swine Nursery and Finishing Management</td>
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<td>ANS 265</td>
<td>Contemporary Issues in the Swine Industry</td>
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<td>Swine Environment Management</td>
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<td>Swine Manure and Nutrient Management</td>
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<td>Employee Management for the Swine Industry</td>
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<td>Internship in the Swine Industry</td>
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<td>ANS 270</td>
<td>Pork Export Markets from a Swine Production</td>
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<td>ANS 271</td>
<td>Swine Nutrition</td>
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<td>ANS 281</td>
<td>Professional Development of PreVeterinary Track Students</td>
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<td>ANS 290</td>
<td>Professional Development for Animal Science Careers</td>
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<td>ANS 303</td>
<td>Principles of Equine Evaluation</td>
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<td>ANS 304</td>
<td>Dairy Cattle Evaluation</td>
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<td>ANS 309</td>
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<td>ANS 322</td>
<td>Muscle Foods and Eggs</td>
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<td>ANS 324</td>
<td>Milk and Dairy Products</td>
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<td>ANS 330</td>
<td>Laboratory Animal Science</td>
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<td>Animal Science Study Abroad</td>
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<td>Companion Animal Management</td>
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<td>ANS 402</td>
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<td>Small Ruminant Management</td>
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<td>Equine Breeding Farm Management</td>
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<td>ANS 411</td>
<td>Management of Growing and Performance Horses</td>
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<td>ANS 415</td>
<td>Comparative Nutrition</td>
<td>3</td>
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<td>ANS 425</td>
<td>Feed Manufacturing Technology</td>
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<td>ANS 440</td>
<td>Animal Genetic Improvement</td>
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<td>ANS 452</td>
<td>Comparative Reproductive Physiology and Biotechnology</td>
<td>3</td>
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<tr>
<td>ANS 453</td>
<td>Physiology and Genetics of Growth and Development</td>
<td>3</td>
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<td>ANS 454</td>
<td>Lactation, Milk and Nutrition</td>
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<td>ANS 480</td>
<td>Judging Team</td>
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<td>ANS 492</td>
<td>Professional Internship Experience in the Animal Sciences</td>
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<td>Research Experience in the Animal Sciences</td>
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<tr>
<td>ANS 494</td>
<td>Teaching Experience in the Animal Sciences</td>
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A grade of C- or higher is required.
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**Agricultural Business Mgmt (Min: 12 Units)**

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**Agricultural Environmental Tec (Min: 12 Units)**

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**Crop Science (Min: 12 Units)**

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FS 435  Food Safety Management Systems  3  
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NTR 415  Comparative Nutrition  3  
NTR 425  Feed Manufacturing Technology  3  
NTR 515  Comparative Nutrition  3  
NTR 525  Feed Manufacturing Technology  3  
PHY 524  Comparative Endocrinology  3  
PO 201  Poultry Science and Production  3  
PO 201A  Poultry Science and Production  3  
PO 202  Poultry Science and Production Laboratory  1  
PO 202A  Poultry Science and Production Laboratory  1  
PO 212  Poultry and People: Why did the chicken cross the world?  3  
PO 215  Applied Avian and Aquaculture Nutrition  3  
PO 290  Poultry Seminar  1  
PO 322  Muscle Foods and Eggs  3  
PO 340  Live Poultry and Poultry Product Evaluation, Grading, and Inspection  3  
PO 404  Avian Anatomy and Physiology  4  
PO 406  Physiological Aspects of Poultry Management  3  
PO 407  Physiological Aspects of Poultry Management Laboratory  1  
PO 410  Production and Management of Game Birds in Confinement  3  
PO 411  Agrosecurity  3  
PO 412  Emerging Topics in Poultry Science  3  
PO 415  Comparative Nutrition  3  
PO 421  Commercial Egg Production  3  
PO 424  Poultry Meat Production  3  
PO 425  Feed Manufacturing Technology  3  
PO 426  Feed Manufacturing Technology Laboratory  1  
PO 433  Poultry Processing and Products  3  
PO 435  Poultry Incubation & Breeding  4  
PO 466  Animal Cell Culture Techniques  2  
PO 492  External Learning Experience  1-6  
PO 493  Special Problems in Poultry Science  1-6  
PO 495  Special Topics in Poultry Science  1-3  
PO 504  Avian Anatomy and Physiology  4  
PO 506  Physiological Aspects of Poultry Management  3  
PO 510  Poultry Product Safety: An On-Farm Model  3  
PO 515  Comparative Nutrition  3  
PO 524  Comparative Endocrinology  3  
PO 525  Feed Manufacturing Technology  3  
PO 533  Poultry Processing and Products  3  
PO 566  Animal Cell Culture Techniques  2  
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ZO 524  Comparative Endocrinology  3  

ALS 303  Transfer Transitions and Diversity in Agriculture & Life Sciences  1  
BAE 435  Precision Agriculture Technology  3  
BAE 473  Introduction to Hydrologic and Water Quality Modeling  3  
BAE 535  Precision Agriculture Technology  3  
BAE 573  Introduction to Hydrologic and Water Quality Modeling  3  
BAET 323  Water Management  3  
CSSC 490  Senior Seminar in Crop Science and Soil Science  1  
HS 428  Service-Learning in Urban Agriculture Systems  1  
MB 532  Soil Microbiology  4  
SSC 185  Land and Life  3  
SSC 200  Soil Science  3  
SSC 201  Soil Science Laboratory  1  
SSC 332  Environmental Soil Microbiology  3  
SSC 341  Soil Fertility and Nutrient Management  3  
SSC 342  Soil and Plant Nutrient Analysis  1  
SSC 410  Soil Judging for Land Evaluation  1  
SSC 421  Role of Soils in Environmental Management  3  
SSC 427  Biological Approaches to Sustainable Soil Systems  3  
SSC 428  Service-Learning in Urban Agriculture Systems  1  
SSC 440  Geographic Information Systems (GIS) in Soil Science and Agriculture  3  
SSC 442  Soil and Environmental Biogeochemistry  3  
SSC 452  Soil Classification  4  
SSC 455  Soils, Environmental Quality and Global Challenges  3  
SSC 461  Soil Physical Properties and Plant Growth  3  
SSC 462  Soil-Crop Management Systems  3  
SSC 470  Wetland Soils  3  
SSC 473  Introduction to Hydrologic and Water Quality Modeling  3  
SSC 511  Soil Physics  4  
SSC 521  Soil Chemistry  3  
SSC 532  Soil Microbiology  4  
SSC 540  Geographic Information Systems (GIS) in Soil Science and Agriculture  3  
SSC 541  Soil Fertility  3  
SSC 545  Remote Sensing Applications in Soil Science and Agriculture  3  
SSC 551  Soil Morphology, Genesis and Classification  3  
SSC 562  Environmental Applications Of Soil Science  3  
SSC 570  Wetland Soils  3  
SSC 573  Introduction to Hydrologic and Water Quality Modeling  3  
SSC 590  Special Problems  1-6  

Agricultural Specialization 2

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<tr>
<td>PO 590</td>
<td>Special Problems in Poultry Science</td>
<td>1-6</td>
</tr>
<tr>
<td>ZO 524</td>
<td>Comparative Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td><strong>PO 566</strong></td>
<td><strong>Animal Cell Culture Techniques</strong></td>
<td></td>
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<tr>
<td><strong>PO 580</strong></td>
<td><strong>Feed and Ingredient Quality Assurance</strong></td>
<td></td>
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<tr>
<td><strong>PO 590</strong></td>
<td><strong>Special Problems in Poultry Science</strong></td>
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<tr>
<td><strong>ZO 524</strong></td>
<td><strong>Comparative Endocrinology</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Soil Science (Min: 12 Units)</strong></td>
<td></td>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>BAE 435</td>
<td>Precision Agriculture Technology</td>
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</tr>
<tr>
<td>BAE 473</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
<td>3</td>
</tr>
<tr>
<td>BAE 535</td>
<td>Precision Agriculture Technology</td>
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</tr>
<tr>
<td>BAE 573</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<tr>
<td>BAET 323</td>
<td>Water Management</td>
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<tr>
<td>CSSC 490</td>
<td>Senior Seminar in Crop Science and Soil Science</td>
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<tr>
<td>HS 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<tr>
<td>MB 532</td>
<td>Soil Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>SSC 185</td>
<td>Land and Life</td>
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</tr>
<tr>
<td>SSC 200</td>
<td>Soil Science</td>
<td>3</td>
</tr>
<tr>
<td>SSC 201</td>
<td>Soil Science Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>SSC 332</td>
<td>Environmental Soil Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
<td>3</td>
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<tr>
<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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<tr>
<td>SSC 410</td>
<td>Soil Judging for Land Evaluation</td>
<td>1</td>
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<tr>
<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
<td>3</td>
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<tr>
<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
<td>3</td>
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<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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</tr>
<tr>
<td>SSC 442</td>
<td>Soil and Environmental Biogeochemistry</td>
<td>3</td>
</tr>
<tr>
<td>SSC 452</td>
<td>Soil Classification</td>
<td>4</td>
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<tr>
<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
<td>3</td>
</tr>
<tr>
<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
<td>3</td>
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<tr>
<td>SSC 462</td>
<td>Soil-Crop Management Systems</td>
<td>3</td>
</tr>
<tr>
<td>SSC 470</td>
<td>Wetland Soils</td>
<td>3</td>
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<tr>
<td>SSC 473</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
<td>3</td>
</tr>
<tr>
<td>SSC 511</td>
<td>Soil Physics</td>
<td>4</td>
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<tr>
<td>SSC 521</td>
<td>Soil Chemistry</td>
<td>3</td>
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<tr>
<td>SSC 532</td>
<td>Soil Microbiology</td>
<td>4</td>
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<tr>
<td>SSC 540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>SSC 541</td>
<td>Soil Fertility</td>
<td>3</td>
</tr>
<tr>
<td>SSC 545</td>
<td>Remote Sensing Applications in Soil Science and Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>SSC 551</td>
<td>Soil Morphology, Genesis and Classification</td>
<td>3</td>
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<tr>
<td>SSC 562</td>
<td>Environmental Applications Of Soil Science</td>
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<tr>
<td>SSC 570</td>
<td>Wetland Soils</td>
<td>3</td>
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<tr>
<td>SSC 573</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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</tr>
<tr>
<td>SSC 590</td>
<td>Special Problems</td>
<td>1-6</td>
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</table>

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>AEE 103</td>
<td>Fundamentals of Agricultural and Extension Education</td>
<td>1</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
<td></td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
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### Hours

First Year

Spring Semester

Select one of the following sequences:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ANS 150</td>
<td>Introduction to Animal Science &amp; Introduction to Animal Science Lab</td>
<td>4</td>
</tr>
<tr>
<td>PO 201 &amp; PO 202</td>
<td>Poultry Science and Production Lab</td>
<td>3</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<td>MA 121 or MA 131</td>
<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1423)</td>
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</tbody>
</table>

Second Year

Fall Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Introductory Agricultural Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
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Spring Semester

<table>
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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
<td></td>
</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
<td></td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
Extension Education (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Extension Education is open to all interested baccalaureate students. The minor is especially appropriate for students enrolled in agricultural, natural resource, and nutrition majors and/or those students who are interested in careers with the Cooperative Extension Service or other nonformal educational/community outreach organizations. Students completing a minor in Extension Education will become familiar with the organization, structure, and mission of Cooperative Extension; the planning and delivery of nonformal educational programs; the management and leadership of volunteers; communication media and technology; and leadership theory, principles, and skills. The minor requires a minimum of 15 credit hours, with 9 credit hours from a required core and 6 credit hours from a list of advised electives. A grade of "C" or better is required in all courses used toward the minor. Courses used to satisfy the minor may not be taken for credit only. Course substitutions may be made with minor advisor and minor administrator approval.

Certification

As the student nears completion of the minor, the student and their minor advisor will complete and submit to the minor administrator the Application for Minor Certification. The minor program administrator will certify the completion of the student’s minor program. Certification must be submitted no later than the enrollment period for the student’s final semester at NC State (prior to the first day of their last semester). The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

SIS code: 11EXTEDM

For more information about this program, including admissions and contact information, please visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#minors).

Plan Requirements

The minor requires a minimum of 15 credit hours with 9 credit hours from a required core and 6 credit hours from a list of advised electives. The minimum grade required for all courses counting toward the minor is “C”.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEE 230</td>
<td>Introduction to Cooperative Extension</td>
<td>3</td>
</tr>
<tr>
<td>AEE 325</td>
<td>Planning and Delivering Non-Formal Education</td>
<td>3</td>
</tr>
<tr>
<td>AEE 433</td>
<td>Leadership and Management of Volunteers in Agricultural and Extension Education</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select one course from at least two different groups: 6

Group 1 - Communication and Technology:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEE 226</td>
<td>Computer Applications and Information Technology in Agricultural &amp; Extension Education</td>
</tr>
<tr>
<td>AEE 311</td>
<td>Communication Methods and Media</td>
</tr>
<tr>
<td>AEE 435</td>
<td>Professional Presentations in Agricultural Organizations</td>
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</table>

Group 2 - Leadership Education:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
</tr>
</tbody>
</table>

1 AEE 103 Fundamentals of Agricultural and Extension Education is the preferred orientation course. ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences is accepted for transfer students.

2 Total hours of free electives vary in order to allow the minimum hours required for the degree to equal 120 credit hrs.
Leadership in Agriculture and Life Sciences (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Leadership in Agriculture and Life Sciences minor is open to all interested baccalaureate students in the College of Agriculture and Life Sciences. The minor is especially appropriate for students enrolled in Agricultural and Life Sciences majors seeking a competitive edge when applying for supervisory or management positions in careers related to the Agriculture and Life Sciences industries. Students completing this minor will be able to apply the theory, principles, and skills required by leaders in their discipline.

Certification

Program coordinators will verify that all requirements have been met and recommend approval by the department head to certify the completion of the student’s minor program. The signed minor application/plan of work for the minor will be submitted to the Academic Programs Office in the College of Agriculture and Life Sciences by the department head. Certification must be submitted no later than the registration period for the student’s final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

SIS Code: 16AGLDM

For more information about this program, including admissions and contact information, please visit our website (https://cals.ncsu.edu/agricultural-and-human-sciences/undergraduate/#minors).

Plan Requirements

The minor requires a minimum of 15 credit hours. The minimum grade required for all courses counting toward the minor is “C-“.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
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<tr>
<td>AEE 355</td>
<td>Professional Presentations in Agricultural Organizations</td>
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<tr>
<td>AEE 360</td>
<td>Developing Team Leadership in Agriculture and Life Sciences</td>
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<tr>
<td>AEE 435</td>
<td>Communication Methods and Media</td>
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<tr>
<td>AEE 460</td>
<td>Organizational Leadership Development in Agriculture and Life Sciences</td>
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<tr>
<td>AEE 478</td>
<td>Advanced Issues in Extension Education</td>
<td>3</td>
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</table>

Group 3 - Advanced Extension Education:

- AEE 435 Communication Methods and Media
- AEE 460 Organizational Leadership Development in Agriculture and Life Sciences

AEE 478 Advanced Issues in Extension Education

Total Hours 15

1 ENG 332 Communication for Business and Management or ENG 333 Communication for Science and Research may be substituted for AEE 311 Communication Methods and Media. Only one of these courses can be used to meet the minor requirements.

Department of Agricultural and Resource Economics

The Department of Agricultural and Resource Economics serves agricultural, resource, and related industries through its extension, research, and teaching programs. Applying principles of economics, business, entrepreneurship, and related disciplines, these programs develop an understanding of contemporary economic and business problems and equip students with knowledge of business organization fundamentals and decision-making skills useful in the operation, ownership, value-creation, and management of business firms.

The department offers undergraduate programs leading to a Bachelor of Science (B.S.) degree in Agricultural Business Management. Students who wish to specialize their business management skills can choose to concentrate in biological sciences business management (BBM). The BBM concentration is designed for students with a strong background and interest in science who desire careers in biotech. Students can also choose to specialize in agribusiness entrepreneurship. The agribusiness entrepreneurship program covers the skills needed to identify, evaluate, and commercialize new business ideas.

What opportunities do our students have?

- We work closely with our majors and business partners to make internship work experiences available for our students, and often majors can receive college credit for their work
- Our job shadowing program offers students the opportunity to spend a day at a business shadowing professionals, where they will gain exposure to a variety of opportunities and career pathways
- Our department organizes road trips every semester, at no cost, to expand our students’ professional networks and make connections for internships
- Study abroad with fellow students on faculty-led program designed specifically for CALS majors!

For more information about this department, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-resource-economics/).

Nelson Hall
Campus Box 8109
2801 Founders Drive
Raleigh, NC 27695
Phone: 919-515-3107
Fax: 919-515-6268
Email: ag_econ@ncsu.edu

John Russ
Undergraduate and Distance Education Programs Coordinator
Office: 3346 Nelson Hall
Professors

B.K. Goodwin
W. N. Thurman
M.L. Walden
M.K. Wohlgenant

Hugh Kiger Professor
A.B. Brown

Professors Emeriti
G.A. Benson
G.A. Carlson
L.E. Danielson
J.E. Easley
E.A. Estes
T.A. Feitshans
D.G. Harwood, Jr.
D.M. Hoover
L.A. Ihnen
H.L. Liner
M.C. Marra
C.E. Moore
D.F. Neuman
T.E. Nichols, Jr.
E.C. Pasour, Jr.
C.R. Pugh
C.D. Safley
R.A. Schrimper
R.L. Simmons
C.R. Weathers
R.C. Wells

Associate Professors
H.G. Fell
I. Kandilov
R. Rejesus
M.J. Roberts
R. von Haefen
X. Zheng

Adjunct Associate Professor
M.K. Muth

Associate Professors Emeritus
J.G. Allgood
H.C. Gilliam, Jr.
Agricultural Business Management (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Science degree in Agricultural Business Management prepares graduates for increasing opportunities to enter managerial positions in ag-related businesses. The academic program combines core courses in agricultural business and economics with courses in science and technology. Students learn to apply the concepts, principles and terminology of business and economics to real-world issues and opportunities.

The Agricultural Business Management Program prepares graduates for careers in management, marketing, sales, finance, supply chain, entrepreneurship, and related fields. The program has sufficient flexibility to provide more extensive course work in science and math for those students desiring to prepare for advanced graduate study. The concentration in biological sciences prepares graduates for management, marketing, and sales careers in fields such as biotechnology, pharmaceuticals, health care, environmental protection, and food processing. Graduates specializing in agribusiness entrepreneurship are trained in value creation and prepared to address the strong demand in agtech, biotech, and foodtech.

For more information about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-resource-economics/students/undergraduate/#undergraduate-offerings).

John Russ
Undergraduate Programs Coordinator
Office: 3346 Nelson Hall
Phone: 919-515-4677
Email: russ@ncsu.edu

Plan Requirements

Agricultural Business Management (BS): 120 Total Units

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<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<td>Orientation</td>
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<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Communications & Tech Fluency

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<tr>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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Select one of the following: 3
### Natural Science Electives

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<th>Title</th>
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<tbody>
<tr>
<td>CH 100</td>
<td>Chemistry and Society</td>
<td>4</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
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<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
<td>3</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
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<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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</tr>
<tr>
<td>MEA 110</td>
<td>Geology I Laboratory</td>
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<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
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<td>MEA 135</td>
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<td>MEA 150</td>
<td>Environmental Issues in Water Resources</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
<td>3</td>
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<td>PY 131</td>
<td>Conceptual Physics</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>PY 212</td>
<td>College Physics II</td>
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### ARE 400-level Electives

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<tbody>
<tr>
<td>ARE 404</td>
<td>Advanced Agribusiness Management</td>
<td>3</td>
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<tr>
<td>ARE 412</td>
<td>Advanced Agribusiness Marketing</td>
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### ARE Electives

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<tbody>
<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
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<tr>
<td>ARE 302</td>
<td>Farm Management</td>
<td>3</td>
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<tr>
<td>ARE 303</td>
<td>Agribusiness Management</td>
<td>3</td>
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<tr>
<td>ARE 304</td>
<td>Agricultural Law</td>
<td>3</td>
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<tr>
<td>ARE 305</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
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<tr>
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ANS 540  Animal Genetic Improvement  3
ANS 550  Applied Ruminant Nutrition  3
ANS 552  Comparative Reproductive Physiology and Biotechnology  3
ANS 553  Physiology and Genetics of Growth and Development  3
ANS 554  Lactation, Milk and Nutrition  3
ANS 561  Equine Nutrition  3
ANS 571  Regulation of Metabolism  3
ANS 575  Current Topics in Genomics and Proteomics in Animal Science  3
ANS 590  Topical Problems in Animal Science  1-3
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BAE 200  Computer Methods in Biological Engineering  2
BAE 202  Introduction to Biological and Agricultural Engineering Methods  4
BAE 203  Introduction to AutoCAD Civil 3D for Environmental & Ecological Engineers  2
BAE 204  Introduction to Environmental and Ecological Engineering  2
BAE 302  Transport Phenomena  3
BAE 305  Biological Engineering Circuits  4
BAE 321  Bioprocessing Engineering Fundamentals  3
BAE 322  Introduction to Food Process Engineering  3
BAE 325  Introductory Geometrics  3
BAE 361  Analytical Methods in Engineering Design  3
BAE 371  Fundamentals of Hydrology for Engineers  3
BAE 376  Watershed Assessment and Water Quality Protection  3
BAE 401  Sensors and Controls  3
BAE 425  Industrial Microbiology and Bioprocessing  3
BAE 435  Precision Agriculture Technology  3
BAE 451  Engineering Design I  2
BAE 452  Engineering Design II  2
BAE 462  Machinery Design and Applications  3
BAE 472  Irrigation and Drainage  3
BAE 473  Introduction to Hydrologic and Water Quality Modeling  3
BAE 474  Principles and Applications of Ecological Engineering  3
BAE 478  Agricultural Waste Management  3
BAE 481  Structures & Environment  3
BAE 488  Postharvest Engineering  3
BAE 492  External Learning Experience  1-6
BAE 493  Special Problems in Biological and Agricultural Engineering  1-6
BAE 495  Special Topics in Biological and Agricultural Engineering  1-3
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BAE 502  Instrumentation for Hydrologic Applications  3
BAE 525  Industrial Microbiology and Bioprocessing  3
BAE 528  Biomass to Renewable Energy Processes  3
BAE 535  Precision Agriculture Technology  3
BAE 536  GIS Applications in Precision Agriculture  3
BAE 560  Aerosol Science and Engineering  3
BAE 561  Agricultural Air Quality  3
BAE 572  Irrigation and Drainage  3
BAE 573  Introduction to Hydrologic and Water Quality Modeling  3
BAE 574  DRAINMOD: Theory and Application  3
BAE 575  Design of Structural Stormwater Best Management Practices  3
BAE 576  Watershed Monitoring and Assessment  3
BAE 577  Wetlands Design and Restoration  3
BAE 578  Agricultural Waste Management  3
BAE 580  Introduction to Land and Water Engineering  3
BAE 581  Open Channel Hydraulics for Natural Systems  3
BAE 582  Risk and Failure Assessment of Stream Restoration Structures  1
BAE 583  Stream Corridor 3 Es: Ecohydraulics, Engineering and Ethics  3
BAE 584  Introduction to Fluvial Geomorphology  3
BAE 585  Integrating AutoCAD Civil 3D and GIS  1
BAE 590  Special Problems  1-6
BAE 591  Master's Research Methods I  1
BAE 592  Master's Research Methods II  1
BAE 593  Introduction to Research Communications  1
BBS 325  Introduction to Brewing Science and Technology  3
BBS 426  Upstream Biomanufacturing Laboratory  2
BBS 526  Upstream Biomanufacturing Laboratory  2
BCH 101  Introduction to Microbiology and Biochemistry Laboratory Practices  3
BCH 571  Regulation of Metabolism  3
BEC 220  Introduction to Drug Development and Careers in Biomanufacturing  1
BEC 330  Principles and Applications of Bioseparations  2
BEC 363  Foundations of Recombinant Microorganisms for Biomanufacturing  2
BEC 426  Upstream Biomanufacturing Laboratory  2
BEC 436  Introduction to Downstream Process Development  2
BEC 440  Expression Systems in Biomanufacturing I  3
BEC 441  Expression Systems in Biomanufacturing II  3
BEC 462  Fundamentals of Bio-Nanotechnology  3
BEC 463  Fermentation of Recombinant Microorganisms  2
BEC 475  Global Regulatory Affairs for Medical Products  3
BEC 480  cGMP Fermentation Operations  2
BEC 483  Tissue Engineering Technologies  2
BEC 485  cGMP Downstream Operations  2
BEC 488  Animal Cell Culture Engineering  2
BEC 495  Special Topics in Biomanufacturing  1-4
BEC 497  Biomanufacturing Research Projects  1-3
BEC 515  Biopharmaceutical Product Characterization Techniques  2
BEC 526  Upstream Biomanufacturing Laboratory  2
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Agricultural Business Management (BS)
NC State University

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ES 111 Applications of Environmental Sciences 1
ES 113 Earth from Space 3
ES 150 Water and the Environment 3
ES 200 Climate Change and Sustainability 3
ES 295 Special Topics in Environmental Science 1-4
ES 300 Energy and Environment 3
ES 400 Analysis of Environmental Issues 3
ES 449 Human Dimensions of Natural Resources in Australia/New Zealand 3
ES 450 Sustaining Natural Resources in Australia/New Zealand 3
ES 495 Special Topics in Environmental Science 1-6
ES 496 Environmental Science Internship 1-3
ES 497 Professional Development in Environmental Science 1-3
ES 498 Research in Environmental Science 1-3
ES 499 Thesis in Environmental Science 3
ET 105 Introduction to Environmental Regulations 1
ET 120 Introduction to Renewable Energy Technologies and Assessments 3
ET 201 Environmental Technology Laboratory I 1
ET 202 Environmental Technology Laboratory II 1
ET 203 Pollution Prevention 1
ET 220 Solar Photovoltaics Assessment 3
ET 255 Hydro, Wind, and Bioenergy Assessment 3
ET 262 Renewable Energy Adoption: Barriers and Incentives 3
ET 293 Independent Study in Environmental Technology & Management 1-6
ET 294 Independent Study in Environmental Technology & Management 1-6
ET 295 Special Topics in Environmental Technology & Management 1-6
ET 301 Environmental Technology Laboratory III 1
ET 302 Environmental Technology Laboratory IV 1
ET 303 Laboratory Safety Systems and Management 1
ET 310 Environmental Monitoring and Analysis 3
ET 320 Fundamentals of Air Pollution 3
ET 330 Environmental Technology Practicum 3
ET 401 Environmental Technology Laboratory V 1
ET 455 Adaptive Management and Governance 3
ET 460 Practice of Environmental Technology 3
ET 493 Independent Study in Environmental Technology & Management 1-6
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ET 495 Special Topics in Environmental Technology & Management 1-6
FM 425 Feed Manufacturing Technology 3
FM 426 Feed Manufacturing Technology Laboratory 1
FM 525 Feed Manufacturing Technology 3
FM 580 Feed and Ingredient Quality Assurance 3
FOR 150 Critical Thinking and Data Analysis 2
FOR 172 Forest System Mapping and Mensuration I 2
FOR 204 Silviculture 2
FOR 248 Forest History, Technology and Society 3
FOR 250 Professional Development II: Communications in Natural Resources 1
FOR 252 Introduction to Forest Science 3
FOR 260 Forest Ecology 4
FOR 261 Forest Communities 2
FOR 264 Forest Wildlife 1
FOR 265 Fire Management 1
FOR 273 Forest System Mapping and Mensuration II 3
FOR 293 Independent Study in Forest Management 1-6
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FOR 295 Special Topics in Forestry 1-6
FOR 303 Silvics and Forest Tree Physiology 3
FOR 304 Theory of Silviculture 4
FOR 318 Forest Pathology 3
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FOR 330 North Carolina Forests 3
FOR 334 Operations Research Applications in Natural Resources 1
FOR 339 Dendrology 4
FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management 1
FOR 353 GIS and Remote Sensing for Environmental Analysis and Assessment 3
FOR 374 Forest Measurement, Modeling, and Inventory 3
FOR 402 Forest Entomology 3
FOR 405 Forest Management 4
FOR 406 Forest Inventory, Analysis and Planning 4
FOR 408 Hardwood Management 3
FOR 411 Forest Tree Genetics and Biology 3
FOR 414 World Forestry 3
FOR 415 World Forestry Study Tour 1
FOR 420 Watershed and Wetlands Hydrology 4
FOR 422 Consulting Forestry 3
FOR 430 Forest Health and Protection 3
FOR 434 Forest Operations and Analysis 3
FOR 472 Forest Soils 4
FOR 491 Special Topics in Forestry and Related Natural Resources 1-4
FOR 493 Independent Study in Forest Management 1-6
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FOR 501 Dendrology 3
FOR 502 Forest Measurements 1
FOR 503 Tree Physiology 1
FOR 504 The Practice of Silviculture 3
FOR 505 Forest Management 4
FOR 506 Silviculture Laboratory 1
FOR 507 Silviculture Mini Course 1
FOR 508 Hardwood Management 3
FOR 509 Forest Resource Policy 1
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NR 500 Natural Resource Management 4
NR 510 Military Land Sustainability 3
NR 511 Managing Natural Resources in an Arena of Conflict 3
NR 512 Land Use Policy & Management 3
NR 520 Watershed and Wetlands Hydrology 4
NR 521 Wetland Assessment, Delineation and Regulation 3
NR 548 Historical Environments 3
NR 554 Introduction to Data Analysis in Natural Resources 3
NR 560 Renewable Natural Resource Management and Policy 3
NR 571 Current Issues in Natural Resource Policy 3
NR 595 Special Topics in Natural Resources 1-6
NTR 210 Introduction to Community Food Security 3
NTR 220 Food and Culture 3
NTR 301 Introduction to Human Nutrition 3
NTR 302 Introduction to Nutrition Research, Communication, and Careers 3
NTR 320 Nutrition Education 3
NTR 330 Public Health Nutrition 3
NTR 401 Advanced Nutrition and Metabolism 3
NTR 410 Maternal and Infant Nutrition 3
NTR 415 Comparative Nutrition 3
NTR 419 Human Nutrition and Chronic Disease 3
NTR 420 Applied Nutrition Education 3
NTR 421 Life Cycle Nutrition 3
NTR 425 Feed Manufacturing Technology 3
NTR 454 Lactation, Milk and Nutrition 3
NTR 490 Senior Capstone Experience in Nutrition 4
NTR 492 Professional Internship Experience in Nutrition Science 1-3
NTR 493 Research Experience in Nutrition Science 1-3
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NTR 500 Principles of Human Nutrition 3
NTR 501 Advanced Nutrition and Metabolism 3
NTR 510 Maternal and Infant Nutrition 3
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NTR 521 Life Cycle Nutrition 3
NTR 525 Feed Manufacturing Technology 3
NTR 550 Applied Ruminant Nutrition 3
NTR 554 Lactation, Milk, and Nutrition 3
NTR 555 Exercise Nutrition 3
NTR 557 Nutraceuticals and Functional Foods 3
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NTR 594 Special Topics in Nutrition 1-6
PB 103 Perspectives on Botany 1
PB 200 Plant Life 4
PB 205 Our Green World 3
PB 208 Agricultural Biotechnology: Issues and Implications 3
PB 213 Plants and Civilization 3
PB 215 Medicinal Plants 3
PB 219 Plants in Folklore, Myth, and religion 3
PB 220 Local Flora 3
**Departmental Electives**

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**Course Listings**

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**Semester Sequence**

This is a sample.

**Course**

**Title**

**Hours**

### First Year

**Fall Semester**

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**Spring Semester**

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<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
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<td>Mathematics Requirement</td>
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Agricultural Business Management (BS): Biological Sciences Concentration

Second Year

Fall Semester

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<td>Science Requirement</td>
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Spring Semester

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<td>Agricultural Law or Environmental Law &amp; Economic Policy</td>
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Third Year

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Spring Semester

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Fourth Year

Fall Semester

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<td>Departmental Electives</td>
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<tr>
<td>Technical Elective</td>
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<td>Select 3 units from either of the following:</td>
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<td><strong>Total Hours</strong></td>
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1 A grade of C- or higher is required.
2 For free electives, select courses with enough credits to meet the minimum graduation requirement of 120 total credit hours.

Agricultural Business Management (BS): Biological Sciences Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Science degree in Agricultural Business Management prepares graduates for increasing opportunities to enter managerial positions in ag-related businesses. The academic program combines core courses in agricultural business and economics with courses in science and technology. Students learn to apply the concepts, principles and terminology of business and economics to real-world issues and opportunities.

The concentration in biological sciences combines training in science with business and economics and leads to a Bachelor of Science degree in Agricultural Business Management with a concentration in the Biological Sciences/Business Management (BBM). The concentration prepares graduates for management, marketing, and sales careers in fields such as biotechnology, pharmaceuticals, health care, environmental protection, and food processing. Graduates specializing in agribusiness entrepreneurship are trained in value creation and prepared to address the strong demand in agtech, biotech, and foodtech.

For more information about this program, including contact information, visit our website (https://cals.ncsu.edu/agricultural-and-resource-economics/students/undergraduate/#undergraduate-offerings).

John Russ
Undergraduate Programs Coordinator
Office: 3346 Nelson Hall
Phone: 919-515-4677
Email: russ@ncsu.edu

Plan Requirements

Agricultural Business Management (BS): 120 Total Units
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<tr>
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<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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**Communications & Tech Fluency**

Select one of the following: 3

- COM 110 Public Speaking
- COM 112 Interpersonal Communication
- COM 201 Introduction to Persuasion Theory
- COM 211 Argumentation and Advocacy

Select one of the following: 3

- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research
- AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed
  or CSC 200 Introduction to Computers and Their Uses

**Mathematical Sciences**

Select one of the following: 3-4

- MA 121 Elements of Calculus
- MA 131 Calculus for Life and Management Sciences A
- MA 141 Calculus I

Select one of the following: 3-4

- MA 114 Introduction to Finite Mathematics with Applications
- MA 231 Calculus for Life and Management Sciences B
- MA 241 Calculus II

Select one of the following: 3

- BUS 350 Economics and Business Statistics
- ST 311 Introduction to Statistics
- ST 350 Economics and Business Statistics

**Natural Sciences**

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4

Select one of the following: 4

- BIO 183 Introductory Biology: Cellular and Molecular Biology
- PB 200 Plant Life
- PB 250 Plant Biology
- GN 301 Genetics in Human Affairs
  or GN 311 Principles of Genetics

Select one of the following: 4

- PY 131 Conceptual Physics
- PY 205 Physics for Engineers and Scientists I
- PY 206 Physics for Engineers and Scientists I Laboratory
- PY 211 College Physics I
- CH 101 Chemistry - A Molecular Science
- CH 102 General Chemistry Laboratory

Select four units of the following: 4

- CH 201 Chemistry - A Quantitative Science
- CH 202 Quantitative Chemistry Laboratory
- CH 220 Introductory Organic Chemistry
- CH 221 Organic Chemistry I
- CH 222 Organic Chemistry I Lab

Select four units of the following: 4

- AEC 360 Ecology
- MB 351 General Microbiology
- MB 352 General Microbiology Laboratory
- PB 360 Ecology
- PB 400 Plant Diversity and Evolution
- ZO 250 Animal Anatomy and Physiology

**Department Course Requirements**

ARE 201 Introduction to Agricultural & Resource Economics 3
  or EC 201 Principles of Microeconomics

ACC 220 Introduction to Managerial Accounting 3
  or ACC 210 Concepts of Financial Reporting

ARE 304 Agribusiness Management 3

ARE 306 Agricultural Law 3
  or ARE 309 Environmental Law & Economic Policy

Select one of the following: 3

- ARE 311 Agricultural Markets
- ARE 312 Agribusiness Marketing
- BUS 360 Marketing Methods

ARE 321 Agricultural Financial Management 3
  or BUS 320 Financial Management

ARE 301 Intermediate Microeconomics 3
  or EC 301 Intermediate Microeconomics

Select one of the following: 3

- ARE 332 Human Resource Management for Agribusiness
- ARE 345 Global Agribusiness Management
- EC 302 Intermediate Macroeconomics
- EC 348 Introduction to International Economics
- EC 431 Labor Economics
- ARE 490 Career Seminar in Agriculture & Resource Economics 1

ARE Electives (p. 164) 3

**Restricted Electives**

Restricted Electives (p. 164) 12

**GEP Courses**

ENG 101 Academic Writing and Research 4

GEH Humanities (p. 1423) 6

GEP Social Sciences (p. 1430) 3

GEP Health and Exercise Studies (p. 1422) 2

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

GEP Interdisciplinary Perspectives (p. 1426) 5

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

**Free Electives**

Free Electives (12 Hr S/U Lmt) 11

Total Hours 120-122
A grade of C- or higher is required.

**ARE Electives**

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<td>Environmental Law &amp; Economic Policy</td>
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<td>Contracts and Organizations in Agriculture</td>
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<td>Options and Derivatives Pricing</td>
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<td>Health Economics</td>
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<td>ECG 561</td>
<td>Applied Econometrics I</td>
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<td>Applied Econometrics II</td>
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**Restricted Electives**

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<td>Survey of Financial and Managerial Accounting</td>
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<td>Accounting Information Systems</td>
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<td>Business Valuation</td>
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<td>Cost Accounting for Effective Management</td>
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<td>Internal Auditing</td>
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<td>Advanced Income Tax</td>
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<td>Database Management in Tax</td>
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<td>Forecasting Effective Tax Rates and Scenario Analysis - Introduction</td>
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<td>Forecasting Effective Tax Rates and Scenario Analysis - Advanced Application</td>
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ACC 565 Visual Analytics in Tax 1
ACC 566 Database Management Applications in Tax 1
ACC 567 Enterprise Resource Planning for Tax 1
ACC 568 Analysis of Unstructured Data in Tax 1
ACC 569 Advanced Visual Analytics in Tax 1
ACC 570 Data Security and Warehousing in Tax 1
ACC 571 Enterprise Resource Planning - Advanced Applications 1
ACC 588 Special Topics in Accounting 1-6
ARE 215 Small Business Accounting 3
ARE 260 Marketing and Risk Management in the Pork Industry 1
ARE 270 Principles of Agribusiness Entrepreneurship 3
ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 1-6
ARE 301 Intermediate Microeconomics 3
ARE 303 Farm Management 3
ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
ARE 323 Agribusiness Finance 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 345 Global Agribusiness Management 3
ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 1
ARE 492 External Learning Experience 1-6
ARE 493 Special Problems/Research Exploration 1-6
ARE 494 Agribusiness Study Abroad 1-6
ARE 495 Special Topics in Agricultural and Resource Economics 1-6
ARE 590 Special Topics in ARE 1-99
BUS 225 Personal Finance 3
BUS 295 Special Topics in Business Management 1-6
BUS 320 Financial Management 3
BUS 340 Information Systems Management 3
BUS 350 Economics and Business Statistics 3
BUS 351 Predictive Analytics for Business 3
BUS 360 Marketing Methods 3
BUS 370 Operations and Supply Chain Management 3
BUS 420 Financial Management of Corporations 3
BUS 422 Investments and Portfolio Management 3
BUS 425 Advanced Personal Financial Management 3
BUS 426 International Financial Management 3
BUS 428 Financial Analytics 3
BUS 429 Financial Modeling 3
BUS 440 Database Management 3
BUS 441 Business Data Communications and Networking 3
BUS 442 Information Systems Development 3
BUS 443 Web Development for Business Applications 3
BUS 444 Systems Analysis and Design 3
BUS 449 Information Technology Capstone 3
BUS 458 Analytics: From Data to Decisions 3
BUS 459 Business Analytics Practicum 3
BUS 460 Consumer Behavior 3
BUS 461 Channel and Retail Marketing 3
BUS 462 Marketing Research 3
BUS 464 International Marketing 3
BUS 465 Traditional and Digital Brand Promotion 3
BUS 466 Personal Selling 3
BUS 467 Product and Brand Management 3
BUS 468 Marketing Strategy 3
BUS 469 Digital Marketing Practicum 3
BUS 470 Operations Modeling and Analysis 3
BUS 472 Operations Planning and Control Systems 3
BUS 473 Supply Chain Strategy 3
BUS 474 Logistics Management 3
BUS 475 Purchasing and Supply Management 3
BUS 476 Decision Modeling and Analysis 3
BUS 479 Supply Chain Management Undergraduate Practicum 3
BUS 495 Special Topics in Business Management 1-6
BUS 498 Independent Study in Business Management 1-6
BUS 501 Strategic Management Foundations 3
BUS 554 Project Management 3
BUS 571 High Growth Entrepreneurship 3
BUS 585 Market Research In Textiles 3
BUS 590 Special Topics In Business Management 1-6
EC 202 Principles of Macroeconomics 3
EC 301 Intermediate Microeconomics 3
EC 302 Intermediate Macroeconomics 3
EC 305 A Closer Look at Capitalism 3
EC 336 Introduction to Resource and Environmental Economics 3
EC 348 Introduction to International Economics 3
AEC 380 Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy 3

Science Set

AEC 360 Ecology 4

AEC 419 Freshwater Ecology 4
AEC 420 Introduction to Fisheries Science 3
AEC 423 Introduction to Fisheries Sciences Laboratory 1
AEC 441 Biology of Fishes 3
AEC 442 Biology of Fishes Laboratory 1
AEC 460 Field Ecology and Methods 4
AEC 509 Biology of Aquatic Insects 3
AEC 515 Fish Physiology 3
AEC 519 Freshwater Ecology 4
AEC 586 Aquaculture 3
AEC 587 Aquaculture Laboratory 1
AEC 761 Conservation and Climate Science 3
AEE 101 Introduction to Career and Technical Education 1
AEE 103 Fundamentals of Agricultural and Extension Education 1
AEE 208 Agricultural Biotechnology: Issues and Implications 3
AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 3
AEE 230 Introduction to Cooperative Extension 3
AEE 303 Administration and Supervision of Student Organizations 3
AEE 311 Communication Methods and Media 3
AEE 322 Experiential Learning in Agriculture 3
AEE 323 Leadership Development in Agriculture and Life Sciences 3
AEE 325 Planning and Delivering Non-Formal Education 3
AEE 326 Teaching Diverse Learners in AED 3
AEE 327 Conducting Summer Programs in Agricultural Education 1
AEE 350 Personal Leadership Development in Agriculture and Life Sciences 3
AEE 360 Developing Team Leadership in Agriculture and Life Sciences 3
AEE 423 Practicum in Agricultural Extension/Industry 8
AEE 424 Planning Agricultural Educational Programs 3
AEE 426 Methods of Teaching Agriculture 3
AEE 427 Student Teaching in Agriculture 8
AEE 433 Leadership and Management of Volunteers in Agricultural and Extension Education 3
AEE 435 Professional Presentations in Agricultural Organizations 3
AEE 460 Organizational Leadership Development in Agriculture and Life Sciences 3
AEE 478 Advanced Issues in Extension Education 3
AEE 490 Seminar in Agricultural and Extension Education 1
AEE 491 Seminar in Agricultural Education 1
AEE 492 External Learning Experience in Agricultural and Extension Education 1-6
AEE 493 Special Problems in Agriculture and Extension Education 1-6
AEE 495 Special Topics in Agricultural and Extension Education 1-3
AEE 500 Agricultural Education, Schools and Society 3
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<td>Employee Management for the Swine Industry</td>
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<td>Pork Export Markets from a Swine Production</td>
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<td>Swine Nutrition</td>
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<td>ANS 281</td>
<td>Professional Development of PreVeterinary Track</td>
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<td>Professional Development for Animal Science</td>
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<td>ANS 303</td>
<td>Principles of Equine Evaluation</td>
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<td>ANS 304</td>
<td>Dairy Cattle Evaluation</td>
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<td>ANS 309</td>
<td>Livestock Evaluation</td>
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<td>Muscle Foods and Eggs</td>
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<td>Milk and Dairy Products</td>
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ME 570  Geological Oceanography  3
ME 573  Principles of Chemical Oceanography  3
ME 574  Advanced Igneous Petrology  3
ME 577  Electron Microprobe Analysis of Geologic Material  2
ME 579  Principles of Air Quality Engineering  3
ME 580  Air Quality Modeling and Forecasting  4
ME 581  Fluid Mechanics in Natural Environments  3
ME 582  Geospatial Modeling  3
ME 585  Physical Hydrogeology  3
ME 591  Special Topics in Marine Science  1-6
ME 592  Special Topics in Earth Sciences  1-6
ME 593  Special Topics in Atmospheric Science  1-6
ME 599  Regional Geology of North America  1-6
MSE 489  Solid State Solar and Thermal Energy Harvesting  3
MSE 589  Solid State Solar and Thermal Energy Harvesting  3
NE 528  Introduction to Plasma Physics and Fusion Energy  3
NE 529  Plasma Physics and Fusion Energy II  3
NR 219  Natural Resource Markets  3
NR 293  Independent Study in Natural Resources  1-6
NR 294  Independent Study in Natural Resources  1-6
NR 295  Special Topics in Natural Resources  1-3
NR 300  Natural Resource Measurements  4
NR 301  Practicum for Professional Development I  1
NR 303  Humans and the Environment  3
NR 350  International Sustainable Resource Use  4
NR 360  Internship Experience  3
NR 400  Natural Resource Management  4
NR 406  Conservation of Biological Diversity  3
NR 420  Watershed and Wetlands Hydrology  4
NR 421  Wetland Assessment, Delineation and Regulation  3
NR 460  Renewable Natural Resource Management and Policy  3
NR 484  Environmental Impact Assessment  4
NR 491  Special Topics in Forestry and Related Natural Resources  1-4
NR 493  Independent Study in Natural Resources  1-6
NR 500  Natural Resource Management  4
NR 494  Independent Study in Natural Resources, Teaching Experience in Nutrition Science  1-3
NR 510  Military Land Sustainability  3
NR 511  Managing Natural Resources in an Arena of Conflict  3
NR 512  Land Use Policy & Management  3
NR 520  Watershed and Wetlands Hydrology  4
NR 521  Wetland Assessment, Delineation and Regulation  3
NR 548  Historical Environments  3
NR 554  Introduction to Data Analysis in Natural Resources  3
NR 560  Renewable Natural Resource Management and Policy  3
NR 571  Current Issues in Natural Resource Policy  3
NR 595  Special Topics in Natural Resources  1-6
NTR 210  Introduction to Community Food Security  3
NTR 220  Food and Culture  3
NTR 301  Introduction to Human Nutrition  3
NTR 302  Introduction to Nutrition Research, Communication, and Careers  3
NTR 320  Nutrition Education  3
NTR 330  Public Health Nutrition  3
NTR 401  Advanced Nutrition and Metabolism  3
NTR 410  Maternal and Infant Nutrition  3
NTR 415  Comparative Nutrition  3
NTR 419  Human Nutrition and Chronic Disease  3
NTR 420  Applied Nutrition Education  3
NTR 421  Life Cycle Nutrition  3
NTR 425  Feed Manufacturing Technology  3
NTR 454  Lactation, Milk and Nutrition  3
NTR 490  Senior Capstone Experience in Nutrition  4
NTR 492  Professional Internship Experience in Nutrition Science  1-3
NTR 493  Research Experience in Nutrition Science  1-3
NTR 495  Special Topics in Nutrition  1-6
NTR 500  Principles of Human Nutrition  3
NTR 501  Advanced Nutrition and Metabolism  3
NTR 510  Maternal and Infant Nutrition  3
NTR 515  Comparative Nutrition  3
NTR 521  Life Cycle Nutrition  3
NTR 525  Feed Manufacturing Technology  3
NTR 550  Applied Ruminant Nutrition  3
NTR 554  Lactation, Milk, and Nutrition  3
NTR 555  Exercise Nutrition  3
NTR 557  Nutraceuticals and Functional Foods  3
NTR 561  Equine Nutrition  3
NTR 594  Special Topics in Nutrition  1-6
PB 103  Perspectives on Botany  1
PB 200  Plant Life  4
PB 205  Our Green World  3
PB 208  Agricultural Biotechnology: Issues and Implications  3
PB 213  Plants and Civilization  3
PB 215  Medicinal Plants  3
PB 219  Plants in Folklore, Myth, and religion  3
PB 220  Local Flora  3
PB 250  Plant Biology  4
PB 277  Space Biology  3
PB 295  Special Topics in Botany  1-4
PB 321  Introduction to Whole Plant Physiology  3
PB 325  Culinary Botany  3
PB 345  Economic Botany  3
PB 346  Economic Botany Lab  1
PB 360  Ecology  4
PB 400  Plant Diversity and Evolution  4
PB 403  Systematic Botany  4
PB 413  Plant Anatomy  2
PB 421  Plant Physiology  3
PB 445  Paleobotany  4
PB 464 Rare Plants of North Carolina 3
PB 480 Introduction to Plant Biotechnology 3
PB 481 Plant Tissue Culture and Transformation 2
PB 488 Systems Biology Modeling of Plant Regulation 3
PB 492 External Learning Experience 1-6
PB 493 SP Problems in BO 1-6
PB 495 Special Topics in Botany 1-6
PB 501 Biology of Plant Pathogens 3
PB 503 Systematic Botany 4
PB 513 Plant Anatomy 2
PB 545 Paleobotany 4
PB 559 Plant Water Relations 2
PB 564 Rare Plants of North Carolina 3
PB 570 Plant Functional Ecology 3
PB 575 Introduction to Mycology 4
PB 580 Introduction to Plant Biotechnology 3
PB 595 Special Topics Botany 1-6
PHY 452 Comparative Reproductive Physiology and Biotechnology 3
PHY 524 Comparative Endocrinology 3
PHY 552 Comparative Reproductive Physiology and Biotechnology 3
PO 201 Poultry Science and Production 3
PO 201A Poultry Science and Production 3
PO 202 Poultry Science and Production Laboratory 1
PO 202A Poultry Science and Production Laboratory 1
PO 212 Poultry and People: Why did the chicken cross the world? 3
PO 215 Applied Avian and Aquaculture Nutrition 3
PO 290 Poultry Seminar 1
PO 322 Muscle Foods and Eggs 3
PO 340 Live Poultry and Poultry Product Evaluation, Grading, and Inspection 3
PO 404 Avian Anatomy and Physiology 4
PO 406 Physiological Aspects of Poultry Management 3
PO 407 Physiological Aspects of Poultry Management Laboratory 1
PO 410 Production and Management of Game Birds in Confinement 3
PO 411 Agrosecurity 3
PO 412 Emerging Topics in Poultry Science 3
PO 415 Comparative Nutrition 3
PO 421 Commercial Egg Production 3
PO 424 Poultry Meat Production 3
PO 425 Feed Manufacturing Technology 3
PO 426 Feed Manufacturing Technology Laboratory 1
PO 433 Poultry Processing and Products 3
PO 435 Poultry Incubation & Breeding 4
PO 466 Animal Cell Culture Techniques 2
PO 492 External Learning Experience 1-6
PO 493 Special Problems in Poultry Science 1-6
PO 495 Special Topics in Poultry Science 1-3
PO 504 Avian Anatomy and Physiology 4
PO 506 Physiological Aspects of Poultry Management 3
PO 510 Poultry Product Safety: An On-Farm Model 3
PO 515 Comparative Nutrition 3
PO 524 Comparative Endocrinology 3
PO 525 Feed Manufacturing Technology 3
PO 533 Poultry Processing and Products 3
PO 566 Animal Cell Culture Techniques 2
PO 580 Feed and Ingredient Quality Assurance 3
PO 590 Special Problems in Poultry Science 1-6
PP 144 Weeds & Diseases of Ornamentals 3
PP 222 Kingdom of Fungi 3
PP 318 Forest Pathology 3
PP 470 Advanced Turfgrass Pest Management 2
PP 501 Biology of Plant Pathogens 3
PP 502 Plant Disease: Methods & Diagnosis 2
PP 575 Introduction to Mycology 4
PRT 449 Human Dimensions of Natural Resources in Australia/New Zealand 3
PRT 450 Sustaining Natural Resources in Australia/New Zealand 3
PSE 335 Principles of Green Chemistry 4
PY 123 Stellar and Galactic Astronomy 3
PY 124 Solar System Astronomy 3
PY 125 Astronomy Laboratory 1
PY 131 Conceptual Physics 4
PY 201 University Physics I 4
PY 202 University Physics II 4
PY 203 University Physics III 4
PY 205 Physics for Engineers and Scientists I 3
PY 206 Physics for Engineers and Scientists I Laboratory 1
PY 208 Physics for Engineers and Scientists II 3
PY 209 Physics for Engineers and Scientists II Laboratory 1
PY 211 College Physics I 4
PY 212 College Physics II 4
PY 251 Introduction to Scientific Computing 3
PY 252 Instrumental and Data Analysis for Physics 2
PY 299 Special Problems in Physics 1-3
PY 301 Introduction to Quantum Mechanics 3
PY 328 Stellar and Galactic Astrophysics 3
PY 341 Relativity, Gravitation and Cosmology 3
PY 401 Quantum Physics I 3
PY 402 Quantum Physics II 3
PY 407 Introduction to Modern Physics 3
PY 411 Mechanics I 3
PY 412 Mechanics II 3
PY 413 Thermal Physics 3
PY 414 Electromagnetism I 3
PY 415 Electromagnetism II 3
PY 452 Advanced Physics Laboratory 3
PY 489 Solid State Solar and Thermal Energy Harvesting 3
PY 495 Special Topics in Physics 1-4
PY 499 Independent Research in Physics 1-6
PY 501 Quantum Physics I 3
PY 502 Quantum Physics II 3
PY 506 Nuclear and Subatomic Physics 3
PY 507 Elementary Particle Physics 3
PY 509 General Relativity 3
PY 511 Mechanics I 3
PY 512 Mechanics II 3
PY 514 Electromagnetism I 3
PY 515 Electromagnetism II 3
PY 516 Physical Optics 3
PY 517 Atomic and Molecular Physics 3
PY 519 Biological Physics 3
PY 525 Computational Physics 3
PY 528 Introduction to Plasma Physics and Fusion Energy 3
PY 529 Plasma Physics and Fusion Energy II 3
PY 543 Astrophysics 3
PY 552 Condensed Matter Physics I 3
PY 570 Polymer Physics 3
PY 581 Matter & Interactions for Teachers I 3
PY 582 Matter & Interactions for Teachers II 3
PY 589 Solid State Solar and Thermal Energy Harvesting 3
PY 590 Special Topics In Physics 1-6
PY 599 Special Topics in Physics 1-6
SMT 202 Anatomy and Properties of Renewable Materials 3
SSC 185 Land and Life 3
SSC 200 Soil Science 3
SSC 201 Soil Science Laboratory 1
SSC 332 Environmental Soil Microbiology 3
SSC 341 Soil Fertility and Nutrient Management 3
SSC 342 Soil and Plant Nutrient Analysis 1
SSC 410 Soil Judging for Land Evaluation 1
SSC 421 Role of Soils in Environmental Management 3
SSC 427 Biological Approaches to Sustainable Soil Systems 3
SSC 428 Service-Learning in Urban Agriculture Systems 1
SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
SSC 442 Soil and Environmental Biogeochemistry 3
SSC 452 Soil Classification 4
SSC 455 Soils, Environmental Quality and Global Challenges 3
SSC 461 Soil Physical Properties and Plant Growth 3
SSC 462 Soil-Crop Management Systems 3
SSC 470 Wetland Soils 3
SSC 473 Introduction to Hydrologic and Water Quality Modeling 3
SSC 511 Soil Physics 4
SSC 521 Soil Chemistry 3
SSC 532 Soil Microbiology 4
SSC 540 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
SSC 541 Soil Fertility 3
SSC 545 Remote Sensing Applications in Soil Science and Agriculture 3
SSC 551 Soil Morphology, Genesis and Classification 3
SSC 562 Environmental Applications Of Soil Science 3
SSC 570 Wetland Soils 3
SSC 573 Introduction to Hydrologic and Water Quality Modeling 3
SSC 590 Special Problems 1-6
TE 570 Polymer Physics 3
TOX 201 Poisons, People and the Environment 3
TOX 401 Principles of Toxicology 4
TOX 415 Environmental Toxicology and Chemistry 4
TOX 501 Principles of Toxicology 4
TOX 515 Environmental Toxicology 4
TOX 595 Special Topics 1-6
USC 291 Service Learning Program Leader Development I 1
USC 292 Service Learning Program Leader Development II 2
VMP 401 Poultry Diseases 4
VMP 420 Disease of Farm Animals 3
ZO 233 Human-Animal Interactions 3
ZO 250 Animal Anatomy and Physiology 4
ZO 317 Primate Ecology and Evolution 3
ZO 333 Captive Animal Biology 3
ZO 350 Animal Phylogeny and Diversity 4
ZO 402 Invertebrate Biology 4
ZO 410 Introduction to Animal Behavior 3
ZO 486 Capstone Course in Zoology 3
ZO 524 Comparative Endocrinology 3
ZO 553 Principles Of Wildlife Science 3
ZO 582 Medical and Veterinary Entomology 3

**Semester Sequence**

This is a sample.

**Course** | **Title** | **Hours**
--- | --- | ---
**First Year Fall Semester**
ALS 103 | Freshman Transitions and Diversity in Agriculture & Life Sciences | 1
ARE 201 or EC 201 | Introduction to Agricultural & Resource Economics or Principles of Microeconomics | 3
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
ENG 101 | Academic Writing and Research | 4
**Mathematics Requirement** Hours 15

**Spring Semester**
Select one of the following: 4
BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4
PB 200 | Plant Life | 3
PB 250 | Plant Biology | 3
**Mathematics Requirement** Hours 3
GEP Humanities (p. 1423) 3
# Agricultural Business Management (Certificate) (For Post-Baccalaureate Students, Distance Education)

<table>
<thead>
<tr>
<th>Hours</th>
<th>121-123</th>
</tr>
</thead>
</table>

## Second Year
### Fall Semester
- **CH 101**: Chemistry - A Molecular Science 3
- **CH 102**: General Chemistry Laboratory 1
- **CSC 200** or **AEE 226**: Introduction to Computers and Their Uses or Computer Applications and Information Technology in Agricultural & Extension Ed 3
- **PY 131** or **PY 211**: Conceptual Physics or College Physics I 4
- **Communications Requirement**: 3
- **GEP Health and Exercise Studies (p. 1422)**: 1

### Spring Semester
- **ACC 220** or **ACC 210**: Introduction to Managerial Accounting or Concepts of Financial Reporting 3
- **Chemistry Requirement**: 4
- **Statistics Requirement**: 3
- **GEP Interdisciplinary Perspectives (p. 1426)**: 2-3
- **GEP Additional Breadth (p. 1417)**: 3

## Spring Semester
- **Advanced Writing Requirement**: 3
- **Restricted Elective**: 3
- **Free Electives**: 8-9

## Third Year
### Fall Semester
- **ARE 301**: Intermediate Microeconomics 3
- **ARE 306** or **ARE 309**: Agricultural Law or Environmental Law & Economic Policy 3
- **ARE 490**: Career Seminar in Agriculture & Resource Economics 1
- **Biology Elective Requirement**: 4
- **ARE or ECG Elective**: 3
- **GEP Interdisciplinary Perspectives (p. 1426)**: 2-3

### Spring Semester
- **Marketing Requirement**: 3
- **GN 311**: Principles of Genetics 4
- **ARE 304**: Agribusiness Management 3
- **Restricted Elective**: 3
- **GEP Humanities (p. 1423)**: 3

## Fourth Year
### Fall Semester
- **ARE 321** or **BUS 320**: Agricultural Financial Management or Financial Management 3
- **ARE/EC Elective**: 3
- **Free Elective**: 3
- **Restricted Elective**: 3
- **Restricted Elective**: 3

## Career Opportunities
The Agricultural Business Management Program prepares graduates for careers in management, marketing, sales, finance, supply chain, entrepreneurship, and related fields. The program has sufficient flexibility to provide more extensive course work in science and math for those students desiring to prepare for advanced graduate study. The concentration in biological sciences prepares graduates for management, marketing, and sales careers in fields such as biotechnology, pharmaceuticals, health care, environmental protection, and food processing. Graduates specializing in agribusiness entrepreneurship are trained in value creation and prepared to address the strong demand in agtech, biotech, and foodtech.

## Program Coordinator
Dr. John S. Russ
Undergraduate Coordinator
Director of ARE Distance Education
Department of Agricultural & Resource Economics (ARE)
NC State University
Box 8109
Nelson Hall, Room 3346
Raleigh, North Carolina 27695
(919) 515-4677
russ@ncsu.edu

More information is available at the Department of Agricultural and Resource Economics website ($http://go.ncsu.edu/ag_business_certificates/.$)
Admissions Requirements

• Student must have received a Bachelor of Science or Bachelor of Arts Degree from an accredited institution. Proof of receipt of a previously awarded B.S. or B.A degree is required, via an official copy of applicant’s transcript from the degree conferring institution, before the application may be reviewed.

• Not enrolled in a 4-year undergraduate degree program at N.C. State University; and

• Acceptance as a Non-Degree Studies Student through DELTA, if not already enrolled.

Completion Requirements

The following are the requirements that must be met to receive a University Certificate in Agricultural Business Management:

• Completion of 15 credit hours from the list of required and elective courses with a grade of C- or higher received for each course and an overall GPA of 2.0 or higher must be achieved upon completion of all required courses.

• Four (4) years will be allowed for completion of all courses. The time limit starts with enrollment in the first course. Students will be allowed to defer no more than two semesters after acceptance into the program.

• All courses must be 601 sections taken through distance education unless special approval is granted for completion of an on-campus section to allow the student to successfully complete the course sequence for receipt of a Post Baccalaureate ABM Certificate.

• None of the required 15 credit hours may be taken for S/U or “credit only.

• No transfer credits from other institutions to fulfill certificate course requirements are allowed.

• Students currently enrolled in the Agricultural Business Management major or who would qualify for the ABM minor do not qualify for this program.

Plan of Study

Contact the Program Coordinator.

Registration Information

Contact the Program Coordinator.

Academic Structure

Term Effective: 1/2010
Plan Code: 32ABCTU
CIP Code: 01.0102
Description: Undergraduate Certificate in Agricultural Business Management
Offered via Distance Education only

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>1,2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective Courses 2</td>
<td>Select three of the following:</td>
<td>12</td>
</tr>
</tbody>
</table>

1 ARE 201 Introduction to Agricultural & Resource Economics-601 must be successfully completed before enrollment in any Elective courses. A grade of C- or higher is required.

2 Course(s) to be taken via distance education (section 601).

3 Any ARE 495 Special Topics in Agricultural and Resource Economics-601 section must be pre-approved for the certificate by the Distance Education Coordinator. ARE 495 Special Topics in Agricultural and Resource Economics-601 may only be taken after the successful completion of 12 credit hours.

Agricultural Business Management (Certificate) (Non Post-Baccalaureate Students, Distance Education)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The University Undergraduate Certificate in Agricultural Business Management is available to any student enrolled as a non-degree studies (NDS) student at NC State University and is currently enrolled in a 2-year or 4-year degree program at an accredited college or university or has already received an Associate’s degree. This Certificate is not available to currently enrolled N.C. State degree seeking students. This certificate provides individuals an opportunity to learn basic business and economic principles that are useful in careers in agricultural and related industries.

Program Coordinator

Dr. John S. Russ
Undergraduate Coordinator
Director of ARE Distance Education
Department of Agricultural & Resource Economics (ARE)
NC State University
Box 8109
Nelson Hall, Room 3346
Raleigh, North Carolina 27695
919) 515-4677
russ@ncsu.edu
Admissions

- Must be currently enrolled in a 2-year or 4-year degree program at an accredited college or university and provide proof of a 2.5 GPA or higher; or must have received an Associate Degree from an accredited institution;
- Proof of current enrollment in an Associate Degree or B.S. or B.A. Degree program, or receipt of an Associate Degree, is required via an official copy of applicant’s transcript from the degree conferring institution, before the application can be reviewed.
- Not enrolled in a 4-year undergraduate degree program at N.C. State University; and
- Accepted as a Non-Degree Studies Student through DELTA, if not already enrolled.

Completion Requirements

The following are the requirements that must be met to receive a University Undergraduate Certificate in Agricultural Business Management:

- Associate Degree or Bachelor of Science or Bachelor of Arts Degree must be received prior to receiving the University Undergraduate Certificate in Agricultural Business Management. Proof of receipt of Associate Degree or B.S. or B.A. Degree is required, by providing updated official copy(ies) of applicant’s transcript(s) from the degree conferring institution(s), before the certificate may be awarded. This requirement must be fulfilled in addition to other certificate program requirements.
- Completion of 15 credit hours from the list of required and elective courses with a grade of C- or higher received for each course and an overall GPA of 2.0 or higher must be achieved upon completion of all required courses.
- Four (4) years will be allowed for completion of all courses. The time limit starts with enrollment in the first course. Students will be allowed to defer no more than two semesters after acceptance into the program.
- All courses must be 601 sections taken through distance education unless special approval is granted for completion of an on-campus section to allow the student to successfully complete the course sequence for receipt of the Undergraduate ABM Certificate.
- None of the required 15 credit hours may be taken for S/U (credit only).
- No transfer credits from other institutions to fulfill certificate course requirements are allowed.
- Students currently enrolled in the Agricultural Business Management major or who would qualify for the ABM minor do not qualify for this program.

Plan of Study and Registration Information

Contact the Program Coordinator.

Academic Structure

Term Effective: 1/2010
Plan Code: 32ABMCTU

More information is available at the Department of Agricultural and Resource Economics website (http://go.ncsu.edu/ag_business_certificates/)

CIP Code: 01.0102
Description: Undergraduate Certificate in Agricultural Business Management
Offered via Distance Education (http://distance.ncsu.edu/programs/university-undergraduate-certificate-in-agricultural-business-management/) only

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>1.2</td>
</tr>
<tr>
<td>Elective Courses</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Select three of the following:

- ARE 303 Farm Management
- ARE 304 Agribusiness Management
- ARE 306 Agricultural Law
- ARE 309 Environmental Law & Economic Policy
- ARE 311 Agricultural Markets
- ARE 312 Agribusiness Marketing
- ARE 215 Small Business Accounting
- ARE 323 Agribusiness Finance
- ARE 332 Human Resource Management for Agribusiness
- ARE 345 Global Agribusiness Management
- ARE 444 Ethics in Agribusiness
- ARE 495 Special Topics in Agricultural and Resource Economics

Total Hours: 15

1. ARE 201 Introduction to Agricultural & Resource Economics-601 must be successfully completed before enrollment in any Elective courses. A grade of C- or higher is required.
2. Course(s) to be taken via distance education (section 601).
3. Any ARE 495 Special Topics in Agricultural and Resource Economics-601 section must be pre-approved for the certificate by the Distance Education Coordinator. ARE 495 Special Topics in Agricultural and Resource Economics-601 may only be taken after the successful completion of 12 credit hours.

Agricultural Business Management (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Agricultural Business Management is offered to undergraduate majors in all departments except the Department of Agricultural and Resource Economics. The minor provides students an opportunity to learn basic business and economic principles that are useful in careers in agricultural and related industries.

Admissions

Admission to the minor requires a cumulative grade point average of 2.0 or better and the completion of ARE 201 Introduction to Agricultural & Resource Economics or EC 201 Principles of Microeconomics with a grade of ‘C’ or better. Students should contact Dr. John S. Russ, to
inquire about adding the minor no later than the registration period for the student’s final semester at NC State.

Certification

Certification requires a cumulative grade point average of 2.0 or better in all courses taken that could be used to satisfy the requirements for the minor. Courses used to satisfy the minor requirements may not be taken for credit only. All 300 or 400 level courses for the minor must be completed at NC State. If transfer credits have been granted for such courses, additional courses will be required and must be approved by the Undergraduate Coordinator. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Dr. John S. Russ
3346 Nelson Hall
919.515-4677
russ@ncsu.edu

Effective date: 6/2013

SIS Code: 11AMM

Plan Requirements

The program of study for the minor in Agricultural Business Management consists of a total of 15 credit hours (5 courses). Courses used to satisfy the minor requirements may not be taken for credit only.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
</tbody>
</table>

Select two of the following (each from a different category):

Category A:
- ARE 303 Farm Management
- or ARE 304 Agribusiness Management

Category B:
- ARE 311 Agricultural Markets
- or ARE 312 Agribusiness Marketing

Category C:
- ARE 321 Agricultural Financial Management
- or ARE 323 Agribusiness Finance

Elective Courses

Select two of the following: 6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
</tr>
<tr>
<td>ARE 303</td>
<td>Farm Management</td>
</tr>
<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
</tr>
<tr>
<td>ARE 311</td>
<td>Agricultural Markets</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
</tr>
<tr>
<td>ARE 321</td>
<td>Agricultural Financial Management</td>
</tr>
<tr>
<td>ARE 323</td>
<td>Agribusiness Finance</td>
</tr>
<tr>
<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
</tr>
<tr>
<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 345</td>
<td>Global Agribusiness Management</td>
<td></td>
</tr>
<tr>
<td>ARE 404</td>
<td>Advanced Agribusiness Management</td>
<td></td>
</tr>
<tr>
<td>ARE 412</td>
<td>Advanced Agribusiness Marketing</td>
<td></td>
</tr>
<tr>
<td>ARE 433</td>
<td>U.S. Agricultural Policy</td>
<td></td>
</tr>
<tr>
<td>ARE 444</td>
<td>Ethics in Agribusiness</td>
<td></td>
</tr>
<tr>
<td>ARE 494</td>
<td>Agribusiness Study Abroad</td>
<td></td>
</tr>
<tr>
<td>ARE 495</td>
<td>Special Topics in Agricultural and Resource Economics</td>
<td></td>
</tr>
<tr>
<td>ACC 200</td>
<td>Introduction to Managerial Accounting</td>
<td></td>
</tr>
<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td></td>
</tr>
<tr>
<td>BUS 320</td>
<td>Financial Management</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 15

1 Select no more than one of the following: ARE 494 Agribusiness Study Abroad, ACC 200 Introduction to Managerial Accounting, ACC 210 Concepts of Financial Reporting, BUS 320 Financial Management

Concentration Areas for Elective Hours

Any student choosing to concentrate their elective hours in a particular area of agricultural business management should select from the following options:

Marketing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 311</td>
<td>Agricultural Markets</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 412</td>
<td>Advanced Agribusiness Marketing</td>
<td>3</td>
</tr>
</tbody>
</table>

Management

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 303</td>
<td>Farm Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 404</td>
<td>Advanced Agribusiness Management</td>
<td>3</td>
</tr>
</tbody>
</table>

Finance

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 321</td>
<td>Agricultural Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 320</td>
<td>Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 323</td>
<td>Agribusiness Finance</td>
<td>3</td>
</tr>
</tbody>
</table>

Law and Policy

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 433</td>
<td>U.S. Agricultural Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

Agricultural Entrepreneurship (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Minor in Agricultural Entrepreneurship is available to undergraduates in all majors. Courses in the minor cover the basic mindset, principles,
and practices of entrepreneurship, including how to start a new business and how to add value to an existing business. Entrepreneurship skills are valuable to not only entrepreneurs but also to managers and others in careers in agricultural and related industries. Student teams work on projects with real businesses in all of our entrepreneurship courses. We also form teams around entrepreneurship projects that students bring to our classes. Students participate in poster and pitch contests judged by entrepreneurs and investors. We help students obtain seed money for prototypes and start-ups, and we fund class-related expenses such as travel that are associated with team projects. We immerse students in our extensive agribusiness network and in the NC State entrepreneurship ecosystem.

**Admissions and Certification of Minor**

Admission to the minor requires a cumulative grade point average of 2.0 or better and the completion of ARE 201 or EC 201 with a grade of ‘C-’ or better. Students should contact Dr. John S. Russ, to inquire about adding the minor no later than the registration period for the student’s final semester at NC State.

**Contact Person**

Dr. John S. Russ  
3346 Nelson Hall  
919-515-4677  
russ@ncsu.edu

**SIS code: 11AGENT**

**Required Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 270</td>
<td>Principles of Agribusiness Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>ARE 370</td>
<td>Agribusiness New Venture Development</td>
<td>3</td>
</tr>
<tr>
<td>ARE 470</td>
<td>Agribusiness Entrepreneurship Clinical Skills</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Courses**

6 hours of Advised Electives designated by the minor advisor and based on project interest.

**Department of Animal Science**

Animal Science is a broad field centered on the biology, production, management and care of domestic animals, and NC State’s Department of Animal Science offers top-tier teaching, research and extension programs that help our faculty and students address critical issues facing the animal industry in North Carolina and beyond.

Undergraduate students study subjects related to various phases of animal science. Courses are offered in anatomy, physiology, nutrition, genetics, reproduction, and management, and there are opportunities for the application of basic scientific training in animal care and well-being areas.

Department Highlights:

- Students interested in Animal Science can join any of several student organizations including the Animal Science Club (https://getinvolved.ncsu.edu/organization/animal_science_club/) or the Pre-Veterinary Club (http://clubs.ncsu.edu/prevet/)
- Animal Science students have the opportunity to student abroad, learning all about the equine industry in Ireland, or about veterinary physiotherapy at Harper Adams University in the United Kingdom
- Students in our programs gain valuable hands-on experience in our hands-on teaching labs as well as at the five nearby teaching farms (horse, small ruminant, swine, beef, dairy).
- All in-class laboratory activities involving live animals or animal specimens are approved by the Institutional Animal Care and Use Committee (IACUC)

For more information about our department, including contact information, visit our website (https://cals.ncsu.edu/animal-science/).

**Department of Animal Science**  
North Carolina State University  
Campus Box 7621  
Raleigh, NC 27695-7621  
Dr. M. Todd See  
Professor and Department Head  
North Carolina State University  
Polk Hall 123, Box 7621  
Raleigh, NC 27695-7621  
Phone : 919-515-2755  
Email : tsee@ncsu.edu

**Faculty**

**Department Head**

M. Todd See

**Director of Undergraduate Programs**

Melissa Merrill

**Director of Graduate Programs**

Joan H. Eisemann

**Departmental Extension Leader**

M.H. Poore

**William Neal Reynolds Professor**

W.L. Flowers  
J. Odle

**Alumni Distinguished Professors**

K.L. Esbenshade  
W.L. Flowers  
J.A. Moore

**Professors**

J.H. Eisemann
Associate Professors
D.H. Poole
S. Trivedi
G. Valacchi
L. Xi

Assistant Professors
D. Esposito
D.D. Harmon
K.D. Ange-van Heugten
J.P. Holt
C. Nestor
C. Pickworth
F. Tiezzi
X. Wang
S. Ward

Extension Specialists
D.D. Harmon
J.P. Holt
M. Knauer
J.M. Luginbuhl
M.H. Poore
S. Ward

Extension Associates
A. Cross
S. Davidson
G. Gregory
B. Jennings

Extension Specialists Emeriti
B. Hopkins
D. Miller

Research Associates
S. Pietrosemoli

William Neal Reynolds Professor Emeritus
G.J. Eisen

Professors Emeriti
J.C. Cornwell
R.W. Harvey
B.A. Hopkins
G.B. Huntington
J.M. Luginbuhl
R.L. McCraw
M. Morrow
R.A. Mowrey
R.M. Petters
O.W. Robison
J.W. Spears
S. Washburn
L.W. Whitlow
J.C. Wilk
Plans
- Animal Nutrition (Certificate) (p. 184)
- Animal Science (BS): Industry Concentration (p. 184)
- Animal Science (BS): Science Concentration (p. 200)
- Animal Science (BS): Veterinary Bioscience Concentration (p. 216)
- Animal Science (Minor) (p. 220)
- Swine Science (Certificate) (p. 221)

Animal Nutrition (Certificate)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Undergraduate Certificate in Animal Nutrition is designed to allow people to gain recognition for learning the basics of animal nutrition. People who successfully complete the required courses will learn about livestock, horse, and companion animal nutrition. Four required courses (12 credit hours) must be completed with a grade of C (2.0) or higher (a grade of C- will not count) in order to earn the certificate. Current undergraduate students at N.C. State University who are not majoring or minoring in Animal Science are welcome to complete the certificate. People from around the world who are not current students at N.C. State University are also welcome to complete the certificate. The four courses can be completed on-campus in Raleigh, via Distance Education, or in combination. Upon successful completion of the certificate requirements, Registration & Records will update the student’s transcript and mail the certificate. The Undergraduate Certificate in Animal Nutrition is administered by the Undergraduate Teaching Coordinator for the Department of Animal Science.

Program Coordinator
Dr. Shannon Pratt Phillips, PhD
Associate Professor
Dept. of Animal Science
Polk Hall 259, Campus Box 7621
NCSU Campus
Raleigh, NC 27695
919-513-1117
sepratt2@ncsu.edu

Additional information available on the Distance Education website for Animal Nutrition (http://distance.ncsu.edu/programs/undergraduate-certificate-in-animal-nutrition/).

Admissions Requirements
A person may be admitted to the certificate program after enrolling in the first course that will be used to fulfill the certificate requirements. To enroll, contact the Undergraduate Teaching Coordinator for the Department of Animal Science: Dr. Shannon Pratt Phillips, sepratt2@ncsu.edu.

Plan of Study
Contact the Program Coordinator.

Registration Information
Contact the Program Coordinator.

Academic Structure
Term Effective: 1/2010
Plan Code: 11ANCCTU, 32ANCCTU
CIP Code: 01.0901
Description: Undergraduate Certificate in Animal Nutrition
Offered: On-campus and Distance Education (http://distance.ncsu.edu/programs/undergraduate-certificate-in-animal-nutrition/) format

Plan Requirements
A minimum grade of “C” (2.0) is required for each course; a C-minus will not be accepted. Undergraduate students majoring or minoring in Animal Science are not eligible to receive the certificate.

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Total Hours 12

1 Course is offered online via Distance Education.

Animal Science (BS): Industry Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The degree of Bachelor of Science in Animal Science may be obtained by selecting one of three concentrations offered by the Department of Animal Science in the College of Agriculture and Life Sciences: Veterinary Bioscience, Science, and Industry.

The Industry concentration is designed for students who are more interested in the business or production aspects of animal science. It offers flexibility in completing Animal Science courses with business, marketing, economics, and applied science coursework. There are many opportunities to gain undergraduate research experience with an Animal Science faculty member, to participate in one of the animal-related clubs, and to engage globally by participating in one of our Animal Science Study Abroad experiences.

Accelerated Graduate Opportunities
Advanced undergraduates have the opportunity to complete the Accelerated Bachelor’s/Master’s degrees, which allows students to earn both the BS and the Master’s of Animal Science degrees within five
years. See listing of graduate degrees offered in the Graduate Catalog (http://www.ncsu.edu/grad/catalog). The **Accelerated BS/DVM for Animal Science Majors (3+1 Advising Guide)** is a pathway for students admitted early to a College of Veterinary Medicine to complete the BS in Animal Science degree by transferring back 12 credits after one year in vet school.

For more information about our program, visit our website (https://cals.ncsu.edu/animal-science/students/undergraduate/#bachelor-of-science).

Department of Animal Science
North Carolina State University
Campus Box 7621
Raleigh, NC 27695-7621
Dr. M. Todd See
Professor and Department Head
North Carolina State University
Polk Hall, Box 7621
Raleigh, NC 27695-7621
Phone: 919-515-2755
Email: tsee@ncsu.edu

**Plan Requirements**

**Animal Science - Industry Concentration: 120 Total Units**

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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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<td><strong>Free Electives</strong></td>
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Free Electives (12 Hr S/U Lmt) 2 8
Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Animal Science Discipline Elective

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<td>Comparative Reproductive Physiology and Biotechnology</td>
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<td>ANS 453</td>
<td>Physiology and Genetics of Growth and Development</td>
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<td>Lactation, Milk and Nutrition</td>
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<td>ANS 575</td>
<td>Current Topics in Genomics and Proteomics in Animal Science</td>
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Animal Science Electives

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Any ANS Courses Not Planned

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### Economics or BUS Electives

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### CALS Group A, B, or C

#### Group A - Biological Sciences

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AEC 420  Introduction to Fisheries Science  3
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AEC 441  Biology of Fishes  3
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AEC 460  Field Ecology and Methods  4
AEC 519  Freshwater Ecology  4
ANS 215  Agricultural Genetics  3
ANS 415  Comparative Nutrition  3
ANS 515  Comparative Nutrition  3
BEC 463  Fermentation of Recombinant Microorganisms  2
BEC 563  Fermentation of Recombinant Microorganisms  2
BIO 140  Survey of Animal Diversity  3
BIO 141  Animal Diversity Laboratory  1
BIO 227  Understanding Structural Diversity through Biological Illustration  3
BIO 315  General Parasitology  3
BIO 330  Evolutionary Biology  3
BIO 361  Developmental Biology  3
BIO 370  Developmental Anatomy of the Vertebrates  3
BIO 375  Developmental Anatomy Laboratory  2
BIO 405  Functional Histology  3
BIO 414  Cell Biology  3
BIO 424  Endocrinology  3
BIO 482  Capstone Course in Molecular, Cellular, and Developmental Biology  3
BIO 483  Capstone Course in Integrative Physiology and Neurobiology  3
BIO 484  Capstone Course in Human Biology  3
BIO 485  Capstone Course in Ecology, Evolution, and Conservation Biology  3
BIO 488  Neurobiology  3
BIO 588  Neurobiology  3
BIT 210  Phage Hunters  3
BIT 211  Phage Genomics  3
BIT 463  Fermentation of Recombinant Microorganisms  2
BIT 563  Fermentation of Recombinant Microorganisms  2
BME 301  Human Physiology : Electrical Analysis  4
BME 302  Human Physiology: Mechanical Analysis  4
CHE 463  Fermentation of Recombinant Microorganisms  2
CHE 563  Fermentation of Recombinant Microorganisms  2
CS 211  Plant Genetics  3
ENT 425  General Entomology  3
FS 301  Introduction to Human Nutrition  3
FS 405  Food Microbiology  3
FS 406  Food Microbiology Lab  1
FS 505  Food Microbiology  3
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FW 353  Wildlife Management  3
GN 301  Genetics in Human Affairs  3
GN 311  Principles of Genetics  4
GN 312  Elementary Genetics Laboratory  1
GN 421  Molecular Genetics  3
GN 423  Population, Quantitative and Evolutionary Genetics  3
GN 425  Advanced Genetics Laboratory  2
GN 434  Genes and Development  3
GN 441  Human and Biomedical Genetics  3
GN 451  Genome Science  3
GN 490  Genetics Colloquium  1
GN 521  Molecular Genetics  3
GN 541  Human and Biomedical Genetics  3
HS 215  Agricultural Genetics  3
HS 451  Plant Nutrition  3
HS 551  Plant Nutrition  3
MB 180  Introduction to Microbial Bioprocessing  3
MB 200  The Fourth Horseman: Plagues that Changed the World  3
MB 210  Phage Hunters  3
MB 211  Phage Genomics  2
MB 351  General Microbiology  3
MB 352  General Microbiology Laboratory  1
MB 354  Inquiry-Guided Microbiology Lab  1
MB 405  Food Microbiology  3
MB 406  Food Microbiology Lab  1
MB 411  Medical Microbiology  3
MB 412  Medical Microbiology Laboratory  1
MB 414  Microbial Metabolic Regulation  3
MB 420  Fundamentals of Microbial Cell Biotransformations  2
MB 441  Immunology  3
MB 451  Microbial Diversity  3
MB 452  Microbial Diversity Lab  2
MB 455  Microbial Biotechnology  3
MB 461  Molecular Virology  3
MB 480  Current Issues in Microbiology  1
MB 505  Food Microbiology  3
MB 506  Food Microbiology Lab  1
MB 520  Fundamentals of Microbial Cell Biotransformations  2
MEA 200  Introduction to Oceanography  3
MEA 210  Oceanography Lab  1
MEA 220  Marine Biology  3
MEA 250  Introduction to Coastal Environments  3
MEA 251  Introduction to Coastal Environments Laboratory  1
MEA 369  Life on Earth: Principles of Paleontology  3
NTR 301  Introduction to Human Nutrition  3
NTR 415  Comparative Nutrition  3
NTR 419  Human Nutrition and Chronic Disease  3
NTR 420  Applied Nutrition Education  3
NTR 421  Life Cycle Nutrition  3
NTR 490  Senior Capstone Experience in Nutrition  4
NTR 515  Comparative Nutrition  3
NTR 521  Life Cycle Nutrition  3
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**Group C - Applied Sci & Tech**

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SSC 462  Soil-Crop Management Systems  3
SSC 540  Geographic Information Systems (GIS) in Soil Science and Agriculture  3
TE 466  Polymeric Biomaterials Engineering  3
TE 467  Mechanics of Tissues & Implants Requirements  3
TE 566  Polymeric Biomaterials Engineering  3
VMP 401  Poultry Diseases  4
VMP 420  Disease of Farm Animals  3

Group C - Applied Sci & Tech

AEC 419  Freshwater Ecology  4
AEC 423  Introduction to Fisheries Sciences Laboratory  1
AEC 519  Freshwater Ecology  4
ANS 322  Muscle Foods and Eggs  3
ANS 425  Feed Manufacturing Technology  3
ANS 525  Feed Manufacturing Technology  3
BAET 323  Water Management  3
BIO 227  Understanding Structural Diversity through Biological Illustration  3
BME 204  Biomedical Measurements  3
BME 217  Biomedical Electronics Laboratory  1
BME 298  Biomedical Engineering Design and Manufacturing I  2
BME 398  Biomedical Engineering Design and Manufacturing II  2
CS 470  Advanced Turfgrass Pest Management  2
CSCC 490  Senior Seminar in Crop Science and Soil Science  1
ENT 470  Advanced Turfgrass Pest Management  2
FM 425  Feed Manufacturing Technology  3
FM 525  Feed Manufacturing Technology  3
FOR 318  Forest Pathology  3
FOR 420  Watershed and Wetlands Hydrology  4
FOR 472  Forest Soils  4
FOR 520  Watershed and Wetlands Hydrology  4
FS 322  Muscle Foods and Eggs  3
FS 435  Food Safety Management Systems  3
FS 462  Postharvest Physiology  3
FS 535  Food Safety Management Systems  3
FS 562  Postharvest Physiology  3
FW 221  Conservation of Natural Resources  3
FW 404  Wildlife Habitat Management  3
FW 460  International Wildlife Management and Conservation  3
FW 560  International Wildlife Management and Conservation  3
HS 200  Home Horticulture  3
HS 201  The World of Horticulture: Principles and Practices  3
HS 203  Home Plant Propagation  3
HS 242  Introduction to Small Scale Landscape Design  3
HS 250  Home Landscape Design: Creating Garden Spaces  3
HS 252  Landscape Graphic Communication  2
HS 272 Landscape Design/Build 6
HS 290 Horticulture: Careers and Opportunities 1
HS 301 Plant Propagation 4
HS 302 Gardening with Herbaceous Perennials 3
HS 303 Ornamental Plant Identification I 3
HS 304 Ornamental Plant Identification II 3
HS 357 Landscape Grading and Drainage 4
HS 400 Residential Landscaping 6
HS 411 Nursery Management 3
HS 416 Planting Design 4
HS 421 Temperate-Zone Tree Fruits: Physiology and Culture 3
HS 422 Small Fruit Production 3
HS 431 Viticulture 3
HS 440 Greenhouse Management 3
HS 442 Floriculture Crop Production 3
HS 462 Postharvest Physiology 3
HS 471 Landscape Ecosystem Management 4
HS 516 Planting Design 4
HS 521 Temperate-Zone Tree Fruits: Physiology and Culture 3
HS 523 Viticulture 3
HS 562 Postharvest Physiology 3
IDS 303 Humanities and the Environment 3
NR 300 Natural Resource Measurements 4
NR 303 Humanities and the Environment 3
NR 400 Natural Resource Management 4
NR 420 Watershed and Wetlands Hydrology 4
NR 460 Renewable Natural Resource Management and Policy 3
NR 484 Environmental Impact Assessment 4
NR 500 Natural Resource Management 4
NR 520 Watershed and Wetlands Hydrology 4
NR 521 Wetland Assessment, Delineation and Regulation 3
NR 560 Renewable Natural Resource Management and Policy 3
NTR 420 Applied Nutrition Education 3
NTR 425 Feed Manufacturing Technology 3
NTR 525 Feed Manufacturing Technology 3
PO 201 Poultry Science and Production 3
PO 201A Poultry Science and Production 3
PO 202 Poultry Science and Production Laboratory 1
PO 202A Poultry Science and Production Laboratory 1
PO 290 Poultry Seminar 1
PO 322 Muscle Foods and Eggs 3
PO 340 Live Poultry and Poultry Product Evaluation, Grading, and Inspection 3
PO 410 Production and Management of Game Birds in Confinement 3
PO 411 Agrosecurity 3
PO 421 Commercial Egg Production 3
PO 425 Feed Manufacturing Technology 3
PO 433 Poultry Processing and Products 3
PO 525 Feed Manufacturing Technology 3
PO 533 Poultry Processing and Products 3
PP 315 Principles of Plant Pathology 4
PP 318 Forest Pathology 3
PP 470 Advanced Turfgrass Pest Management 2
SSC 185 Land and Life 3
SSC 341 Soil Fertility and Nutrient Management 3
SSC 342 Soil and Plant Nutrient Analysis 1
SSC 421 Role of Soils in Environmental Management 3
SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
SSC 442 Soil and Environmental Biogeochemistry 3
SSC 452 Soil Classification 4
SSC 461 Soil Physical Properties and Plant Growth 3
SSC 462 Soil-Crop Management Systems 3
SSC 470 Wetland Soils 3
SSC 540 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
SSC 570 Wetland Soils 3
TOX 201 Poisons, People and the Environment 3
TOX 401 Principles of Toxicology 4
TOX 415 Environmental Toxicology and Chemistry 4
TOX 501 Principles of Toxicology 4

Semester Sequence

This is a sample.

Course Title Hours

First Year

Fall Semester

ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences 1
ANS 150 Introduction to Animal Science 3
ANS 151 Introduction to Animal Science Lab 1
BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
ENG 101 Academic Biology and Research 4
MA 107 Precalculus I 3

Hours 16

Spring Semester

CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1
Animal Science Course 3

Select one of the following:

MA 114 Introduction to Finite Mathematics with Applications 3
MA 121 Elements of Calculus 3
MA 131 Calculus for Life and Management Sciences A 3
BIO 183 Introductory Biology: Cellular and Molecular Biology 4
Animal Science (BS): Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/)).

The degree of Bachelor of Science in Animal Science may be obtained by selecting one of three concentrations offered by the Department of Animal Science in the College of Agriculture and Life Sciences: Veterinary Bioscience, Science, and Industry.

The Science concentration is designed for students with an interest in advanced study, such as MS and PhD programs, in disciplines such as physiology, nutrition, or genetics. This concentration gives students more flexibility to select courses that fit their disciplinary interests. There are many opportunities to gain undergraduate research experience with an Animal Science faculty member, to participate in one of the animal-related clubs, and to engage globally by participating in one of our Animal Science Study Abroad experiences.

### Accelerated Graduate Opportunities

Advanced undergraduates have the opportunity to complete the **Accelerated Bachelor's/Master's degrees**, which allows students to earn both the BS and the Master's of Animal Science degrees within five years. See listing of graduate degrees offered in the Graduate Catalog ([http://www.ncsu.edu/grad/catalog/](http://www.ncsu.edu/grad/catalog/)). The **Accelerated BS/DVM** for Animal Science Majors (3+1 Advising Guide) is a pathway for students admitted early to a College of Veterinary Medicine to complete the BS in Animal Science degree by transferring back 12 credits after one year in vet school.

For more information about our program, visit our website ([https://cals.ncsu.edu/animal-science/students/undergraduate/#bachelor-of-science](https://cals.ncsu.edu/animal-science/students/undergraduate/#bachelor-of-science)).
Plan Requirements

Animal Science (BS): Science Concentration: 120 Total Units

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Communication

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<td>COM 112</td>
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<td>Argumentation and Advocacy</td>
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Mathematical & Natural Sciences

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<td>Economics and Business Statistics</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
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<td>General Chemistry Laboratory</td>
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<td>ANS 215</td>
<td>Agricultural Genetics</td>
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<td>Principles of Genetics</td>
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Major Requirements

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<td>Physiology of Domestic Animals</td>
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<td>Anatomy of Domestic Animals Lab</td>
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<td>ANS 220</td>
<td>Reproductive Physiology</td>
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<td>ANS 230</td>
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<td>&amp; ANS 231</td>
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<td>ANS 403</td>
<td>Swine Management</td>
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<td>ANS 404</td>
<td>Dairy Cattle Management</td>
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<td>ANS 408</td>
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<td>ANS 410</td>
<td>Equine Breeding Farm Management</td>
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Animal Science Electives (p. 202) 5

Science Option Requirements

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<td>Chemistry - A Quantitative Science</td>
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<td>Quantitative Chemistry Laboratory</td>
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<td>CH 221</td>
<td>Organic Chemistry I</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<td>CH 223</td>
<td>Organic Chemistry II</td>
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<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology</td>
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<td>Scientific Inquiry in Microbiology: At the Bench</td>
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<td>University Physics I</td>
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<td>Physics for Engineers and Scientists I</td>
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GEP Courses

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<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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CALS Group A, B, or C

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Free Electives

Free Electives (12 Hr S/U Lmt) ² 8

Total Hours 120

¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.
Animal Science Discipline Elective

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<td>Feed Manufacturing Technology</td>
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<tr>
<td>ANS 440</td>
<td>Animal Genetic Improvement</td>
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<tr>
<td>ANS 452</td>
<td>Comparative Reproductive Physiology and Biototechnology</td>
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<td>ANS 453</td>
<td>Physiology and Genetics of Growth and Development</td>
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<td>ANS 454</td>
<td>Lactation, Milk and Nutrition</td>
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<td>ANS 515</td>
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<td>ANS 525</td>
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<tr>
<td>ANS 530</td>
<td>Advanced Applied Animal Reproduction</td>
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<td>ANS 540</td>
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<td>ANS 571</td>
<td>Regulation of Metabolism</td>
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<td>Current Topics in Genomics and Proteomics in Animal Science</td>
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<td>ANS 590</td>
<td>Topical Problems in Animal Science</td>
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Animal Science Electives

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<td>AEE 208</td>
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<td>ANS 105</td>
<td>Introduction to Companion Animal Science</td>
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<td>ANS 110</td>
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<td>Techniques of Animal Care</td>
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<td>Swine Health and Biosecurity</td>
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<td>Swine Breeding and Gestation Management</td>
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<td>Farrowing Management</td>
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<td>Pork Export Markets from a Swine Production Perspective</td>
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<td>Swine Nutrition</td>
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<td>ANS 281</td>
<td>Professional Development of PreVeterinary Track Students</td>
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<td>ANS 290</td>
<td>Professional Development for Animal Science Careers</td>
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<td>ANS 303</td>
<td>Principles of Equine Evaluation</td>
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Animal Science (BS): Science Concentration

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MA 523 Linear Transformations and Matrix Theory 3
MA 524 Combinatorics I 3
MA 526 Algebraic Geometry 3
MA 528 Options and Derivatives Pricing 3
MA 531 Dynamic Systems and Multivariable Control I 3
MA 532 Ordinary Differential Equations I 3
MA 534 Introduction To Partial Differential Equations 3
MA 537 Nonlinear Dynamics and Chaos 3
MA 540 Uncertainty Quantification for Physical and Biological Models 3
MA 544 Computer Experiments In Mathematical Probability 3
MA 546 Probability and Stochastic Processes I 3
MA 547 Financial Mathematics 3
MA 548 Monte Carlo Methods for Financial Math 3
MA 549 Financial Risk Analysis 3
MA 551 Introduction to Topology 3
MA 555 Introduction to Manifold Theory 3
MA 561 Set Theory and Foundations Of Mathematics 3
MA 565 Graph Theory 3
MA 573 Mathematical Modeling of Physical and Biological Processes I 3
MA 574 Mathematical Modeling of Physical and Biological Processes II 3
MA 580 Numerical Analysis I 3
MA 583 Introduction to Parallel Computing 3
MA 584 Numerical Solution of Partial Differential Equations--Finite Difference Methods 3
MA 587 Numerical Solution of Partial Differential Equations--Finite Element Method 3
MA 591 Special Topics 1-6
MBA 528 Options and Derivatives Pricing 3
MEA 100 Earth System Science: Exploring the Connections 4
MEA 101 Geology I: Physical 3
MEA 110 Geology I Laboratory 1
MEA 130 Introduction to Weather and Climate 3
MEA 135 Introduction to Weather and Climate Laboratory 1
MEA 202 Geology II: Historical 3
MEA 211 Geology II Laboratory 1
MEA 300 Environmental Geology 4
MEA 312 Atmospheric Thermodynamics 4
MEA 315 Mathematics Methods in Atmospheric Sciences 4
MEA 320 Fundamentals of Air Pollution 3
MEA 321 Fundamentals of Air Quality and Climate Change 3
MEA 323 Geochemistry of Natural Waters 3
MEA 409 Watershed Forensics 3
MEA 410 Introduction to Mineralogy and Petrology 4
MEA 411 Marine Sediment Transport 3
MEA 412 Atmospheric Physics 3
MEA 415 Climate Dynamics 3
MEA 421 Atmospheric Dynamics I 3
MEA 422 Atmospheric Dynamics II 3
MEA 425 Introduction to Atmospheric Chemistry 3
MEA 440 Igneous and Metamorphic Petrology 4
MEA 443 Synoptic Weather Analysis and Forecasting 4
MEA 444 Mesoscale Analysis and Forecasting 4
MEA 449 Principles of Biological Oceanography 3
MEA 450 Introductory Sedimentology and Stratigraphy 4
MEA 451 Structural Geology 4
MEA 454 Marine Physical-Biological Interactions 3
MEA 455 Micrometeorology 3
MEA 458 Introduction to Tropical Meteorology 3
MEA 459 Field Investigation of Coastal Processes 5
MEA 460 Principles of Physical Oceanography 3
MEA 462 Observational Methods and Data Analysis in Marine Physics 3
MEA 463 Fluid Physics 3
MEA 464 Ocean Circulation Systems 3
MEA 465 Geologic Field Camp 4
MEA 466 Preparatory Course for Field Camp 1
MEA 467 Marine Meteorology 3
MEA 469 Ecology of coastal Resources 3
MEA 470 Introduction to Geophysics 3
MEA 471 Exploration and Engineering Geophysics 3
MEA 473 Principles of Chemical Oceanography 3
MEA 476 Worldwide River and Delta Systems: Their Evolution and Human Impacts 3
MEA 479 Air Quality 3
MEA 481 Geomorphology: Earth's Dynamic Surface 3
MEA 485 Introduction to Hydrogeology 3
MEA 488 Meteorology for Media 3
MEA 493 Special Topics in MEAS 1-6
MEA 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences 1
MEA 498 Internship in MEAS 1-6
MEA 507 Discipline-based Education Research in the Geosciences 3
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MEA 514 Advanced Physical Meteorology 3
MEA 515 Climate Dynamics 3
MEA 517 Fundamentals of Climate Change Science 3
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MEA 519 Barriers to Climate Change Literacy 3
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MEA 573 Principles of Chemical Oceanography 3
MEA 574 Advanced Igneous Petrology 3
MEA 577 Electron Microprobe Analysis of Geologic Material 2
MEA 579 Principles of Air Quality Engineering 3
MEA 580 Air Quality Modeling and Forecasting 4
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**Group B - Economics & Business**

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BUS 462 Marketing Research 3
BUS 464 International Marketing 3
BUS 465 Traditional and Digital Brand Promotion 3
BUS 466 Personal Selling 3
BUS 467 Product and Brand Management 3
BUS 468 Marketing Strategy 3
BUS 469 Digital Marketing Practicum 3
BUS 470 Operations Modeling and Analysis 3
BUS 472 Operations Planning and Control Systems 3
BUS 473 Supply Chain Strategy 3
BUS 475 Purchasing and Supply Management 3
BUS 479 Supply Chain Management Undergraduate Practicum 3
EC 301 Intermediate Microeconomics 3
EC 336 Introduction to Resource and Environmental Economics 3
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MIE 201 Introduction to Business Processes 3
MIE 305 Legal and Regulatory Environment 3
MIE 330 Human Resource Management 3
MIE 335 Organizational Behavior 3
MIE 432 Labor and Employee Relations 3
MIE 434 Compensation Systems 3
MIE 435 Leadership and Management 3
MIE 436 Training and Development 3
MIE 438 Staffing 3
MIE 480 Business Policy and Strategy 3
PRT 406 Sports Law 3

**Group B - Economics & Business**

ACC 220 Introduction to Managerial Accounting 3
ACC 280 Survey of Financial and Managerial Accounting 3
ARE 301 Intermediate Microeconomics 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 412 Advanced Agribusiness Marketing 3
BUS 340 Information Systems Management 3
BUS 449 Information Technology Capstone 3
BUS 474 Logistics Management 3
EC 202 Principles of Macroeconomics 3
EC 301 Intermediate Microeconomics 3
EC 302 Intermediate Macroeconomics 3
EC 305 A Closer Look at Capitalism 3
EC 336 Introduction to Resource and Environmental Economics 3
EC 348 Introduction to International Economics 3
EC 351 Econometrics I 3
EC 404 Money, Financial Markets, and the Economy 3
EC 410 Public Finance 3
EC 413 Industrial Organization 3
EC 431 Labor Economics 3
EC 437 Health Economics 3
EC 449 International Finance 3
EC 451 Econometrics II 3
EC 474 Economics of Financial Institutions and Markets 3
EC 480 Introduction to Economic Research 3
EC 490 Research Seminar in Economics 3
FTM 482 Advanced Textile Brand Management and Marketing 3
MIE 412 Finance and Accounting for Entrepreneurs 3
MIE 413 New Venture Planning 3
MIE 419 Entrepreneurship Practicum 3
PRT 406 Sports Law 3

**Group C - Applied Sci & Tech**

AEE 101 Introduction to Career and Technical Education 1
AEE 208 Agricultural Biotechnology: Issues and Implications 3
AEE 230 Introduction to Cooperative Extension 3
AEE 303 Administration and Supervision of Student Organizations 3
AEE 311 Communication Methods and Media 3
AEE 322 Experiential Learning in Agriculture 3
AEE 323 Leadership Development in Agriculture and Life Sciences 3
AEE 325 Planning and Delivering Non-Formal Education 3
AEE 326 Teaching Diverse Learners in AED 3
AEE 327 Conducting Summer Programs in Agricultural Education 1
AEE 350 Personal Leadership Development in Agriculture and Life Sciences 3
AEE 360 Developing Team Leadership in Agriculture and Life Sciences 3
AEE 423 Practicum in Agricultural Extension/Industry 8
AEE 424 Planning Agricultural Educational Programs 3
AEE 426 Methods of Teaching Agriculture 3
AEE 427 Student Teaching in Agriculture 8
AEE 433 Leadership and Management of Volunteers in Agricultural and Extension Education 3
AEE 435 Professional Presentations in Agricultural Organizations 3
AEE 460 Organizational Leadership Development in Agriculture and Life Sciences 3
AEE 478 Advanced Issues in Extension Education 3
AEE 490 Seminar in Agricultural and Extension Education 1
AEE 533 Leadership and Management of Volunteers in Agricultural and Extension Education 3
BAET 201 Shop Processes and Management 3
BAET 323 Water Management 3
BAET 332 Management of Animal Environments 4
BAET 333 Processing Agricultural Products 4
BAET 343 Agricultural Electrification 4
BAET 411 Agricultural Machinery and Power Units 4
BAET 432 Agricultural and Environmental Safety and Health 3
BAET 443 Environmental Restoration Implementation 3
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**Group C - Applied Sci & Tech**

- **AEC 420**: Introduction to Fisheries Science
- **AEE 206**: Introduction to Teaching Agriculture
- **AEE 303**: Administration and Supervision of Student Organizations
- **AEE 322**: Experiential Learning in Agriculture
- **AEE 327**: Conducting Summer Programs in Agricultural Education
- **AEE 424**: Planning Agricultural Educational Programs
- **AEE 426**: Methods of Teaching Agriculture
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<td>HS 203</td>
<td>Home Plant Propagation</td>
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<td>Home Landscape Design: Creating Garden Spaces</td>
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<td>HS 252</td>
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<td>HS 422</td>
<td>Small Fruit Production</td>
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**Group C - Applied Sci & Tech**

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<td>Water Management</td>
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<td>BIO 227</td>
<td>Understanding Structural Diversity through Biological Illustration</td>
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<td>BME 204</td>
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<td>BME 217</td>
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<td>BME 298</td>
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Semester Sequence

This is a sample.

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>MA 107</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>General Chemistry Laboratory</td>
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<td><strong>Animal Science Course</strong></td>
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<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td><strong>Second Year</strong></td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>Fundamentals of Economics</td>
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<td>COM 112</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td><strong>Spring Semester</strong></td>
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<td>Organic Chemistry II Lab</td>
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<td>Introduction to Statistics</td>
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<td>GEP Humanities (p. 1423)</td>
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</table>
Animal Science (BS): Veterinary Bioscience Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The degree of Bachelor of Science in Animal Science may be obtained by selecting one of three concentrations offered by the Department of Animal Science in the College of Agriculture and Life Sciences: Veterinary Bioscience, Science, and Industry.

The Veterinary Bioscience concentration is for students who are interested in advanced study in DVM programs and has all veterinary school prerequisite courses built into the concentration. Students in this concentration must maintain an overall GPA of 3.0 or higher. There are many opportunities to gain undergraduate research experience with an Animal Science faculty member, to participate in one of the animal-related clubs, and to engage globally by participating in one of our Animal Science Study Abroad experiences.

Accelerated Graduate Opportunities

Advanced undergraduates have the opportunity to complete the Accelerated Bachelor's/Master's degrees, which allows students to earn both the BS and the Master's of Animal Science degrees within five years. See listing of graduate degrees offered in the Graduate Catalog (http://www.ncsu.edu/grad/catalog/). The Accelerated BS/DVM for Animal Science Majors (3+1 Advising Guide) is a pathway for students admitted early to a College of Veterinary Medicine to complete the BS in Animal Science degree by transferring back 12 credits after one year in vet school.

For more information about our program, visit our website (https://cals.ncsu.edu/animal-science/students/undergraduate/#bachelor-of-science).

Department of Animal Science
North Carolina State University
Campus Box 7621
Raleigh, NC 27695-7621

Dr. M. Todd See
Professor and Department Head
North Carolina State University
Polk Hall, Box 7621
Raleigh, NC 27695-7621
Phone: 919-515-2755
Email: tsee@ncsu.edu

Plan Requirements

Animal Science (BS): Veterinary Bioscience Concentration: 120 Total Units

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<tr>
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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Communication

Select one of the following: 3

1 Use of animals and animal specimens is critical to our educational program. To obtain full credit for Animal Science courses, students are required to participate in laboratory procedures involving animals and animal specimens. All activities with live animals are IACUC (Institutional Animal Care and Use Committee) approved. Many lectures also incorporate animals or animal specimens into the course.

2 ANS 150 Introduction to Animal Science, MA 107 Precalculus I, ENG 101 Academic Writing and Research, and CH 101 Chemistry - A Molecular Science must be completed with a grade of C-minus or higher, and the student should repeat the course in the semester following the initial attempt if less than a C-minus is earned.

3 Pre-vet students: this course also meets a vet school requirement.

4 Students are encouraged to take an Ethics course as part of their Humanities, Additional Breadth, Interdisciplinary Perspectives, or Free Electives.
### Mathematical & Natural Sciences

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<td>Economics and Business Statistics</td>
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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science 1</td>
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### Major Requirements

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<td>ANS 408</td>
<td>Small Ruminant Management</td>
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<td>ANS 410</td>
<td>Equine Breeding Farm Management</td>
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<td>ANS 411</td>
<td>Management of Growing and Performance Horses</td>
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Animal Science Electives (p. 218) 5

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### Veterinary Bioscience Options

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or MB 354 Inquiry-Guided Microbiology Lab

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Foreign Language Proficiency (p. 1417) (verify requirement)

### Free Electives

Free Electives (12 Hr S/U Lmt) 2

Total Hours 120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

### Animal Science Discipline Courses

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Animal Science Electives

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Animal Science Electives

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### Semester Sequence

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<td>General Biochemistry</td>
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<td>or Principles of Biochemistry</td>
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**Total:** 16
Animal Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The Department of Animal Science offers an undergraduate minor in Animal Science to all interested baccalaureate students. This minor is appropriate for (but not limited to) students majoring in Agricultural Business Management, Agricultural Education, Agricultural Science, Agronomy, Food Science, Nutrition Science, Poultry Science, and Zoology. Students completing a minor in Animal Science will become familiar with animal production and with its related industries.

Admissions

Students who plan to minor in Animal Science should contact Dr. Melissa Merrill for consultation and approval. Dr. Merrill can be reached at: 919.515.3028, Melissa_Merrill@ncsu.edu or in 342 Riddick Hall.

Certification

Dr. Melissa Merrill will certify the completion of the student's minor program. Certification must be submitted no later than the registration period for the student's final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Dr. Melissa Merrill
342 Riddick Hall
919.515.3028
Melissa_Merrill@ncsu.edu

SIS Code: 11ANM

Plan Requirements

• Minimum of 15 credit hours is required.
• A grade of ‘C-’ or higher in each course.
• The program is flexible in order for students to be able to emphasize the discipline or species of their interest.

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<td>Pork Export Markets from a Swine Production Perspective 2</td>
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<td>Professional Development of PreVeterinary Track Students</td>
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<td>ANS/NTR/PO 425</td>
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Total Hours 15
Credit is allowed for either ANS 105 Introduction to Companion Animal Science or ANS 110 Introduction to Equine Science, but not both.

2 AgIdea course, offered online with additional tuition.

Swine Science (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The Undergraduate Certificate in Swine Science program is the study of pork production and is available to post-secondary students interested in the pork industry. NCSU Animal Science majors can only complete the certificate by counting the courses to their Free Elective requirements as these courses will not count toward any Animal Science major requirements. The certificate is available via distance education. Students completing the certificate will have knowledge of all aspects of pork production, the pork industry, and factors that impact swine production and management. In addition, the U.S. Polk Center of Excellence located in Des Moines, Iowa will issue a certification of completion which is recognized in the pork industry as proficiency of swine practices.

Student Learning Outcomes

- Have a comprehensive knowledge or pork production and describe where pork production list within the animal agriculture industries in the United States and North Carolina.
- Describe production practices for all phases of production of swine, including the impacts of nutrition, physiology, and genetics on these practices.
- Understand diseases that affect swine and develop programs to eliminate or mitigate their impact.
- Identify key factors impacting the profitability of the pork industry, understand key records that need to be maintained in a production setting, and describe the markets available for swine and pork products.
- Understand the issues of pork production and effectively communicate with various constituencies regarding pork, pork production, and animal agriculture.

Registration Information

Contact the Program Coordinator.

Program Coordinator

Dr. Kenneth L. Esbenshade
Department of Animal Science
Box 7621; 466B Riddick Hall
Raleigh, NC 27695-7621
Phone: 919-515-9702
Email: kesbensh@ncsu.edu

Academic Structure

Term Effective: 1/2018
Plan Code: 11SWSCCTU/32SWSCCTU
CIP Code: 01.090

Plan Requirements

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<td>Internship in the Swine Industry</td>
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<td>Contemporary Issues in the Swine Industry</td>
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<td>ARE 260</td>
<td>Marketing and Risk Management in the Pork Industry</td>
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</table>

Total Hours 15

¹ ANS Students may use suitable substitute approved by certificate coordinator

Department of Applied Ecology

The Department of Applied Ecology exists to advance and share fundamental and novel discoveries in ecology and apply them to our greatest environmental challenges. Working at the intersection of basic and applied life sciences, our researchers confront local problems and solve grand global challenges. Faculty strengths are in the areas of ecology, fisheries, aquaculture, conservation biology, environmental toxicology, and global change biology.

The Department of Applied Ecology has a strong and diverse research portfolio that exists at the interface of basic and applied life sciences. Topics of interest vary widely as do the levels of analysis, ranging from cells to ecosystems. We share a passion for understanding the living world and applying ecological principles to solving societal challenges. Research in these fields fuels a strong, well-funded graduate program, effective extension and outreach, an undergraduate minor and a developing undergraduate curriculum.

For more information about this department, including contact information, visit our website (https://cals.ncsu.edu/applied-ecology/).

Department of Applied Ecology
North Carolina State University
100 Eugene Brooks Avenue
Campus Box 7617
Raleigh, NC 27695-7617
Phone: 919-515-5327
Email: ddaday@ncsu.edu
Faculty
Department Head
D.D. Aday

Graduate Coordinator
R.E. Irwin

Department Extension Leader
W.G. Cope

Distinguished University and William Neal Reynolds Professor
J.M. Burkholder
W.G. Cope
R.R. Dunn

Professors
D.D. Aday
J.A. Buckel
J.M. Burkholder
J.A. Collazo
W.G. Cope
R.R. Dunn
J.M. Hinshaw
R.E. Irwin
T.J. Kwak
A.C. Ramirez

Assistant Professors
J. Ciao
J.R. Fischer
C.E. LeProvost
B.J. Reading
B.W. Taylor
E.K. Youngsteadt

K. Gross
N. Haddad
A. Lynch
A. McKerrow
G. McMahon, USGS SECASC
M.B. Reiskind
A. Terando, USGS SECASC

Professors Emeritus
R.W. Laney

Plans

- Applied Ecology (Minor) (p. 222)

Applied Ecology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Applied Ecology is intended for students interested in applying ecological concepts and principles to solving real-world problems. Students with expertise in applied ecology will be well equipped to address local and global challenges associated with a wide variety of important issues such as water quantity and quality, natural resource management, environmental conservation and restoration, climate change, and maintenance of biodiversity. To receive a minor in Applied Ecology students will be required to complete challenging courses and an in-depth research experience.

For admission, students should first complete BIO 181 and BIO 360 with letter grades of C- or better before contacting the Minor Coordinator.

Administration of the Minor

Erin McKenney
Minor Coordinator
Department of Applied Ecology
126 David Clark Laboratory
eamckenn@ncsu.edu

SIS Code: 11AECM

Plan Requirements

For admission, students should first complete BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity and AEC 360 Ecology with letter grades of C- or better before contacting the Minor Coordinator.

For completion:

- All letter-graded courses must be completed with a C or better.

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Department of Biological and Agricultural Engineering

In the Department of Biological and Agricultural Engineering we embrace natural solutions. By applying engineering principles and the fundamentals of biology-based systems and tools, we’re managing natural resources to address the grand challenges related to providing food, water, fiber and energy to our growing world. The scope of BAE ranges in scale from the molecular to the ecosystem level, for the safe, efficient, and environmentally sound production, processing and management of agricultural, biological and natural resources. From bioenergy to food processing and water management, we’re engineering solutions for a sustainable future.

The BAE department provides excellent educational opportunities at the undergraduate level with programs that are well recognized as among the finest in the United States. Most recently, NC State BAE was No. 4 among biological and agricultural engineering programs nationally.

Department highlights:

- All of the resources of a large department but with the added value of a personalized, community environment.
- There is a broad range of departmental clubs and initiatives to become involved with including the Pack Pullers Quarter Scale Tractor Competition Team, the American Society of Agricultural and Biological Engineers Student Chapter and the Fountain Wars Design Competition Team and the Sustainability Committee.
- BAE students have the opportunity to learn abroad including a trip led by BAE faculty to Spain to study ancient Roman engineering.
- Students in BAE gain valuable hands on experience in the machine shop and the natural environment.

For more information about our department, including contact information, visit our website (http://bae.ncsu.edu).

Faculty

Department Head
G.A. Fox

Undergraduate Coordinator
S.A. Hale

Department Extension Leader
M.R. Burchell

Distinguished University and William Neal Reynolds Professor
W.F. Hunt

Professors
M.D. Boyette
M.E. Burchell
J. Cheng
M.S. Chinn
G.A. Fox
S.A. Hale
G.T. Roberson
S.B. Shah
L. Wang-Li
M. Youssef
W. Yuan

**Associate Professors**
F. Birgand
J.J. Classen
S.G. Hall
P. Kolar

**Assistant Professors**
C.F. Castro-Bolinga
D.S. Jones
N. Nelson
C. Poole
C. Sayde
M. Sharara
J. Ward
S. Young

**Lecturer**
T.D. Stephenson

**Extension Assistant Professor**
B.A. Doll
G.H. Ellington

**Adjunct Professors**
D.M. Amatya
E.Z. Bean
K.B. Cantrell

L. Coats
P.N. Dugba
M.L. Franklin
J. Hathaway
R.K.M. Jayanty
C. Munster
P. Puckett
L.M. Safley, Jr.
R. Sharma-Shivappa
L.F. Sykes

**Professors Emeritus**
C.F. Abrams
J.C. Barker
G. Chescheir
R.O. Evans
G.L. Grabow
C.J. Bowers, Jr.
L.B. Driggers
E.G. Humphries
G.D. Jennings
G.J. Kriz
T.M. Losordo
H.E. Pattee
R.E. Phillips
F.M. Richardson
R.P. Rohrbach
A.R. Rubin
R.W. Skaggs
R.E. Sneed
R.S. Sowell
J. Spooner
L.F. Stikeleather
C.W. Suggs
P.W. Westerman
T.B. Whitaker, *(USDA)*
Biological and Agricultural Engineering Technology (BS): 120 Total Units

Plan Requirements

Biological and Agricultural Engineering Technology (BS): 120 Total Units

Biological and Agricultural Engineering Technology (SSS) Bachelor of Science (B.S.) degree is to:

- Design and implement technological systems by interacting directly with both production personnel as well as the environment.
- Provide a critical link in the agricultural and environmental spectrum.
- To attain depth in science, business, or environmental areas. Graduates are prepared for careers in hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both production personnel as well as the designers and implementers of technological systems.

The program objectives of the Biological and Agricultural Engineering Technology (BAET) Bachelor of Science (B.S.) degree are to:

- Develop technical knowledge of physical and biological sciences used in agricultural and environmental systems;
- Apply critical thinking, existing technology and practical approaches to solve problems in agricultural and environmental systems;
- Produce technologists able to work in teams and effectively communicate to audiences; and
- Develop in students an appreciation for life-long education that supports their careers.

Biological and Agricultural Engineering Technology (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The BAET curriculum is administered by the College of Agriculture and Life Sciences and is intended to uniquely prepare students for hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both production personnel as well as the designers and implementers of technological systems.

The program objectives of the Biological and Agricultural Engineering Technology (BAET) Bachelor of Science (B.S.) degree are to:

- Develop technical knowledge of physical and biological sciences used in agricultural and environmental systems;
- Apply critical thinking, existing technology and practical approaches to solve problems in agricultural and environmental systems;
- Produce technologists able to work in teams and effectively communicate to audiences; and
- Develop in students an appreciation for life-long education that supports their careers.

Plans

- Biological and Agricultural Engineering Technology (BS) (p. 225)
- Biological and Agricultural Engineering Technology (BS): Agricultural Systems Management Concentration (p. 239)
- Biological and Agricultural Engineering Technology (BS): Environmental Systems Management Concentration (p. 253)
- Biological and Agricultural Engineering Technology (Minor) (p. 268)
- Biological Engineering (BS) (p. 268)
- Biological Engineering (BS): Agricultural Engineering Concentration (p. 272)
- Biological Engineering (BS): Bioprocessing Engineering Concentration (p. 274)
- Biological Engineering (BS): Ecological Engineering Concentration (p. 277)
- Biological Engineering (BS): Environmental Engineering Concentration (p. 280)

Biological and Agricultural Engineering Technology (Minor)

Biological and Agricultural Engineering Technology (BS): Agricultural and Environmental Safety and Health

Biological and Agricultural Engineering Technology (BS): Agricultural Electrification

Biological and Agricultural Engineering Technology (BS): Management of Animal Environments

Biological and Agricultural Engineering Technology (BS): Shop Processes and Management

Biological and Agricultural Engineering Technology (BS): Foundations of Graphics

Biological and Agricultural Engineering Technology (BS): Introduction to Computers and Their Uses

Biological and Agricultural Engineering Technology (BS): Computer Applications and Information Technology in Agricultural & Extension Ed

Biological and Agricultural Engineering Technology (BS): Introduction to Biological Engineering

Biological and Agricultural Engineering Technology (BS): Shop Processes and Management

Biological and Agricultural Engineering Technology (BS): Water Management

Biological and Agricultural Engineering Technology (BS): Management of Animal Environments

Biological and Agricultural Engineering Technology (BS): Agricultural Electrification

Biological and Agricultural Engineering Technology (BS): Agricultural and Environmental Safety and Health

Biological and Agricultural Engineering Technology (BS): Shop Processes and Management

Biological and Agricultural Engineering Technology (BS): Foundations of Graphics

Biological and Agricultural Engineering Technology (BS): Introduction to Agricultural & Resource Economics

Biological and Agricultural Engineering Technology (BS): Leadership Development in Agriculture and Life Sciences

Biological and Agricultural Engineering Technology (BS): Academic Writing and Research

Biological and Agricultural Engineering Technology (BS): GEP Health and Exercise Studies

Biological and Agricultural Engineering Technology (BS): GEP Humanities

GEP Courses

Engineering

GEP Health and Exercise Studies

GEP Humanities

GEP Social Sciences

GEP Humanities

GEP Social Sciences

GEP Health and Exercise Studies

Associate professors emeriti

G. Baughman

R.L. Huffman

J.H. Young

D.H. Willits

NC State University
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3  
GEP Interdisciplinary Perspectives (p. 1426) 5  
GEP U.S. Diversity (p. 1431) (verify requirement)  
GEP Global Knowledge (p. 1419) (verify requirement)  
Foreign Language Proficiency (p. 1417) (verify requirement)  
Free Elective 2 1  
Total Hours 120  

1 A grade of C- or higher is required.  
2 Students should consult their academic advisors to determine which courses fill this requirement.

### BAET Electives

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<td>Environmental Restoration Implementation</td>
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<td>GIS 510</td>
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<td>ARE 306</td>
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### Restricted Electives

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**Group A - Biological Sciences**

- ANS 225 Principles of Animal Nutrition 3
- BIT 100 Current Topics in Biotechnology 4
- BIT 465 Real-time PCR Techniques 2
- BIT 471 RNA Interference and Model Organisms 2
- BIT 473 Protein Interactions 2
- BIT 474 Plant Genetic Engineering 2
- BIT 565 Real-time PCR Techniques 2
- BIT 571 RNA Interference and Model Organisms 2
- BIT 573 Protein Interactions 2
- BIT 574 Plant Genetic Engineering 2
- ENT 305 Introduction to Forensic Entomology 3

**Group A - Physical Sciences**

- AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 3
- BAE 200 Computer Methods in Biological Engineering 2
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ME 585  Physical Hydrogeology  3
ME 591  Special Topics in Marine Science  1-6
ME 592  Special Topics in Earth Sciences  1-6
ME 593  Special Topics in Atmospheric Science  1-6
ME 599  Regional Geology of North America  1-6
OR 504  Introduction to Mathematical Programming  3
OR 505  Linear Programming  3
OR 531  Dynamic Systems and Multivariable Control I  3
OR 565  Graph Theory  3
OR 579  Introduction to Computer Performance Modeling  3
PSY 240  Introduction to Behavioral Research I  3
PSY 241  Introduction to Behavioral Research I Lab  1
PSY 242  Introduction to Behavioral Research II  3
PSY 243  Introduction to Behavioral Research II Lab  2
PY 414  Electromagnetism I  3
PY 415  Electromagnetism II  3
PY 514  Electromagnetism I  3
PY 515  Electromagnetism II  3
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ST 412  Long-Term Actuarial Models  3
ST 413  Short-Term Actuarial Models  3
ST 442  Introduction to Data Science  3
ST 546  Probability and Stochastic Processes I  3

Group A - Physical Sciences

BME 201  Computer Methods in Biomedical Engineering  3
CSC 442  Introduction to Data Science  3
EC 351  Econometrics I  3
ECE 489  Solid State Solar and Thermal Energy Harvesting  3
ECE 589  Solid State Solar and Thermal Energy Harvesting  3
EG 561  Applied Econometrics I  3
EMS 519  Teaching and Learning of Statistical Thinking  3
GPH 404  Epidemiology and Statistics in Global Public Health  3
MA 412  Long-Term Actuarial Models  3
MA 413  Short-Term Actuarial Models  3
MA 546  Probability and Stochastic Processes I  3
MA 555  Introduction to Manifold Theory  3
MA 150  Environmental Issues in Water Resources  4
ME 463  Fluid Physics  3
MSE 489  Solid State Solar and Thermal Energy Harvesting  3
MSE 589  Solid State Solar and Thermal Energy Harvesting  3
NE 528  Introduction to Plasma Physics and Fusion Energy  3
NE 529  Plasma Physics and Fusion Energy II  3
PSY 240  Introduction to Behavioral Research I  3
PSY 241  Introduction to Behavioral Research I Lab  1
PSY 242  Introduction to Behavioral Research II  3
PSY 243  Introduction to Behavioral Research II Lab  2
PY 123  Stellar and Galactic Astronomy  3
PY 124  Solar System Astronomy  3
PY 125  Astronomy Laboratory  1
PY 131  Conceptual Physics  4
PY 203  University Physics III  4
PY 301  Introduction to Quantum Mechanics  3
PY 328  Stellar and Galactic Astrophysics  3
PY 341  Relativity, Gravitation and Cosmology  3
PY 401  Quantum Physics I  3
PY 402  Quantum Physics II  3
PY 407  Introduction to Modern Physics  3
PY 411  Mechanics I  3
PY 412  Mechanics II  3
PY 413  Thermal Physics  3
PY 414  Electromagnetism I  3
PY 415  Electromagnetism II  3
PY 452  Advanced Physics Laboratory  3
PY 489  Solid State Solar and Thermal Energy Harvesting  3
PY 495  Special Topics in Physics  1-4
PY 499  Independent Research in Physics  1-6
PY 501  Quantum Physics I  3
PY 502  Quantum Physics II  3
PY 506  Nuclear and Subatomic Physics  3
PY 507  Elementary Particle Physics  3
PY 509  General Relativity  3
PY 511  Mechanics I  3
PY 512  Mechanics II  3
PY 514  Electromagnetism I  3
PY 515  Electromagnetism II  3
PY 516  Physical Optics  3
PY 517  Atomic and Molecular Physics  3
PY 519  Biological Physics  3
PY 525  Computational Physics  3
PY 528  Introduction to Plasma Physics and Fusion Energy  3
PY 529  Plasma Physics and Fusion Energy II  3
PY 543  Astrophysics  3
PY 552  Condensed Matter Physics I  3
PY 570  Polymer Physics  3
PY 581  Matter & Interactions for Teachers I  3
PY 582  Matter & Interactions for Teachers II  3
PY 589  Solid State Solar and Thermal Energy Harvesting  3
PY 590  Special Topics in Physics  1-6
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SSC 201  Soil Science Laboratory  1
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ST 312  Introduction to Statistics II  3
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ST 371  Introduction to Probability and Distribution Theory  3
ST 372  Introduction to Statistical Inference and Regression  3
ST 380  Probability and Statistics for the Physical Sciences  3
ST 401  Experiences in Data Analysis  4
ST 404  Epidemiology and Statistics in Global Public Health  3
ST 405  Applied Nonparametric Statistics  3
ST 412  Long-Term Actuarial Models  3
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ANS 324  Milk and Dairy Products  3
ANS 330  Laboratory Animal Science  3
ANS 411  Management of Growing and Performance Horses  3
ANS 425  Feed Manufacturing Technology  3
ANS 525  Feed Manufacturing Technology  3
BAE 325  Introductory Geomatics  3
BAE 425  Industrial Microbiology and Bioprocessing  3
BAE 435  Precision Agriculture Technology  3
BAE 525  Industrial Microbiology and Bioprocessing  3
BAE 535  Precision Agriculture Technology  3
BBS 201  Introduction to Biopharmaceutical Science  3
BBS 301  Process Validation Science  3
BBS 426  Upstream Biomanufacturing Laboratory  2
BBS 526  Upstream Biomanufacturing Laboratory  2
BCCH 220  Role of Biotechnology in Society  3
BEC 426  Upstream Biomanufacturing Laboratory  2
BEC 483  Tissue Engineering Technologies  2
BEC 526  Upstream Biomanufacturing Laboratory  2
BEC 583  Tissue Engineering Technologies  2
BME 375  Biomedical Microcontroller Applications  3
BME 444  Orthopaedic Biomechanics  3
BME 451  Biomedical Engineering Senior Design I  3
BME 452  Biomedical Engineering Senior Design II  3
BME 466  Polymeric Biomaterials Engineering  3
BME 467  Mechanics of Tissues & Implants Requirements  3
BME 483  Tissue Engineering Technologies  2
BME 484  Fundamentals of Tissue Engineering  3
BME 544  Orthopaedic Biomechanics  3
BME 566  Polymeric Biomaterials Engineering  3
BME 583  Tissue Engineering Technologies  2
BME 584  Fundamentals of Tissue Engineering  3
CS 200  Introduction to Turfgrass Management  4
CS 210  Lawns and Sports Turf  3
CS 213  Crop Science  3
CS 216  Southern Row Crop Production - Cotton, Peanuts, and Tobacco  3
CS 218  Southern Row Crop Production - Corn, Small Grains and Soybeans  3
CS 230  Introduction to Agroecology  3
CS 312  Grassland Management for Natural Resources Conservation  3
CS 400  Turf Cultural Systems  3
CS 411  Crop Ecology  3
CS 413  Plant Breeding  2
CS 414  Weed Science  4
CS 415  Integrated Pest Management  3
CS 424  Seed Physiology  3
CS 430  Advanced Agroecology  4
CS 465  Turf Management Systems and Environmental Quality  3
CS 524  Seed Physiology  3
CS 565  Turf Management Systems and Environmental Quality  3
CSSC 490  Senior Seminar in Crop Science and Soil Science  1
ECI 424  Student Teaching in Modern Foreign Languages  12
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ENT 401  Honey Bee Biology and Management  3
ES 100  Introduction to Environmental Sciences  3
ES 200  Climate Change and Sustainability  3
ES 300  Energy and Environment  3
ES 400  Analysis of Environmental Issues  3
FM 425  Feed Manufacturing Technology  3
FM 460  Feed Mill Operations and Leadership  3
FM 480  Feed Quality Assurance & Formulation  3
FM 490  Feed Science Seminar  1
FM 525  Feed Manufacturing Technology  3
FOR 318  Forest Pathology  3
FOR 420  Watershed and Wetlands Hydrology  4
FOR 472  Forest Soils  4
FOR 520  Watershed and Wetlands Hydrology  4
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FW 221  Conservation of Natural Resources  3
FW 311  Piedmont Wildlife Ecology and Management  3
FW 312  Fisheries Techniques and Management  1
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FW 453  Principles of Wildlife Science  4
FW 460  International Wildlife Management and Conservation  3
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NR 520 Watershed and Wetlands Hydrology 4
NR 560 Renewable Natural Resource Management and Policy 3
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NTR 525 Feed Manufacturing Technology 3
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PO 424 Poultry Meat Production 3
PO 425 Feed Manufacturing Technology 3
PO 435 Poultry Incubation & Breeding 4
PO 525 Feed Manufacturing Technology 3
PP 318 Forest Pathology 3
SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
SSC 462 Soil-Crop Management Systems 3
SSC 540 Geographic Information Systems (GIS) in Soil Science and Agriculture 3
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TE 467 Mechanics of Tissues & Implants Requirements 3
TE 566 Polymeric Biomaterials Engineering 3
VMP 401 Poultry Diseases 4
VMP 420 Disease of Farm Animals 3

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AEC 423 Introduction to Fisheries Sciences Laboratory 1
AEC 519 Freshwater Ecology 4
ANS 322 Muscle Foods and Eggs 3
ANS 425 Feed Manufacturing Technology 3
ANS 525 Feed Manufacturing Technology 3
BAET 323 Water Management 3
BIO 227 Understanding Structural Diversity through Biological Illustration 3
BME 204 Biomedical Measurements 3
BME 217 Biomedical Electronics Laboratory 1
BME 298 Biomedical Engineering Design and Manufacturing I 1
BME 398 Biomedical Engineering Design and Manufacturing II 2

CS 470 Advanced Turfgrass Pest Management 2
CSSCC 490 Senior Seminar in Crop Science and Soil Science 1
ENT 470 Advanced Turfgrass Pest Management 2
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FW 560 International Wildlife Management and Conservation 3
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HS 201 The World of Horticulture: Principles and Practices 3
HS 203 Home Plant Propagation 3
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HS 250 Home Landscape Design: Creating Garden Spaces 3
HS 252 Landscape Graphic Communication 2
HS 272 Landscape Design/Build 6
HS 290 Horticulture: Careers and Opportunities 1
HS 301 Plant Propagation 4
HS 302 Gardening with Herbaceous Perennials 3
HS 303 Ornamental Plant Identification I 3
HS 304 Ornamental Plant Identification II 3
HS 357 Landscape Grading and Drainage 4
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HS 411 Nursery Management 3
HS 416 Planting Design 4
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HS 422 Small Fruit Production 3
HS 423 Viticulture 3
HS 431 Vegetable Production 4
HS 440 Greenhouse Management 3
HS 442 Floriculture Crop Production 3
HS 462 Postharvest Physiology 3
HS 471 Landscape Ecosystem Management 4
HS 516 Planting Design 4
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**Semester Sequence**

This is a sample.

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Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization through selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The BAET curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum’s flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.

Biological and Agricultural Engineering Technology (BS): Agricultural Systems Management Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The BAET curriculum is administered by the College of Agriculture and Life Sciences and is intended to uniquely prepare students for hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both production personnel as well as the designers and implementers of technological systems.

The program objectives of the Biological and Agricultural Engineering Technology (BAET) Bachelor of Science (B.S.) degree are to:

- Develop technical knowledge of physical and biological sciences used in agricultural and environmental systems;
- Apply critical thinking, existing technology and practical approaches to solve problems in agricultural and environmental systems;
- Produce technologists able to work in teams and effectively communicate to audiences; and
- Develop in students an appreciation for life-long education that supports their careers.

Plan Requirements

Biological and Agricultural Engineering Technology (BS): Agricultural Systems Management Concentration: 120 Total Units

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**Natural & Physical Sciences**

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**Agricultural Systems Management**

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**Restricted Electives**

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- **BIT 100**  | Current Topics in Biotechnology     | 4       |
- **BIT 465**  | Real-time PCR Techniques            | 2       |
- **BIT 471**  | RNA Interference and Model Organisms | 2       |
- **BIT 473**  | Protein Interactions                | 2       |
- **BIT 474**  | Plant Genetic Engineering           | 2       |
- **BIT 565**  | Real-time PCR Techniques            | 2       |
- **BIT 571**  | RNA Interference and Model Organisms | 2       |
- **BIT 573**  | Protein Interactions                | 2       |
- **BIT 574**  | Plant Genetic Engineering           | 2       |
- **ENT 305**  | Introduction to Forensic Entomology   | 3       |

- **AEE 226**  | Computer Applications and Information Technology in Agricultural & Extension Ed | 3       |
- **BAE 200**  | Computer Methods in Biological Engineering | 2       |
- **BMA 573**  | Mathematical Modeling of Physical and Biological Processes I | 3       |
- **BMA 574**  | Mathematical Modeling of Physical and Biological Processes II | 3       |
- **BUS 340**  | Information Systems Management         | 3       |
- **BUS 350**  | Economics and Business Statistics      | 3       |
- **CE 435**   | Engineering Geology                   | 3       |
- **CE 479**   | Air Quality                           | 3       |
- **CE 581**   | Fluid Mechanics in Natural Environments | 3       |
- **CH 230**   | Computational Chemistry Lab I          | 1       |
- **CH 232**   | Computational Chemistry Lab II         | 1       |
- **CH 315**   | Quantitative Analysis                 | 3       |
- **CH 316**   | Quantitative Analysis Laboratory       | 1       |
- **CH 331**   | Introductory Physical Chemistry        | 4       |
- **CH 401**   | Systematic Inorganic Chemistry I       | 3       |
- **CH 403**   | Systematic Inorganic Chemistry II      | 3       |
- **CH 415**   | Analytical Chemistry II                | 3       |
- **CH 431**   | Physical Chemistry I                   | 3       |
- **CH 433**   | Physical Chemistry II                  | 3       |
- **CH 435**   | Introduction to Quantum Chemistry      | 3       |
- **CH 437**   | Physical Chemistry for Engineers       | 4       |
- **CH 441**   | Forensic Chemistry                     | 3       |
- **CH 442**   | Advanced Synthetic Techniques          | 4       |
- **CH 444**   | Advanced Synthetic Techniques II       | 4       |
- **CH 452**   | Advanced Measurement Techniques I      | 4       |
- **CH 454**   | Advanced Measurement Techniques II     | 4       |
- **CH 463**   | Molecular Origins of Life              | 3       |
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NC State University

NC State University
Biological and Agricultural Engineering Technology (BS): Agricultural Systems Management Concentration

Leadership and Management

- Compensation Systems
- Labor and Employee Relations
- Organizational Behavior
- Human Resource Management
- Legal and Regulatory Environment

Introduction to Business Processes
- Personal and Professional Identity Development
- Marketing

Advanced Textile Brand Management and Economics
- Introduction to Resource and Environmental Economics

Introduction to Resource and Environmental Economics

Group B - Economics & Business

- ACC 200 Introduction to Managerial Accounting
- ACC 220 Introduction to Managerial Accounting
- ACC 280 Survey of Financial and Managerial Accounting
- ARE 301 Intermediate Microeconomics
- ARE 332 Human Resource Management for Agribusiness
- ARE 336 Introduction to Resource and Environmental Economics
- ARE 412 Advanced Agribusiness Marketing
- BUS 340 Information Systems Management
- BUS 449 Information Technology Capstone
- BUS 474 Logistics Management
- EC 202 Principles of Macroeconomics
- EC 301 Intermediate Microeconomics
- EC 302 Intermediate Macroeconomics
- EC 305 A Closer Look at Capitalism
- EC 336 Introduction to Resource and Environmental Economics
- EC 348 Introduction to International Economics
- EC 351 Econometrics I
- EC 404 Money, Financial Markets, and the Economy
- EC 410 Public Finance
- EC 413 Industrial Organization
- EC 431 Labor Economics
- EC 437 Health Economics
- EC 449 International Finance
- EC 451 Econometrics II
- EC 474 Economics of Financial Institutions and Markets
- EC 480 Introduction to Economic Research
- EC 490 Research Seminar in Economics
- FTM 482 Advanced Textile Brand Management and Marketing
- MIE 412 Finance and Accounting for Entrepreneurs
- MIE 413 New Venture Planning
- MIE 419 Entrepreneurship Practicum
- PRT 406 Sports Law

Group C - Applied Sci & Tech

- AEE 101 Introduction to Career and Technical Education
- AEE 208 Agricultural Biotechnology: Issues and Implications
- AEE 230 Introduction to Cooperative Extension
- AEE 303 Administration and Supervision of Student Organizations
- AEE 311 Communication Methods and Media
- AEE 322 Experiential Learning in Agriculture
- AEE 323 Leadership Development in Agriculture and Life Sciences
- AEE 325 Planning and Delivering Non-Formal Education
- AEE 326 Teaching Diverse Learners in AED
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**Group C - Applied Sci & Tech**

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### Semester Sequence

This is a sample.

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Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization though selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The BAET curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum’s flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.

Biological and Agricultural Engineering Technology (BS): Environmental Systems Management Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The BAET curriculum is administered by the College of Agriculture and Life Sciences and is intended to uniquely prepare students for hands-on application of technology to efficiently manage agricultural and environmental systems. Flexibility within the program allows students to attain depth in science, business, or environmental areas. Graduates provide a critical link in the agricultural and environmental spectrum by interacting directly with both production personnel as well as the designers and implementers of technological systems.

The program objectives of the Biological and Agricultural Engineering Technology (BAET) Bachelor of Science (B.S.) degree are to:
- Develop technical knowledge of physical and biological sciences used in agricultural and environmental systems;
- Apply critical thinking, existing technology and practical approaches to solve problems in agricultural and environmental systems;
- Produce technologists able to work in teams and effectively communicate to audiences; and
- Develop in students an appreciation for life-long education that supports their careers.

Plan Requirements

Biological and Agricultural Engineering Technology (BS): Environmental Systems Management Concentration: 120 Total Units

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Communication

Select one of the following: 3
- COM 110 Public Speaking
- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research

Mathematical Sciences

- MA 131 Calculus for Life and Management Sciences A 3
- MA 114 Introduction to Finite Mathematics with Applications 3
- ST 350 Economics and Business Statistics 3

Natural & Physical Sciences

- CH 101 Chemistry - A Molecular Science 3
- CH 102 General Chemistry Laboratory 1
- PY 211 College Physics I 4
- BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
- SSC 200 Soil Science 4
& SSC 201 and Soil Science Laboratory 4

Select one of the following: 4
- CH 201 Chemistry - A Quantitative Science
& CH 202 and Quantitative Chemistry Laboratory
- PY 212 College Physics II

AES Major Requirements

- BAE 100 Introduction to Biological Engineering 1
- BAET 201 Shop Processes and Management 3
- BAET 323 Water Management 3
- BAET 332 Management of Animal Environments 4
- BAET 343 Agricultural Electrification 4
- BAET 432 Agricultural and Environmental Safety and Health 3
- CSC 200 Introduction to Computers and Their Uses 3
or AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed
- GC 120 Foundations of Graphics 3
- ARE 201 Introduction to Agricultural & Resource Economics 3
- AEE 323 Leadership Development in Agriculture and Life Sciences 3

Environmental Systems Management

Select one of the following 3
- BAET 333 Processing Agricultural Products
- BAET 411 Agricultural Machinery and Power Units
- BAE 435 Precision Agriculture Technology
- BAE 535 Precision Agriculture Technology
- BAE 325 Introductory Geomatics 3
- BAET 443 Environmental Restoration Implementation 3
- GIS 510 Fundamentals of Geospatial Information Science and Technology 3

ARE Electives

- ARE Electives (p. 254) 6
- Restricted Electives (p. 254) 15

GEP Courses

- ENG 101 Academic Writing and Research 1 4
- GEP Humanities (p. 1423) 3
- GEP Social Sciences (p. 1430) 3
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement) 3
- GEP Global Knowledge (p. 1419) (verify requirement) 3
- Foreign Language Proficiency (p. 1417) (verify requirement) 3

Free Elective

Free Elective 2 1

Total Hours 120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

ARE Electives

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<td>Environmental Law &amp; Economic Policy</td>
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Restricted Electives

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Group C - Applied Sci & Tech

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AEE 208 Agricultural Biotechnology: Issues and Implications 3
AEE 230 Introduction to Cooperative Extension 3
AEE 303 Administration and Supervision of Student Organizations 3
AEE 311 Communication Methods and Media 3
AEE 322 Experiential Learning in Agriculture 3
AEE 323 Leadership Development in Agriculture and Life Sciences 3
AEE 325 Planning and Delivering Non-Formal Education 3
AEE 326 Teaching Diverse Learners in AED 3
AEE 327 Conducting Summer Programs in Agricultural Education 1
AEE 350 Personal Leadership Development in Agriculture and Life Sciences 3
AEE 360 Developing Team Leadership in Agriculture and Life Sciences 3
AEE 423 Practicum in Agricultural Extension/Industry 8
AEE 424 Planning Agricultural Educational Programs 3
AEE 426 Methods of Teaching Agriculture 3
AEE 427 Student Teaching in Agriculture 8
AEE 433 Leadership and Management of Volunteers in Agricultural and Extension Education 3
AEE 435 Professional Presentations in Agricultural Organizations 3
AEE 460 Organizational Leadership Development in Agriculture and Life Sciences 3
AEE 478 Advanced Issues in Extension Education 3
AEE 490 Seminar in Agricultural and Extension Education 1
AEE 533 Leadership and Management of Volunteers in Agricultural and Extension Education 3
BAET 201 Shop Processes and Management 3
BAET 323 Water Management 3
BAET 332 Management of Animal Environments 4
BAET 332 Management of Animal Environments 4
BAET 333 Processing Agricultural Products 4
BAET 343 Agricultural Electrification 4
BAET 411 Agricultural Machinery and Power Units 4
BAET 432 Agricultural and Environmental Safety and Health 3
BAET 443 Environmental Restoration Implementation 3
ALS 110 Academic and Career Skills Seminar 1
ANS 105 Introduction to Companion Animal Science 3
ANS 110 Introduction to Equine Science 3
ANS 150 Introduction to Animal Science 3
ANS 151 Introduction to Animal Science Lab 1
ANS 201 Techniques of Animal Care 2
ANS 208 Agricultural Biotechnology: Issues and Implications 3
ANS 225 Principles of Animal Nutrition 3
ANS 303 Principles of Equine Evaluation 2
ANS 304 Dairy Cattle Evaluation 2
ANS 309 Livestock Evaluation 3
ANS 322 Muscle Foods and Eggs 3
ANS 324 Milk and Dairy Products 3
ANS 400 Companion Animal Management 3
ANS 402 Beef Cattle Management 3
ANS 403 Swine Management 3
ANS 404 Dairy Cattle Management 3
ANS 408 Small Ruminant Management 3
ANS 410 Equine Breeding Farm Management 3
ANS 425 Feed Manufacturing Technology 3
ANS 440 Animal Genetic Improvement 3
ANS 453 Physiology and Genetics of Growth and Development 3
ANS 454 Lactation, Milk and Nutrition 3
ANS 525 Feed Manufacturing Technology 3
ANS 540 Animal Genetic Improvement 3
ANS 553 Physiology and Genetics of Growth and Development 3
ANS 554 Lactation, Milk and Nutrition 3
BAE 100 Introduction to Biological Engineering 1
BAE 202 Introduction to Biological and Agricultural Engineering Methods 4
BAE 302 Transport Phenomena 3
BAE 322 Introduction to Food Process Engineering 3
BAE 361 Analytical Methods in Engineering Design 3
BAE 371 Fundamentals of Hydrology for Engineers 3
BAE 401 Sensors and Controls 3
BAE 435 Precision Agriculture Technology 3
BAE 451 Engineering Design I 2
BAE 452 Engineering Design II 2
BAE 462 Machinery Design and Applications 3
BAE 472 Irrigation and Drainage 3
BAE 473 Introduction to Hydrologic and Water Quality Modeling 3
BAE 474 Principles and Applications of Ecological Engineering 3
BAE 481 Structures & Environment 3
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**Group C - Applied Sci & Tech**

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<td>Management of Animal Environments</td>
<td>4</td>
</tr>
<tr>
<td>BAET 323</td>
<td>Water Management</td>
<td>3</td>
</tr>
<tr>
<td>BAET 333</td>
<td>Processing Agricultural Products</td>
<td>3</td>
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<tr>
<td>Agriculture and Resource Economics Elective</td>
<td>3</td>
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<tr>
<td>GIS 280</td>
<td>Introduction to GIS</td>
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**Fourth Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BAET 432</td>
<td>Agricultural and Environmental Safety and Health</td>
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<td>BAET 443</td>
<td>Environmental Restoration Implementation</td>
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<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>Communications Elective</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>Group A, B, and C Elective</td>
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<tr>
<td>Group A, B, or C Elective</td>
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<tr>
<td>BAET 450</td>
<td>Biological and Agricultural Engineering Technology Capstone</td>
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<tr>
<td>GEP Additional Breadth (p. 1417)</td>
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<td></td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Career Opportunities**

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization though selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level
salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The BAET curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum's flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.

**Biological and Agricultural Engineering Technology (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The BAET minor is offered to students interested in the application of engineering technology analysis in agricultural and environmental systems that utilize machinery, agricultural structures, food and feed processing, soil, water and waste management, electrical power and controls, and agricultural safety and health technology. It allows majors in other programs to understand engineering technology for equipment, materials, resources, processes, and facilities utilized in their major area of study, and be knowledgeable in the application of technology for managing environmental issues, impacts, and monitoring.

**Admissions**

Students who plan to minor in Agricultural and Engineering Technology should contact Dr. Crowell Bowers for consultation and approval. Admission to the minor requires a cumulative grade point average of 2.0 or higher. Students should contact the Biological and Agricultural Engineering Undergraduate Coordinator to inquire about adding the minor no later than the registration period for the student’s final semester at NC State. A minor advisor will be assigned to all of the students enrolled.

**Certification**

The minor should be declared as soon as the student decides to pursue it. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact Person**

S. Andrew Hale  
108 Weaver Labs  
919.515.6760  
andy_hale@ncsu.edu

**SIS Code: 11BAET**

**Plan Requirements**

- Completion of a minimum of 15 credit hours.
- Open to all students at NC State except students majoring in Biological and Agricultural Engineering Technology (BAET).
- The program is flexible in order for students to be able to emphasize the area of their interest.

### Required Course

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
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<td>BAET</td>
<td>Water Management</td>
<td>3</td>
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<tr>
<td>BAET</td>
<td>Management of Animal Environments</td>
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<tr>
<td>BAET</td>
<td>Agricultural and Environmental Safety and Health</td>
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### Elective Courses

<table>
<thead>
<tr>
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<tr>
<td>BAET</td>
<td>Shop Processes and Management</td>
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<tr>
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<td>Water Management</td>
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<tr>
<td>BAET</td>
<td>Management of Animal Environments</td>
<td></td>
</tr>
<tr>
<td>BAET</td>
<td>Processing Agricultural Products</td>
<td></td>
</tr>
<tr>
<td>BAET</td>
<td>Agricultural Electrification</td>
<td></td>
</tr>
<tr>
<td>BAET</td>
<td>Agricultural Machinery and Power Units</td>
<td></td>
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<td>BAET</td>
<td>Agricultural and Environmental Safety and Health</td>
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<td>BAE</td>
<td>Environmental Restoration Implementation</td>
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<td>BAE</td>
<td>Environmental Geomatics</td>
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<tr>
<td>BAE</td>
<td>Precision Agriculture Technology</td>
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</table>

Total Hours: 15

### Biological Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The BE curriculum is jointly administered by the College of Agriculture and Life Sciences and the College of Engineering and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. BE graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements. Specific curriculum requirements are available online.

BAE faculty, in concert with program constituencies, has developed the following undergraduate program objectives. Within the first five years following graduation, NC State’s Biological Engineering graduates will:

- Excel in their careers or in graduate school by applying their knowledge of engineering principles, processes, and procedures;
- Practice engineering professionally and ethically;
- Communicate effectively in a professional environment; and
- Be engaged in life-long learning and professional development.

### Plan Requirements

#### Biological Engineering (BS): 128 Total Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory ¹</td>
<td>1</td>
</tr>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving ²</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research ²</td>
<td>4</td>
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### Spring Semester

Select one of the following:  
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
</tr>
<tr>
<td>CH 202</td>
<td>and Quantitative Chemistry Laboratory</td>
</tr>
<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
</tr>
<tr>
<td>CH 222</td>
<td>and Organic Chemistry I Lab</td>
</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>CH 222</td>
<td>and Organic Chemistry I Lab</td>
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</table>

**Hours**: 14

### Second Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BAE 200</td>
<td>Computer Methods in Biological Engineering</td>
</tr>
<tr>
<td>CE 214 or MAE 206</td>
<td>Engineering Mechanics-Statics or Engineering Statics</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Lab</td>
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**Hours**: 17

#### Spring Semester

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<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BAE 202</td>
<td>Introduction to Biological and Agricultural Engineering Methods</td>
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<tr>
<td>BAE 203 &amp; BAE 204</td>
<td>Introduction to AutoCAD Civil 3D for Environmental &amp; Ecological Engineers and Introduction to Environmental and Ecological Engineering</td>
</tr>
<tr>
<td>CE 215 or MAE 208</td>
<td>Engineering Mechanics-Dynamics or Engineering Dynamics</td>
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**Hours**: 16

### Third Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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<td>Transport Phenomena</td>
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<table>
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<th>Course</th>
<th>Title</th>
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<tr>
<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
</tr>
<tr>
<td>BAE 361</td>
<td>Analytical Methods in Engineering Design</td>
</tr>
<tr>
<td>BAE 371</td>
<td>Fundamentals of Hydrology for Engineers</td>
</tr>
<tr>
<td>BAE 481</td>
<td>Structures &amp; Environment</td>
</tr>
<tr>
<td>CE 208 or MAE 308</td>
<td>Hydraulics or Fluid Mechanics</td>
</tr>
<tr>
<td>BAE 305</td>
<td>Biological Engineering Circuits</td>
</tr>
<tr>
<td>ENG 331 or ENG 333</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
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</table>

**Hours**: 16

### Fourth Year

#### Fall Semester

Select one of the following:  
<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BAE 452</td>
<td>Engineering Design II</td>
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<tr>
<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
</tr>
<tr>
<td>BAE 474</td>
<td>Principles and Applications of Ecological Engineering</td>
</tr>
<tr>
<td>BAE 488</td>
<td>Postharvest Engineering</td>
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<tr>
<td>BAE 525</td>
<td>Industrial Microbiology and Bioprocessing</td>
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**Hours**: 14

#### Spring Semester

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<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
</tr>
<tr>
<td>STS 301</td>
<td>Science and Civilization</td>
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<tr>
<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
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**Hours**: 15

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1. A grade of C or higher is required.
2. A grade of C- or higher is required.
### GEP Courses

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<tr>
<th>Code</th>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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### Biological Science/Chemistry Electives

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<td>AEC 360</td>
<td>Ecology</td>
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<tr>
<td>BIO 361</td>
<td>Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 414</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
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<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
<td>3</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
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<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
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<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
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<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
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<tr>
<td>HS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
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<tr>
<td>HS 562</td>
<td>Postharvest Physiology</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology</td>
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<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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<td>PB 360</td>
<td>Ecology</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 332</td>
<td>Environmental Soil Microbiology</td>
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### Advanced Biology Elective

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<tbody>
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<td>Ecology</td>
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<tr>
<td>BIO 361</td>
<td>Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 414</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
<tr>
<td>HS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>HS 562</td>
<td>Postharvest Physiology</td>
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</tr>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PB 360</td>
<td>Ecology</td>
<td>4</td>
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<td>SSC 332</td>
<td>Environmental Soil Microbiology</td>
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### Engineering Electives

<table>
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<tr>
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<tbody>
<tr>
<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
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<td>BAE 361</td>
<td>Analytical Methods in Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>BAE 371</td>
<td>Fundamentals of Hydrology for Engineers</td>
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</tr>
<tr>
<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
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<tr>
<td>BAE 462</td>
<td>Machinery Design and Applications</td>
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<tr>
<td>BAE 472</td>
<td>Irrigation and Drainage</td>
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<td>BAE 473</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
<td>3</td>
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<td>BAE 474</td>
<td>Principles and Applications of Ecological Engineering</td>
<td>3</td>
</tr>
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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
<td>3</td>
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<td>BAE 525</td>
<td>Industrial Microbiology and Bioprocessing</td>
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<td>BAE 528</td>
<td>Biomass to Renewable Energy Processes</td>
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<td>BAE 572</td>
<td>Irrigation and Drainage</td>
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<td>BAE 573</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<td>CHE 435</td>
<td>Process Systems Analysis and Control</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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<td>SSC 473</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<tr>
<td>SSC 573</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<tr>
<td>TE 435</td>
<td>Process Systems Analysis and Control</td>
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</table>

### Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
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</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>1</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td><strong>Total Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>CH 201 &amp; CH 202</td>
<td>Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory</td>
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<tr>
<td>CH 220 &amp; CH 222</td>
<td>Introductory Organic Chemistry and Organic Chemistry I Lab</td>
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<tr>
<td>CH 221 &amp; CH 222</td>
<td>Organic Chemistry I and Organic Chemistry I Lab</td>
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<td>MA 241</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>PY 206</td>
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</table>
Select one of the following:  
**EC 205** Fundamentals of Economics  
**ARE 201** Introduction to Agricultural & Resource Economics  
**EC 201** Principles of Microeconomics

### Second Year

#### Fall Semester

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<th>Course Title</th>
<th>Hours</th>
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<td>BAE 200</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<td>PY 208</td>
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<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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#### Spring Semester

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<th>Course Title</th>
<th>Hours</th>
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<td>BAE 202</td>
<td>Introduction to Biological and Agricultural Engineering Methods</td>
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<tr>
<td>BAE 203 &amp; BAE 204</td>
<td>Introduction to AutoCAD Civil 3D for Environmental &amp; Ecological Engineers and Introduction to Environmental and Ecological Engineering</td>
<td>3</td>
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<td>MAE 208</td>
<td>Engineering Dynamics</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
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### Third Year

#### Fall Semester

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<tr>
<td>BAE 302</td>
<td>Transport Phenomena</td>
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<td>BAE 361</td>
<td>Analytical Methods in Engineering Design</td>
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<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
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<tr>
<td>BAE 371</td>
<td>Fundamentals of Hydrology for Engineers</td>
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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
<td>3</td>
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<tr>
<td>MAE 308</td>
<td>Fluid Mechanics 1 or Hydraulics</td>
<td>3</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
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<tr>
<td>BAE 305</td>
<td>Biological Engineering Circuits</td>
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#### Spring Semester

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<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
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### Fourth Year

#### Fall Semester

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<td>Engineering Design I</td>
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<td>Introduction to Food Process Engineering</td>
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<td>BAE 371</td>
<td>Fundamentals of Hydrology for Engineers</td>
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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
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Select one of the following:  

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<td>IDS 201</td>
<td>Environmental Ethics</td>
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<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<td>Ethical Dimensions of Progress</td>
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### Spring Semester

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<td>GEP Social Sciences</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td></td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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### Total Hours

128

1. A grade of C- or higher is required.

### Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization through selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop...
Biological Engineering (BS): Agricultural Engineering Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The BE curriculum is jointly administered by the College of Agriculture and Life Sciences and the College of Engineering and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. BE graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements. Specific curriculum requirements are available online.

BAE faculty, in concert with program constituencies, has developed the following undergraduate program objectives. Within the first five years following graduation, NC State’s Biological Engineering graduates will:

- Excel in their careers or in graduate school by applying their knowledge of engineering principles, processes, and procedures;
- Practice engineering professionally and ethically;
- Communicate effectively in a professional environment; and
- Be engaged in life-long learning and professional development.

Plan Requirements

### Biological Engineering (BS): Agricultural Engineering Concentration

#### Course Title Hours

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<tr>
<td>Fall Semester</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>Code</td>
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<td>CE 282</td>
<td>Hydraulics</td>
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<tr>
<td>or MAE 308</td>
<td>Fluid Mechanics</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>or ENG 333</td>
<td>or Communication for Science and Research</td>
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### Spring Semester

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<td>BAE 361</td>
<td>Analytical Methods in Engineering Design</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>CE 225</td>
<td>Mechanics of Solids</td>
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<td>or MAE 214</td>
<td>Solid Mechanics</td>
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### Fourth Year

#### Fall Semester

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<td>BAE 462</td>
<td>Machinery Design and Applications</td>
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<td>STS 301</td>
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#### Spring Semester

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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
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<td>BAE 488</td>
<td>Postharvest Engineering</td>
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<tr>
<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
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<tr>
<td>or BAE 371</td>
<td>or Fundamentals of Hydrology for Engineers</td>
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1 A grade of C or higher is required.  
2 A grade of C- or higher is required.

### Advanced Biology Elective

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<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
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<td>HS 462</td>
<td>Postharvest Physiology</td>
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<td>HS 562</td>
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<td>MB 351</td>
<td>General Microbiology</td>
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### Semester Sequence

This is a sample.

#### Course    | Title                                         | Hours |
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<tr>
<td>Fall Semester</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<td>Academic Writing and Research</td>
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#### Spring Semester

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<tr>
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<tr>
<td></td>
<td><strong>GEP Health and Exercise Studies (p. 1422)</strong></td>
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#### Second Year

#### Fall Semester

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<td>BAE 200</td>
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<td>or Engineering Mechanics-Statics</td>
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<td>PY 209</td>
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<td>BIO 181</td>
<td>Introductory Biology; Ecology, Evolution, and</td>
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<td>or BIO 183</td>
<td>Biodiversity or Introductory Biology; Cellular and Molecular Biology</td>
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**Code**

**Title**

**Hours**

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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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Spring Semester

<table>
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<th>Title</th>
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<tbody>
<tr>
<td>BAE 202</td>
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</tr>
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<td>MAE 208</td>
<td>Engineering Dynamics ¹</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
<td>3</td>
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<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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Total Hours: 16

Third Year

Fall Semester

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<tbody>
<tr>
<td>BAE 325</td>
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<td>Transport Phenomena</td>
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<td>Fluid Mechanics ¹</td>
<td>3</td>
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<td>or CE 282</td>
<td>or Hydraulics</td>
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<td>BAE 305</td>
<td>Biological Engineering Circuits</td>
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<td>ENG 331</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
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Total Hours: 16

Spring Semester

<table>
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<th>Credits</th>
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<tbody>
<tr>
<td>BAE 401</td>
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<td>Analytical Methods in Engineering Design</td>
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<td>MAE 214</td>
<td>Solid Mechanics ¹</td>
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Total Hours: 15

Fourth Year

Fall Semester

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Spring Semester

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Total Hours: 16

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<th></th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>Total Hours</strong></td>
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</table>

¹ A grade of C- or higher is required.

Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization though selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

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Biological Engineering (BS):
Bioprocessing Engineering Concentration

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- Excel in their careers or in graduate school by applying their knowledge of engineering principles, processes, and procedures;
- Practice engineering professionally and ethically;
- Communicate effectively in a professional environment; and
- Be engaged in life-long learning and professional development.

Plan Requirements

Biological Engineering (BS), Bioprocessing Engineering Concentration: 128 Total Units
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science $^1$</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory $^1$</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving $^2$</td>
<td>1</td>
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<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research $^2$</td>
<td>4</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I $^1$</td>
<td>4</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>BAE 100</td>
<td>Introduction to Biological Engineering</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<tr>
<td>MA 241</td>
<td>Calculus II $^1$</td>
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<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td>BAE 200</td>
<td>Computer Methods in Biological Engineering</td>
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<tr>
<td>CE 214 or MAE 206</td>
<td>Engineering Mechanics-Statics $^2$</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<td>CH 223</td>
<td>Organic Chemistry II</td>
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<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>BAE 202</td>
<td>Introduction to Biological and Agricultural Engineering Methods</td>
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<tr>
<td>CE 215 or MAE 208</td>
<td>Engineering Mechanics-Dynamics $^2$</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>Engineering Thermodynamics I</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>Transport Phenomena</td>
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<td>Bioprocessing Engineering Fundamentals</td>
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<td>STS 301</td>
<td>Science and Civilization</td>
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<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
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<td>ENG 331 or ENG 333</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
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<td>Industrial Microbiology and Bioprocessing</td>
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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td><strong>Total Hours</strong></td>
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$^1$ A grade of C or higher is required.

$^2$ A grade of C- or higher is required.
## Bioprocessing Engineering Elective

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<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
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<td>BEC 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>BEC 485</td>
<td>cGMP Downstream Operations</td>
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<td>BEC 488</td>
<td>Animal Cell Culture Engineering</td>
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<tr>
<td>BEC 536</td>
<td>Introduction to Downstream Process Development</td>
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<tr>
<td>BEC 563</td>
<td>Fermentation of Recombinant Microorganisms</td>
<td>2</td>
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<tr>
<td>BEC 585</td>
<td>cGMP Downstream Operations</td>
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<td>BIT 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>BIT 563</td>
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<td>CHE 435</td>
<td>Process Systems Analysis and Control</td>
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<td>CHE 463</td>
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<td>CHE 488</td>
<td>Animal Cell Culture Engineering</td>
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<td>CHE 563</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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<td>TE 435</td>
<td>Process Systems Analysis and Control</td>
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## Semester Sequence

This is a sample.

### Course

#### Fall Semester

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory ¹</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving ¹</td>
<td>1</td>
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<td>E 115</td>
<td>Introduction to Computing Environments ¹</td>
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<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
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<tr>
<td>MA 141</td>
<td>Calculus I ¹</td>
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#### Spring Semester

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<td>BAE 100</td>
<td>Introduction to Biological Engineering</td>
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</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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</tr>
<tr>
<td>MA 241</td>
<td>Calculus II ¹</td>
<td>4</td>
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<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I ¹</td>
<td>3</td>
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<tr>
<td>PY 206</td>
<td>Physics for Engineers and Scientists I Labor</td>
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Select one of the following:

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<tbody>
<tr>
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<td>Principles of Microeconomics</td>
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</tr>
<tr>
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<td>ARE 201</td>
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#### Second Year

<table>
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<th>Code</th>
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<tbody>
<tr>
<td>BAE 200</td>
<td>Computer Methods in Biological Engineering</td>
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<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BAE 202</td>
<td>Introduction to Biological and Agricultural Engineering Methods</td>
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<tr>
<td>MAE 208</td>
<td>Engineering Dynamics ¹</td>
<td>3</td>
</tr>
<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>MAE 201</td>
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#### Third Year

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<tr>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>BAE 302</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>BAE 321</td>
<td>Bioprocessing Engineering Fundamentals</td>
<td>3</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology</td>
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<td>MA 308</td>
<td>Fluid Mechanics ¹</td>
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<tr>
<td>BAE 305</td>
<td>Biological Engineering Circuits</td>
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#### Fourth Year

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<td>BAE 451</td>
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<tr>
<td>Bioprocessing Engineering Elective</td>
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<td>IDS 201</td>
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<td>STS 301</td>
<td>Science and Civilization</td>
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<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>ENG 331</td>
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<tbody>
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<table>
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### Hours

- Total Hours: 46
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Plan Requirements

Biological Engineering (BS): Ecological Engineering Concentration: 128 Total Units

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<td>General Chemistry Laboratory</td>
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<td>Calculus II</td>
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<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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1 Must be completed with a grade of C- or higher.
BIO 181  Introductory Biology: Ecology, Evolution, and Biodiversity  4

Spring Semester
BAE 203  Introduction to AutoCAD Civil 3D for Environmental & Ecological Engineers  2
BAE 204  Introduction to Environmental and Ecological Engineering  2
MAE 208  Engineering Dynamics  2
MA 341  Applied Differential Equations I  3
MAE 201  Engineering Thermodynamics I  3
SSC 200  Soil Science  3

Hours  17

Third Year
Fall Semester
BAE 302  Transport Phenomena  3
BAE 305  Biological Engineering Circuits  4
BAE 371  Fundamentals of Hydrology for Engineers  3
CE 282  Hydraulics  2
PB 360  Ecology  4

Hours  17

Spring Semester
BAE 376  Watershed Assessment and Water Quality Protection  3
BAE 401  Sensors and Controls  3
CE 225 or MAE 214  Mechanics of Solids or Solid Mechanics  3
ST 370  Probability and Statistics for Engineers  3

Hours  12

Fourth Year
Fall Semester
BAE 325  Introductory Geomatics  3
BAE 451  Engineering Design I  2
BAE 473  Introduction to Hydrologic and Water Quality Modeling  3
BAE 474  Principles and Applications of Ecological Engineering  3
ENG 331 or ENG 333  Communication for Engineering and Technology or Communication for Science and Research  3

Ethics Elective (p. 278)  3

Hours  17

Spring Semester
BAE 452  Engineering Design II  2
Engineering Elective (p. 278)  3

Hours  5

Total Hours  113

1 A grade of C or higher is required.
2 A grade of C- or higher is required.
Second Year

Fall Semester

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<td>MA 242</td>
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Spring Semester

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Third Year

Fall Semester

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Spring Semester

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Fourth Year

Fall Semester

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<td>BAE 473</td>
<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<td>Principles and Applications of Ecological Engineering</td>
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Spring Semester

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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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Total Hours 129

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Career Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization though selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The BAET curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum’s flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.
Biological Engineering (BS): Environmental Engineering Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The BE curriculum is jointly administered by the College of Agriculture and Life Sciences and the College of Engineering and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. BE graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements. Specific curriculum requirements are available online.

BAE faculty, in concert with program constituencies, has developed the following undergraduate program objectives. Within the first five years following graduation, NC State's Biological Engineering graduates will:

• Excel in their careers or in graduate school by applying their knowledge of engineering principles, processes, and procedures;
• Practice engineering professionally and ethically;
• Communicate effectively in a professional environment; and
• Be engaged in lifelong learning and professional development.

Plan Requirements

Biological Engineering (BS): Environmental Engineering Concentration: 128 Total Units

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<tr>
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<td>CH 101</td>
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<td>CH 102</td>
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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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**Spring Semester**

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**Second Year**

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**Spring Semester**

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**Semester Sequence**

This is a sample.

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<td>SSC 371</td>
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<td>CE 282</td>
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1 A grade of C or higher is required.
2 A grade of C- or higher is required.

**GEP Courses**

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<tr>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Total Hours**

112
B.A. 305 Biological Engineering Circuits 4

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<tbody>
<tr>
<td>BAE 401 Sensors and Controls 3</td>
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<tr>
<td>BAE 472 Irrigation and Drainage 3</td>
</tr>
<tr>
<td>MAE 214 Solid Mechanics 3</td>
</tr>
<tr>
<td>or CE 225 Mechanics of Solids 3</td>
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<tr>
<td>ST 370 Probability and Statistics for Engineers 3</td>
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<tr>
<td>Advanced Biology Elective 3</td>
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| Hours | 16 |

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<th>Fourth Year</th>
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<td>Fall Semester</td>
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<tr>
<td>BAE 451 Engineering Design I 2</td>
</tr>
<tr>
<td>BAE 478 Agricultural Waste Management 3</td>
</tr>
<tr>
<td>Ethics 3</td>
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<tr>
<td>GEP Humanities (p. 1423) 3</td>
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<tr>
<td>ENG 331 Communication for Engineering and Technology or Communication for Science and Research 3</td>
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| Hours | 17 |

<table>
<thead>
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<th>Spring Semester</th>
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<tr>
<td>BAE 452 Engineering Design II 2</td>
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<td>GEP Social Sciences (p. 1430) 3</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426) 2</td>
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<td>GEP Humanities (p. 1423) 3</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422) 1</td>
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</table>

| Hours | 17 |
| Total Hours | 128 |

1 A grade of C- or higher is required.

**Career Opportunities**

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization through selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

The B.A.E. curriculum provides graduates opportunities in technical analysis, application and evaluation of agricultural production systems and environmental systems. The curriculum’s flexibility enables students to specialize technologically in agriculture, the environment, or business management. Careers include technical jobs in production agriculture, environmental systems, agribusiness sales and service, and agricultural extension.

**Department of Crop and Soil Sciences**

We roll up our sleeves and get our hands dirty to accomplish great things in the Department of Crop and Soil Sciences. Our world-class undergraduate programs prepare students to answer environmental and agricultural challenges, building on our rich history of growing agricultural and environmental sciences in North Carolina and around the globe. But our focus is on the future, because the solutions for feeding a growing population, conserving natural resources and dealing with climate change are rooted in crop and soil sciences.

We conduct research that drives innovation and new technology, expands understanding and provides science-based information to solve problems, but we don’t stop there. We make sure our graduates, stakeholders and partners put their gained knowledge and innovation to work for a better tomorrow.

A quick overview of our programs:

- The Bachelor of Science (B.S.) program has three specialty areas to choose from: Agronomy, Crop Biotechnology, and Soil Science
- Two undergraduate certificate programs (the Crop Science Certificate and Soil Science Certificate) that allow participants to focus their attention on the core courses of our undergraduate degree programs; both can be completed through distance education (online).
- Two associate degrees through the Agricultural Institute
- Four undergraduate minors

Here are some highlights about our department:

- Our students have the opportunity to join a number of clubs and organizations, from Agronomy Club to Agribusiness/NAMA Club
- Join fellow CALS students on study abroad adventures to

For more information about this department, including contact information, visit our website.

**For Additional Information**

If you need additional information, or have questions about the undergraduate programs in the Department of Crop and Soil Sciences, you can contact the Undergraduate Programs Office at 919.515.5820 or by email at cropsoil-undergraduate-office@ncsu.edu
Faculty
Department Head
Jeff Mullahey

Undergraduate Coordinator for Crop and Soil Sciences
David A. Crouse

Director of Graduate Programs for Crop Science
Charles Peacock

Director of Graduate Programs for Soil Science
Rich McLaughlin

Department Extension Leader
Deanna L. Osmond

Distinguished University Professor
M.M. Goodman

Alumni Distinguished Undergraduate Professor
D.A. Crouse
R.P. Patterson
M.S. Schroeder-Moreno

William Neal Reynolds Professors
M.M. Goodman
D.L. Hesterberg
D.L. Jordan
M.J. Vepraskas

William Neal Reynolds Professor Emeritus
E.A. Wernsman
A.C. York

Professors
A. Amoozegar
D.C. Bowman
S.W. Broome
G. Brown-Guedira, USDA
K.O. Burkey, USDA
T.E. Carter, Jr., (USDA)
R.J. Cooper
C.R. Crozier
R.E. Dewey
E.J. Dunphy
K.L. Edmisten
L.R. Fisher
C.H. Haigler
J.L. Havlin
R.W. Heiniger
D.L. Hesterberg
J.B. Holland, (USDA)
T.G. Isleib
R.S. Lewis
D.P. Livingston, USDA
J.M. Luginbuhl
D.S. Marshall, (USDA)
R.A. McLaughlin
G.L. Miller
M.D. Mullen
J.P. Murphy
D.L. Osmond
C.H. Peacock
R. Qu
T.W. Rufty, Jr.
R.J. Richardson
W.P. Robarge
W. Shi
T.J. Smyth
H.T. Stalker
M.G. Wagger
G.G. Wilkerson
F.H. Yelverton
Professors Emeriti
D.T. Bowman
S.W. Buol
J.C. Burns
J.W. Burton
B.E. Caldwell
D.K. Cassel
D.S. Chamblee
H.D. Coble
W.K. Collins
M.G. Cook
F.T. Corbin
F.R. Cox
G.A. Cummings
J.W. Gilliam
D.W. Israel
J.T. Green, Jr.
H.D. Gross
G.R. Gwynn
R.E. Jarrett
G.L. Jones
L.D. King
H.J. Kleiss
J.A. Lee
W.H. Lewis
H.M. Linker
R.C. Long
G.S. Miner
J.P. Mueller
G.F. Peedin
L.L. Phillips
C.D. Raper
G.A. Sullivan
D.L. Thompson
R.J. Volk
J.B. Weber
S.B. Weed
A.K. Weissinger
P.R. Weisz
A.G. Wollum
A.D. Worsham

Associate Professors
A.J. Cardinal
O. Duckworth
A.K. Graves
J.L. Heitman
V. Kuraparthy
S.R. Milla-Lewis
S.C. Reberg-Horton
M.S. Schroeder-Moreno
L.J. Unruh Snyder
J.G. White

Associate Professors Emeriti
D.A. Danehower
R.L. Davis
J.P. Lilly
G.C. Naderman

Assistant Professors
W.J. Everman
T.G. Gardner
M.L. Polizzotto
E. Taliercio, (USDA)

Adjunct Professors
T.M. Crosbie
D.C. Drehmel
K.D. Getsinger
E.B. Godshalk
P.G. Hunt
Agroecology & Sustainable Food Systems (BS): Agroecology Research & Production Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Bachelor of Science in Plant and Soil Sciences degree is a flexible program that allows students to choose from a wide range of programs, based on their personal interests and career goals. Students can select a concentration from six areas of study including Agroecology, Agronomic Business, Agronomic Science, Crop Biotechnology, Crop Production, and Soil Science. Each concentration provides a strong science-based foundation as well as technical and supporting courses related to each individual discipline.

Plan Requirements

Agroecology & Sustainable Food Systems (BS): Agroecology Research & Production Concentration: 120 Total Units

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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>Mathematics &amp; Natural Sciences</td>
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<tr>
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<td>Calculus I</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<td>or PB 200</td>
<td>Plant Life</td>
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<td>Chemistry - A Molecular Science</td>
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<td>General Chemistry Laboratory</td>
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<td>AEC 360</td>
<td>Ecology</td>
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<td>Communication/Advanced Writing</td>
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<td>Public Speaking</td>
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<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
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<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>CS 230</td>
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<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
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<td>CS 430</td>
<td>Advanced Agroecology</td>
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<td>HS 410</td>
<td>Community Food Systems</td>
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### Foundational Electives

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<td>CH 220</td>
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<td>CH 221</td>
<td>Organic Chemistry I</td>
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<td>Organic Chemistry I Lab</td>
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<td><strong>Group II (Max: 4 Units)</strong></td>
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<td>CS 213</td>
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<td>HS 431</td>
<td>Vegetable Production</td>
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<tr>
<td><strong>Group III (Max: 4 Units)</strong></td>
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<tr>
<td>PY 131</td>
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### Restricted Electives

#### 300+ Level Electives

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<td>AEC 400</td>
<td>Applied Ecology</td>
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<td>ANS 408</td>
<td>Small Ruminant Management</td>
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<td>CS 312</td>
<td>Grassland Management for Natural Resources Conservation</td>
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<td>CS 411</td>
<td>Crop Ecology</td>
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<td>ENT 425</td>
<td>General Entomology</td>
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<td>ENT 526</td>
<td>Organic Agriculture: Principles and Practices</td>
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<td>ES 300</td>
<td>Energy and Environment</td>
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<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
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<td>FS 520</td>
<td>Pre-Harvest Food Safety</td>
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<td>FS 530</td>
<td>Post-Harvest Food Safety</td>
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<td>FS 562</td>
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<td>FSA 520</td>
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<td>FSA 530</td>
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<td>HS 432</td>
<td>Introduction to Permaculture</td>
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<tr>
<td>HS 451</td>
<td>Plant Nutrition</td>
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<td>HS 462</td>
<td>Postharvest Physiology</td>
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<td>HS 532</td>
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<td>HS 551</td>
<td>Plant Nutrition</td>
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<td>HS 562</td>
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<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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<tr>
<td>PB 345</td>
<td>Economic Botany</td>
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<td>PB 346</td>
<td>Economic Botany Lab</td>
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<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<td>Soil and Plant Nutrient Analysis</td>
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<td>Soil Physical Properties and Plant Growth</td>
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<td>Soil-Crop Management Systems</td>
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<td>FOR 318</td>
<td>Forest Pathology</td>
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<tr>
<td>PP 315</td>
<td>Principles of Plant Pathology</td>
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### Semester Sequence

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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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</tr>
<tr>
<td>or ALS 303</td>
<td>or Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>MA 107</td>
<td>Precalculus I</td>
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## Foundation Elective

<table>
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<tr>
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<th>Course Title</th>
<th>Hours</th>
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<tbody>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology or Plant Life</td>
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<td>PB 200</td>
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<td>Calculus for Life and Management Sciences A</td>
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<td>Calculus I</td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COM 112</td>
<td>or Interpersonal Communication</td>
<td></td>
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### Second Year

#### Fall Semester

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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
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Select one of the following:  

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<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
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<td>IDS 211</td>
<td>Eating through American History</td>
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<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<tr>
<td>AEC/PB 360</td>
<td>Ecology</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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### Third Year

#### Fall Semester

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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
<td>3</td>
</tr>
<tr>
<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems or Environmental Soil Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>or SSC 332</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS/HS 410</td>
<td>Community Food Systems</td>
<td>3</td>
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Select one of the following:  

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td></td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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</tr>
</tbody>
</table>

**Career Opportunities**

The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

- Agronomist
- Agronomy Sales and Management
- Athletic Turf Manager
- Crop Advisor
- Conservationist
- Crops Systems Specialist
- Ecologist
- Environmental Scientist and Specialist
- Extension Agent
- Golf Course Superintendent
- Hydrologist
- Nutrient Management/ Waste Management Specialist
- Plant Breeder
- Precision Agriculture Specialist
- Real Estate Manager
- Research Station Manager
- Restoration Specialist
• Seed Production Agronomist
• Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers

### Agroecology & Sustainable Food Systems (BS): Community Food Systems Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Bachelor of Science in Plant and Soil Sciences degree is a flexible program that allows students to choose from a wide range of programs, based on their personal interests and career goals. Students can select a concentration from six areas of study including Agroecology, Agronomic Business, Agronomic Science, Crop Biotechnology, Crop Production, and Soil Science. Each concentration provides a strong science-based foundation as well as technical and supporting courses related to each individual discipline.

### Plan Requirements

#### Agroecology & Sustainable Food Systems (BS): Community Food Systems Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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**Mathematics & Natural Sciences**

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<td>MA 107</td>
<td>Precalculus I</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<td>or PB 200</td>
<td>Plant Life</td>
<td>3</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>AEC 360</td>
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**Communication/Advanced Writing**

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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
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<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>AEE 311</td>
<td>Communication Methods and Media</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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**Major Requirements**

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<tbody>
<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
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<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
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<td>CS 430</td>
<td>Advanced Agroecology</td>
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<td>HS 410</td>
<td>Community Food Systems</td>
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<tr>
<td>HS 480</td>
<td>Sustainable Food Production (capstone)</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
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<tr>
<td>SSC 200</td>
<td>Soil Science</td>
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<tr>
<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<td>STS 323</td>
<td>World Population and Food Prospects</td>
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<tr>
<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
<td>3</td>
</tr>
<tr>
<td>or SSC 332</td>
<td>Environmental Soil Microbiology</td>
<td></td>
</tr>
<tr>
<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
<td>3</td>
</tr>
<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
<td>1</td>
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<tr>
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<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>IDS 211</td>
<td>Eating through American History</td>
<td></td>
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<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>CSSC 492</td>
<td>Professional Internship Experience in Crop and Soil Sciences</td>
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**Concentration Electives**

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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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<tr>
<td>CSSC 492</td>
<td>Research Experience in Crop and Soil Sciences</td>
<td></td>
</tr>
<tr>
<td>HS 429</td>
<td>Horticulture Internship</td>
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</tr>
<tr>
<td>HS 493</td>
<td>Research Experience in Horticultural Science</td>
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**GEP Courses**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
<td>GEP Humanities (p. 1423)</td>
<td>6</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>2</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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</tr>
<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>FS 301</td>
<td>Introduction to Human Nutrition</td>
<td>3</td>
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<tr>
<td>GPH 201</td>
<td>Fundamentals of Global Public Health</td>
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**Foundational Electives**

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<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Group I (Max: 4 Units)</td>
<td>NTR 220 Food and Culture</td>
<td>3</td>
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<td>NTR 420 Applied Nutrition Education</td>
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<td></td>
<td>SOC 311 Community Relationships</td>
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**Group II (Max: 4 Units)**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>FS 301</td>
<td>Introduction to Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>GPH 201</td>
<td>Fundamentals of Global Public Health</td>
<td>3</td>
</tr>
</tbody>
</table>

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
NTR 301  Introduction to Human Nutrition  3  
STS 214  Introduction to Science, Technology, and Society  3  

**Group III (Max: 4 Units)**

AEE 206  Introduction to Teaching Agriculture  3  
AEE 230  Introduction to Cooperative Extension  3  
AEE 311  Communication Methods and Media  3  
NPS 340  Fundamentals of Grant Development for Nonprofits  3  

### Restricted Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEE 311</td>
<td>Communication Methods and Media</td>
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</tr>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>AEE 325</td>
<td>Planning and Delivering Non-Formal Education</td>
<td>3</td>
</tr>
<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 433</td>
<td>U.S. Agricultural Policy</td>
<td>3</td>
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<td>EC 301</td>
<td>Intermediate Microeconomics</td>
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<tr>
<td>HS 431</td>
<td>Vegetable Production</td>
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<tr>
<td>HS 432</td>
<td>Introduction to Permaculture</td>
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<td>HS 532</td>
<td>Introduction to Permaculture</td>
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<td>IDS 303</td>
<td>Humans and the Environment</td>
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<td>NR 303</td>
<td>Humans and the Environment</td>
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<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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<tr>
<td>PB 345</td>
<td>Economic Botany</td>
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<td>PB 346</td>
<td>Economic Botany Lab</td>
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<tr>
<td>SOC 342</td>
<td>International Development</td>
<td>3</td>
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<tr>
<td>SOC 350</td>
<td>Food and Society</td>
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<tr>
<td>SOC 402</td>
<td>Urban Sociology</td>
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### Semester Sequence

#### First Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
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<tr>
<td>or ALS 303</td>
<td>or Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
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<td>Foundation Elective</td>
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**Spring Semester**

<table>
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<tr>
<th>Course</th>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology or Plant Life</td>
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<tr>
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<td>MA 121  Elements of Calculus</td>
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<td>MA 131  Calculus for Life and Management Sciences A</td>
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#### Second Year

**Fall Semester**

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<tbody>
<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>CS 230</td>
<td>Introduction to Agroecology</td>
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<td>IDS 211  Eating through American History</td>
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**Spring Semester**

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<td>Ecology</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<td>Foundation Elective</td>
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#### Third Year

**Fall Semester**

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<tr>
<td>SOC 241</td>
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<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
<td>3</td>
</tr>
<tr>
<td>or SSC 332</td>
<td>or Environmental Soil Microbiology</td>
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</tr>
<tr>
<td>CS/HS 410</td>
<td>Community Food Systems</td>
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<td></td>
<td>ENG 332  Communication for Business and Management</td>
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<td>ENG 333  Communication for Science and Research</td>
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<td>AEE 311  Communication Methods and Media</td>
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**Spring Semester**

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<td>Advanced Agroecology</td>
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<td>SSC/HS 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<td>STS 323</td>
<td>World Population and Food Prospects</td>
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<td>Restricted Elective</td>
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**Hours**

- First Year: 15
- Second Year: 14-15
- Third Year: 15
Fourth Year
Fall Semester
CS/HS 480 Sustainable Food Production (capstone) 1
Restricted Elective 3
Restricted Elective 3
Restricted Elective 3
Free Elective 3
CSSC 492 or CSSC 493 Professional Internship Experience in Crop and Soil Sciences or Research Experience in Crop and Soil Sciences 3

Hours 16

Spring Semester
CS 415 Integrated Pest Management 3
GEP Additional Breadth (p. 1417) 3
Restricted Elective 3
Restricted Elective 3
Free Elective 3

Hours 15

Total Hours 120-121

Career Opportunities
The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

• Agronomist
• Agronomy Sales and Management
• Athletic Turf Manager
• Crop Advisor
• Conservationist
• Crops Systems Specialist
• Ecologist
• Environmental Scientist and Specialist
• Extension Agent
• Golf Course Superintendent
• Hydrologist
• Nutrient Management/ Waste Management Specialist
• Plant Breeder
• Precision Agriculture Specialist
• Real Estate Manager
• Research Station Manager
• Restoration Specialist
• Seed Production Agronomist
• Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers/!

Agroecology (Minor)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)!

The minor in Agroecology is open to all undergraduate students at NC State University. It is designed for students majoring in the biological sciences, agronomy, horticulture and animal sciences, but will be of interest to a wide array of students as agriculture has broad implications in the life sciences, economics, and sociology. Agroecology instruction provides students a fundamental understanding of agriculture and its interaction with natural and social systems. Students selecting the Agroecology minor will gain an understanding of modern production agriculture from an ecological and sociological perspective, obtain new skills in analyzing agricultural systems, and the knowledge to design a plan for change. This knowledge will improve a student’s ability to work with agricultural professionals to implement a system that meets ecological and social needs while remaining profitable for farmers.

Admissions
Admission to the minor requires a cumulative grade point average of 2.0 or better. Students should contact the Crop and Soil Sciences Undergraduate Programs Office to inquire about adding the minor no later than the registration period for the student’s final semester at NC State. A minor advisor will be assigned to all students interested in completing the Agroecology minor. Students enrolled in the minor must consult with their minor advisors during each registration period.

Certification
The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor should be completed no later than the registration period for the student’s final semester at NC State. Students should contact the Crop and Soil Sciences Undergraduate Programs Office for certification of the minor.

Contact Person
Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
cropsoil-undergraduate-office@ncsu.edu

SIS Code: 11AGECM

Plan Requirements
A minimum of 17 hours is required for the minor in Agroecology. Students are required to complete 11 credits of required courses and a minimum of 6 credits of restricted elective courses. A minimum grade of 'C-' or better is required in each course selected. No courses for the minor may be taken using the S/U option.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
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<tr>
<td>PB/AEC 360</td>
<td>Ecology</td>
<td>4</td>
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<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
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<tr>
<td>CS 430</td>
<td>Advanced Agroecology</td>
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</table>

| Elective Courses |
| Select one course from at least two of the following groups: |
| 6 |

Group 1: Ecology and Agricultural Production

ANS 150 Introduction to Animal Science
BAET 323 Water Management
PB 200 Plant Life
PB 213/CS 214 Plants and Civilization
PB 250 Plant Biology
CS 213 Crop Science
CS 411 Crop Ecology
CS 415 Integrated Pest Management
ENT 212 Basic Entomology
ENT 401 Honey Bee Biology and Management
ENT 425 General Entomology
FW 221 Conservation of Natural Resources
FOR 260 Forest Ecology
HS 432 Introduction to Permaculture
NR 300 Natural Resource Measurements
NR 406 Conservation of Biological Diversity
SSC 200 Soil Science
SSC 201 Soil Science Laboratory

Group 2: Social Science
HI 340 History of Agriculture
IDS 201 Environmental Ethics
SOC 241 Sociology of Agriculture and Rural Society
SOC 450 Environmental Sociology

Group 3: Economics
ARE 201 Introduction to Agricultural & Resource Economics
CSSC 290 Professional Development in Crop & Soil Sciences
CS 211 Plant Genetics
CS 213 Crop Science
CS 214 Crop Science Laboratory
CS 414 Weed Science
CS 415 Integrated Pest Management
SSC 200 Soil Science
SSC 201 Soil Science Laboratory
SSC 341 Soil Fertility and Nutrient Management
SSC 342 Soil and Plant Nutrient Analysis
SSC 462 Soil-Crop Management Systems

Concentration Electives
Select one of the following:
CS 224 Seeds, Biotechnology and Societies
CS 230 Introduction to Agroecology
SSC 185 Land and Life
Select two of the following:
CS 216 Southern Row Crop Production - Cotton, Peanuts, and Tobacco
CS 218 Southern Row Crop Production - Corn, Small Grains and Soybeans
CS 312 Grassland Management for Natural Resources Conservation
CSSC 492 Professional Internship Experience in Crop and Soil Sciences
or CSSC 493 Research Experience in Crop and Soil Sciences

Restricted Electives (p. 292) 17

General Education Program (GEP) Courses
ENG 101 Academic Writing and Research
GEP Humanities (p. 1423)
GEP Social Sciences (p. 1430)

Crop and Soil Sciences (BS): Agronomy
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)
Bachelor of Science in Plant and Soil Sciences degree is a flexible program that allows students to choose from a wide range of programs, based on their personal interests and career goals. Students can select a concentration from six areas of study including Agroecology, Agronomic Business, Agronomic Science, Crop Biotechnology, Crop Production, and Soil Science. Each concentration provides a strong science-based foundation as well as technical and supporting courses related to each individual discipline.

Plan Requirements
Crop and Soil Sciences (BS): Agronomy: 120 Total Units

Mathematics & Natural Sciences

MA 121 Elements of Calculus 3
ST 311 Introduction to Statistics 3
BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1
CH 220 Introductory Organic Chemistry 3
CH 222 Organic Chemistry I Lab 1
PB 321 Introduction to Whole Plant Physiology 3
PY 131 Conceptual Physics 4
BIO 183 Introductory Biology: Cellular and Molecular Biology 4

Communication/Advanced Writing
COM 110 Public Speaking 3
or COM 112 Interpersonal Communication
Select one of the following:
ENG 331 Communication for Engineering and Technology 3
ENG 332 Communication for Business and Management
ENG 333 Communication for Science and Research

Required Courses within Major
ARE 201 Introduction to Agricultural & Resource Economics 3
CSSC 290 Professional Development in Crop & Soil Sciences 1
CS 211 Plant Genetics 3
CS 213 Crop Science 3
CS 214 Crop Science Laboratory 1
CS 414 Weed Science 4
CS 415 Integrated Pest Management 3
SSC 200 Soil Science 1
SSC 201 Soil Science Laboratory 1
SSC 341 Soil Fertility and Nutrient Management 3
SSC 342 Soil and Plant Nutrient Analysis 1
SSC 462 Soil-Crop Management Systems 3

Concentration Electives
Select one of the following:
CS 224 Seeds, Biotechnology and Societies
CS 230 Introduction to Agroecology
SSC 185 Land and Life
Select two of the following:
CS 216 Southern Row Crop Production - Cotton, Peanuts, and Tobacco
CS 218 Southern Row Crop Production - Corn, Small Grains and Soybeans
CS 312 Grassland Management for Natural Resources Conservation
CSSC 492 Professional Internship Experience in Crop and Soil Sciences
or CSSC 493 Research Experience in Crop and Soil Sciences

Restricted Electives (p. 292) 17

General Education Program (GEP) Courses
ENG 101 Academic Writing and Research 4
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2 6

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Restricted Electives

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<td>Small Business Accounting</td>
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<td>ARE 303</td>
<td>Farm Management</td>
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<td>ARE 304</td>
<td>Agribusiness Management</td>
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<td>ARE 306</td>
<td>Agricultural Law</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 311</td>
<td>Agricultural Markets</td>
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<td>ARE 312</td>
<td>Agribusiness Marketing</td>
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<td>ARE 323</td>
<td>Agribusiness Finance</td>
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<td>Human Resource Management for Agribusiness</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>Introductory Geomatics</td>
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<td>BAE 535</td>
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<td>CS 312</td>
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<td>CS 524</td>
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<td>ENT 425</td>
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<td>PP 315</td>
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<td>SSC 185</td>
<td>Land and Life</td>
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<td>SSC 332</td>
<td>Environmental Soil Microbiology</td>
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<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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Semester Sequence

This is a sample.

First Year

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Elements of Calculus</td>
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Spring Semester

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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>COM 110</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology or Plant Life</td>
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Second Year

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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<tr>
<td>CS 213</td>
<td>Crop Science</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>CS 214</td>
<td>Crop Science Laboratory</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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Spring Semester

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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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</table>
PB 321 Introduction to Whole Plant Physiology 3
GEP Interdisciplinary Perspectives (p. 1426) 2

Hours 16

**Third Year**

**Fall Semester**

CS 414 Weed Science (Fall only) 4
SSC 341 Soil Fertility and Nutrient Management 3
Select one of the following: 3
   - CS 216 Southern Row Crop Production - Cotton, Peanuts, and Tobacco
   - CS 218 Southern Row Crop Production - Corn, Small Grains and Soybeans
   - CS 312 Grassland Management for Natural Resources Conservation

Restrictive Electives 6

Hours 18

**Spring Semester**

CS 211 Plant Genetics 3
Select one of the following: 3
   - ENG 331 Communication for Engineering and Technology
   - ENG 332 Communication for Business and Management
   - ENG 333 Communication for Science and Research
   - SSC 342 Soil and Plant Nutrient Analysis 1
Select one of the following: 3
   - CS 216 Southern Row Crop Production - Cotton, Peanuts, and Tobacco
   - CS 218 Southern Row Crop Production - Corn, Small Grains and Soybeans
   - CS 312 Grassland Management for Natural Resources Conservation

Restrictive Electives 6

Hours 16

**Fourth Year**

**Fall Semester**

GEP Social Sciences (p. 1430) 3
PY 131 Conceptual Physics 4
CSSC 492 or CSSC 493 Professional Internship Experience in Crop and Soil Sciences 3 or Research Experience in Crop and Soil Sciences
Restrictive Elective 2
Free Elective 3

Hours 15

**Spring Semester**

CS 415 Integrated Pest Management 3
SSC 462 Soil-Crop Management Systems (Spring only) 3
GEP Additional Breadth (p. 1417) 3
Free Elective 3

Hours 12

Total Hours 120

**Career Opportunities**

The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

- Agronomist
- Agronomy Sales and Management
- Athletic Turf Manager
- Crop Advisor
- Conservationist
- Crops Systems Specialist
- Ecologist
- Environmental Scientist and Specialist
- Extension Agent
- Golf Course Superintendent
- Hydrologist
- Nutrient Management/Waste Management Specialist
- Plant Breeder
- Precision Agriculture Specialist
- Real Estate Manager
- Research Station Manager
- Restoration Specialist
- Seed Production Agronomist
- Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers (http://go.ncsu.edu/careers/)

**Crop and Soil Sciences (BS): Crop Biotechnology**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Plan Requirements**

**Crop and Soil Sciences (BS): Crop Biotechnology: 120 Total Units**

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<th>Hours</th>
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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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**Mathematics & Natural Sciences**

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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
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**Communication/Advanced Writing**

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<th>Title</th>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
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Select one of the following:

- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research

**Required Courses within Major**

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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
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<td>Professional Development in Crop &amp; Soil Sciences</td>
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<td>CS 213</td>
<td>Crop Science</td>
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<td>CS 413</td>
<td>Plant Breeding</td>
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<td>Plant Genetics</td>
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<td>PB 421</td>
<td>Plant Physiology</td>
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<td>PB 480</td>
<td>Introduction to Plant Biotechnology</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory ¹</td>
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**Concentration Electives**

Select one of the following:

- ANT 261 Technology in Society and Culture
- CS 224 Seeds, Biotechnology and Societies
- SOC 261 Technology in Society and Culture
- STS 302 Contemporary Science, Technology and Human Values
- Biotechnology Elective (p. 294)
- CSSC 492 Professional Internship Experience in Crop and Soil Sciences
- or CSSC 493 Research Experience in Crop and Soil Sciences
- Restricted Electives (p. 295)

**General Education Program (GEP) Courses**

<table>
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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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**Free Electives**

Free Electives (12 Hr S/U Lmt) ²

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<td>BIT 200</td>
<td>Early Research in Biotechnology</td>
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<td>BIT 210</td>
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<td>BIT 211</td>
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<td>BIT 295</td>
<td>Special Topics in Biotechnology</td>
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<td>BIT 462</td>
<td>Gene Expression Analysis: Microarrays</td>
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<td>BIT 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>BIT 464</td>
<td>Protein Purification</td>
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<td>BIT 465</td>
<td>Real-time PCR Techniques</td>
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<td>Animal Cell Culture Techniques</td>
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<td>PCR and DNA Fingerprinting</td>
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<td>BIT 468</td>
<td>Genome Mapping</td>
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<td>RNA Interference and Model Organisms</td>
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<td>Protein Interactions</td>
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<td>BIT 481</td>
<td>Plant Tissue Culture and Transformation</td>
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<td>BIT 492</td>
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<td>BIT 493</td>
<td>Special Problems in Biotechnology</td>
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<td>BIT 501</td>
<td>Ethical Issues in Biotechnology</td>
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**Biotechnology Elective**

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<td>Animal Cell Culture Techniques</td>
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<td>BIT 467</td>
<td>PCR and DNA Fingerprinting</td>
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<td>BIT 471</td>
<td>RNA Interference and Model Organisms</td>
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<td>BIT 473</td>
<td>Protein Interactions</td>
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<td>BIT 510</td>
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**Total Hours**

120

¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.
### Restricted Electives

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<td>PP 315</td>
<td>Principles of Plant Pathology</td>
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<td>Role of Soils in Environmental Management</td>
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<td>Biological Approaches to Sustainable Soil Systems</td>
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<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<td>Soil and Environmental Biogeochemistry</td>
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<td>Soil Classification</td>
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<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
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<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<td>STS 323</td>
<td>World Population and Food Prospects</td>
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### Semester Sequence

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<td>HS 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<td>Sustainable Food Production (capstone)</td>
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<td>MB 200</td>
<td>The Fourth Horseman: Plagues that Changed the World</td>
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<td>MB 351</td>
<td>General Microbiology</td>
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<td>PB 200</td>
<td>Plant Life</td>
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<tr>
<td>PB 250</td>
<td>Plant Biology</td>
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## Crop and Soil Sciences (BS): Soil Science

### Foundation Elective
- MA 131: Calculus for Life and Management Sciences A 3
- CSSC 290: Professional Development in Crop & Soil Sciences 1

### Spring Semester
- BIO 183 or PB 200: Introductory Biology: Cellular and Molecular Biology or Plant Life 4
- CH 101: Chemistry - A Molecular Science 3
- CH 102: General Chemistry Laboratory 1
- MA 231: Calculus for Life and Management Sciences B 3
- GEP Health and Exercise Studies (p. 1422) 1
- GEP Humanities (p. 1423) 3

### Hours
- 16

### Second Year

#### Fall Semester
- CH 221: Organic Chemistry I 3
- CH 222: Organic Chemistry I Lab 1
- CS 213: Crop Science 3
- CS 214: Crop Science Laboratory 1
- SSC 200: Soil Science 3
- SSC 201: Soil Science Laboratory 1
- GEP Health and Exercise Studies (p. 1422) 1
- Restrictive Electives 3

### Hours
- 15

#### Spring Semester
- CH 223: Organic Chemistry II 3
- CH 224: Organic Chemistry II Lab 1
- COM 110: Public Speaking 3
- CS 211: Plant Genetics 3
- Restricted Electives 3
- GEP Interdisciplinary Perspectives (p. 1426) 2

### Hours
- 16

### Third Year

#### Fall Semester
- GEP Social Sciences (p. 1430) 3
- PY 131: Conceptual Physics 4
- PB 421: Plant Physiology 3
- ST 311: Introduction to Statistics 3
- ARE 201: Introduction to Agricultural & Resource Economics 3

### Hours
- 16

#### Spring Semester
- BCH 351: General Biochemistry 3
- GEP Humanities (p. 1423) 3
- Restrictive Elective 3
- BIT 410: Manipulation of Recombinant DNA 4

### Hours
- 13

### Fourth Year

#### Fall Semester
- Biotechnology Elective 4
- PB 480: Introduction to Plant Biotechnology 3
- GEP Additional Breadth (p. 1417) 3
- Experiential Learning Elective 3

### Hours
- 13

#### Spring Semester
- CS 413: Plant Breeding 2
- Select one of the following: 3
  - ENG 331: Communication for Engineering and Technology
  - ENG 332: Communication for Business and Management
  - ENG 333: Communication for Science and Research
- Restrictive Elective 4
- Free Elective 7

### Hours
- 16

### Total Hours
- 120

### Career Opportunities

The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

- Agronomist
- Agronomy Sales and Management
- Athletic Turf Manager
- Crop Advisor
- Conservationist
- Crops Systems Specialist
- Ecologist
- Environmental Scientist and Specialist
- Extension Agent
- Golf Course Superintendent
- Hydrologist
- Nutrient Management/ Waste Management Specialist
- Plant Breeder
- Precision Agriculture Specialist
- Real Estate Manager
- Research Station Manager
- Restoration Specialist
- Seed Production Agronomist
- Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers (http://go.ncsu.edu/careers/)

### Crop and Soil Sciences (BS): Soil Science

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Bachelor of Science in Plant and Soil Sciences degree is a flexible program that allows students to choose from a wide range of programs, based on their personal interests and career goals. Students can select a concentration from six areas of study including Agroecology, Agronomic Business, Agronomic Science, Crop Biotechnology, Crop Production, and Soil Science. Each concentration provides a strong science-based foundation as well as technical and supporting courses related to each individual discipline.

Plan Requirements

Crop and Soil Sciences (BS): Soil Science: 120 Total Units

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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Mathematics & Natural Sciences

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<td>MA 121</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>Introduction to Whole Plant Physiology</td>
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<td>PY 131</td>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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Communication/Advanced Writing

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<td>Interpersonal Communication</td>
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<td>ENG 332</td>
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Required Courses within Major

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Concentration Electives

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<td>Economics, Management &amp; Policy Electives (p. 297)</td>
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<td>Professional Internship Experience in Crop and Soil Sciences</td>
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<td>Research Experience in Crop and Soil Sciences</td>
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Restricted Electives (p. 298)                | 12    |

GEP Courses

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Free Electives

Free Electives (12 Hr S/U Lmt) | 2     |

Total Hours | 120    |

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

Soil Science Electives

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<td>Wetland Soils</td>
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Economics, Management & Policy Electives

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<td>ARE 306</td>
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<td>ARE 309</td>
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<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>CS 418</td>
<td>Introduction to Regulatory Science in Agriculture</td>
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<td>American Politics and Government</td>
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<tr>
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<tr>
<td>BAE 325</td>
<td>Introductory Geomatics</td>
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<tr>
<td>BAET 323</td>
<td>Water Management</td>
<td>3</td>
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<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
<td>4</td>
</tr>
<tr>
<td>CS 211</td>
<td>Plant Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CS 216</td>
<td>Southern Row Crop Production - Cotton, Peanuts, and Tobacco</td>
<td>3</td>
</tr>
<tr>
<td>CS 218</td>
<td>Southern Row Crop Production - Corn, Small Grains and Soybeans</td>
<td>3</td>
</tr>
<tr>
<td>CS 224</td>
<td>Seeds, Biotechnology and Societies</td>
<td>3</td>
</tr>
<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
<td>3</td>
</tr>
<tr>
<td>CS 312</td>
<td>Grassland Management for Natural Resources Conservation</td>
<td>3</td>
</tr>
<tr>
<td>CS 410</td>
<td>Community Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>CS 411</td>
<td>Crop Ecology</td>
<td>3</td>
</tr>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
<td>4</td>
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<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
<td>3</td>
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<tr>
<td>CS 424</td>
<td>Seed Physiology</td>
<td>3</td>
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<tr>
<td>CS 430</td>
<td>Advanced Agroecology</td>
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<tr>
<td>CS 524</td>
<td>Seed Physiology</td>
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<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
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<tr>
<td>ES 150</td>
<td>Water and the Environment</td>
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<tr>
<td>ET 201</td>
<td>Environmental Technology Laboratory I</td>
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<tr>
<td>ET 202</td>
<td>Environmental Technology Laboratory II</td>
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<tr>
<td>ET 203</td>
<td>Pollution Prevention</td>
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<tr>
<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>FOR 520</td>
<td>Watershed and Wetlands Hydrology</td>
<td>4</td>
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<tr>
<td>GIS 280</td>
<td>Introduction to GIS</td>
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<tr>
<td>MEA 300</td>
<td>Environmental Geology</td>
<td>4</td>
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<tr>
<td>NR 300</td>
<td>Natural Resource Measurements</td>
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<tr>
<td>NR 400</td>
<td>Natural Resource Management</td>
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<tr>
<td>NR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>NR 421</td>
<td>Wetland Assessment, Delineation and Regulation</td>
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<tr>
<td>NR 500</td>
<td>Natural Resource Management</td>
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<tr>
<td>NR 520</td>
<td>Watershed and Wetlands Hydrology</td>
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</tr>
<tr>
<td>NR 521</td>
<td>Wetland Assessment, Delineation and Regulation</td>
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<tr>
<td>SSC 410</td>
<td>Soil Judging for Land Evaluation</td>
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<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td>3</td>
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<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
<td>3</td>
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<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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</table>

### First Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>ALS 303</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>SSC 200</td>
<td>Soil Science</td>
<td>3</td>
</tr>
<tr>
<td>SSC 201</td>
<td>Soil Science Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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### Third Year

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
<td>3</td>
</tr>
<tr>
<td>Soil Science Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Economics, Management and Policy Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
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<tr>
<td>Select one of the following:</td>
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</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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</tr>
</tbody>
</table>
Crop Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The minor in Crop Science is offered to all undergraduate students at NC State University, with the exception of those enrolled in the Plant & Soil Science major. This minor provides a basic understanding of the requirements for successful field crop production and the role crop species and management practices play in a broad spectrum of sustainable agricultural enterprises.

A course selection option permits a student to focus on the particular aspect of Crop Science that complements the student’s major and career plans. The minor in Crop Science is designed to:

1. Provide a strong background in Crop Science to the variety of disciplines which interact in some way with field crop production;
2. Clarify the role crop species and rotational sequences play in agricultural enterprises both in the United States and globally to increase our quality of life; and
3. Identify strategies either in use or being researched to increase the compatibility of crop species with their environment to achieve yield stability, suitable quality of product, and sustainability of the production enterprise.

Admissions

Admission to the minor requires a cumulative grade point average of 2.0 or better. Students should contact the Crop and Soil Sciences Undergraduate Programs Office to inquire about adding the minor no later than the registration period for the student’s final semester at NC State.

Certification

The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor should be completed no later than the registration period for the student’s final semester at NC State. Students should contact the Crop and Soil Sciences Undergraduate Programs Office for certification of the minor.

Contact Person

Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
cropssoil-undergraduate-office@ncsu.edu

SIS code: 11CSM

Plan Requirements

A minimum of 17 hours is required for the minor in Crop Science. Students are required to complete 4 credits of required courses and a minimum of 13 credits of restricted elective courses. A minimum grade of ‘C-’ or better is required in each course selected. No courses for the minor may be taken using the S/U option.
Crop Science Certificate (Distance Education)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Undergraduate Certificate in Crop Science is a program that allows participants to explore the breadth of crop related courses offered in the Department of Crop and Soil Sciences. Participants in the program can customize their program to gain an understanding of the importance of agronomic crops for our state and national economy; how agronomic growth, development, and yield interact with environmental factors during the production season; sustainable production systems for agronomic crops; and marketing and distribution issues of these crops that can be related to world hunger. Individual courses will vary in instruction style, exam methods and assignments, and will include an assortment of on-line instruction methodology, video and PowerPoint presentations, outside readings, and on-line discussion sessions.

Program Coordinator
Dr. David Crouse
Undergraduate Teaching Coordinator and Director of Distance Education Programs

Admissions Requirements
High school diploma is required. The successful completion of one college biology course or equivalent experience is required.

Plan of Study and Registration Information
Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
cropsoul-undergraduate-office@ncsu.edu

Academic Structure
Term Effective: 1/2017
Plan Code: 11ACPCTU, 32ACPCTU
CIP Code: 01.1101
Description: Undergraduate Certificate in Crop Science
Offered via Distance Education (http://distance.ncsu.edu/programs/university-certificate-in-agronomic-crop-production/) format only

Plan Requirements
- Total credit hours required: 15
- Students completing the Undergraduate Certificate in Agronomic Crop Production must complete a minimum of 15 credit hours with minimum of C- or better in each class.
- The Certificate will be awarded upon successful completion of required and elective courses.
- Students who have graduated with or are currently enrolled in the Plant and Soil Sciences undergraduate baccalaureate degree program at N.C. State University are not eligible for this certificate.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 213</td>
<td>Crop Science</td>
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</tr>
<tr>
<td>CS 214</td>
<td>Crop Science Laboratory</td>
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</table>

**Elective Courses**
Select 13 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
<td>1</td>
</tr>
<tr>
<td>CS 211</td>
<td>Plant Genetics</td>
<td>1</td>
</tr>
<tr>
<td>CS 216</td>
<td>Southern Row Crop Production - Cotton, Peanuts, and Tobacco</td>
<td>1</td>
</tr>
<tr>
<td>CS 218</td>
<td>Southern Row Crop Production - Corn, Small Grains and Soybeans</td>
<td>1</td>
</tr>
<tr>
<td>CS 224</td>
<td>Seeds, Biotechnology and Societies</td>
<td>1</td>
</tr>
<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
<td>1</td>
</tr>
<tr>
<td>CS 312</td>
<td>Grassland Management for Natural Resources Conservation</td>
<td>1</td>
</tr>
<tr>
<td>CS 411</td>
<td>Crop Ecology</td>
<td>1</td>
</tr>
<tr>
<td>CS 413</td>
<td>Plant Breeding</td>
<td>1</td>
</tr>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
<td>1</td>
</tr>
<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
<td>1</td>
</tr>
<tr>
<td>CS 424</td>
<td>Seed Physiology</td>
<td>1</td>
</tr>
<tr>
<td>CS 430</td>
<td>Advanced Agroecology</td>
<td>1</td>
</tr>
<tr>
<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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</tr>
<tr>
<td>CSSC 495</td>
<td>Special Topics in Crop and Soil Sciences</td>
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</table>

Total Hours: 15

1 If you have successfully completed ANS 215 Agricultural Genetics/HS 215 Agricultural Genetics or GN 311 Principles of Genetics prior to enrolling in the Crop Science Minor, you may not receive credit for CS 211 Plant Genetics towards the Crop Science Minor. You must select other courses from the elective list.
Field Botany (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Certificate in Field Botany will provide the opportunity to develop skills in vascular plant identification, through both sight recognition and use of taxonomic keys, and knowledge of domain specific terminology. The certificate requires 14 hours of traditional course work in four courses. The certificate is a non-degree program offered jointly by the department of Plant and Microbial Biology (PMB) and Department of Forestry and Environmental Resources through on-campus classroom instruction, but is administered by PMB. It is available to students pursuing an undergraduate degree in any major at N. C. State University or to Non-Degree Studies (NDS) students. Students who have earned an undergraduate degree may also return as NDS students to complete the certificate. Students completing the certificate will find it very helpful in securing employment with the U.S. Army Corps of Engineers (protecting wetlands), private consulting firms (preparing impact statements and planning reports), the U.S. Fish and Wildlife Service (conserving threatened and endangered plants and improving wildlife habitat), Natural Heritage Programs (conserving rare plants), and private conservation organizations.

Admissions Requirements

Students must be enrolled in an undergraduate degree at N. C. State University or as a Non-Degree Studies student (NDS).

Program Coordinator

Dr. Alexander Krings
2109 Gardner Hall
Box 7612
919-515-2700
akrings@ncsu.edu

Academic Structure

Term Effective: 8/2018
Plan Code: 11FBOCTU
CIP Code: 26.0301

Plan Requirements

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<tr>
<th>Code</th>
<th>Title</th>
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<td>PB 220</td>
<td>Local Flora</td>
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<td>FOR 339</td>
<td>Dendrology</td>
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<tr>
<td>PB 403</td>
<td>Systematic Botany</td>
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<tr>
<td>PB 464</td>
<td>Rare Plants of North Carolina</td>
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<tr>
<td><strong>Total Hours</strong></td>
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<td><strong>14</strong></td>
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</table>

Natural Resources (BS): Soil, Water and Land Use Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Bachelor of Science in Natural Resources degree encompasses the study of soil, water, air, minerals, flora, fauna and people. This curriculum offers a broad base in resource management with an opportunity to select one of several specializations. Two of these specifically address soil science: Soil Resources and Soil and Water Systems. The soil resource concentration prepares students to understand basic soil properties and to relate soil capabilities to a broad spectrum of land uses. The soil and water systems concentration integrates the role of soil with the importance of surface and groundwater hydrology.

Plan Requirements

Natural Resources (BS): Soil, Water and Land Use Concentration:
120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Communication/Advanced Writing

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<tr>
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<tbody>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
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Select one of the following:

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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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Mathematics & Natural Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>AEC 360</td>
<td>Ecology</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>MEA 110</td>
<td>Geology I Laboratory</td>
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<td>PY 131</td>
<td>Conceptual Physics</td>
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Required Courses within Major

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
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<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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<td>NR 300</td>
<td>Natural Resource Measurements</td>
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<tr>
<td>SSC 200</td>
<td>Soil Science 1</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory 1</td>
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<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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<tr>
<td>SSC 452</td>
<td>Soil Classification</td>
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<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
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<tr>
<td>CSSC 490</td>
<td>Senior Seminar in Crop Science and Soil Science</td>
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Concentration Electives

Select one of the following Foundation electives:

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<th>Title</th>
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<tbody>
<tr>
<td>ES 150</td>
<td>Water and the Environment</td>
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<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
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<tr>
<td>SSC 185</td>
<td>Land and Life</td>
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</table>

Advanced Chemistry Electives: 3-4
Select one of the following:

CH 201 Chemistry - A Quantitative Science
& CH 202 and Quantitative Chemistry Laboratory
CH 220 Introductory Organic Chemistry
& CH 222 and Organic Chemistry I Lab
SSC 442 Soil and Environmental Biogeochemistry
Economics, Management & Policy Electives (p. 302) 6
CSC 492 Professional Internship Experience in Crop and Soil Sciences
or CSSC 493 Research Experience in Crop and Soil Sciences

Geospatial Technologies Elective (p. 302) 3
Land Use Electives (p. 302) 6
Plant Science Electives (p. 302) 6
Water, Wetlands & Ecology Electives (p. 302) 6

GEP Courses
ENG 101 Academic Writing and Research 1 4
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 4
Total Hours 117-118

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Economics, Management & Policy Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
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<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
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<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
<td>3</td>
</tr>
<tr>
<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
<td>3</td>
</tr>
<tr>
<td>CS 418</td>
<td>Introduction to Regulatory Science in Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<tr>
<td>PS 201</td>
<td>American Politics and Government</td>
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<tr>
<td>PS 202</td>
<td>State and Local Government</td>
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<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
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Geospatial Technologies Electives

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<tr>
<td>BAE 325</td>
<td>Introductory Geomatics</td>
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<tr>
<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
<td>3</td>
</tr>
<tr>
<td>GIS 280</td>
<td>Introduction to GIS</td>
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<tr>
<td>GIS 512</td>
<td>Introduction to Environmental Remote Sensing</td>
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<tr>
<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<td>SSC 540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<tr>
<td>SSC 545</td>
<td>Remote Sensing Applications in Soil Science and Agriculture</td>
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Land Use Electives

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<tr>
<td>MEA 300</td>
<td>Environmental Geology</td>
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<tr>
<td>MEA 481</td>
<td>Geomorphology: Earth's Dynamic Surface</td>
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<tr>
<td>NR 400</td>
<td>Natural Resource Management</td>
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<tr>
<td>NR 484</td>
<td>Environmental Impact Assessment</td>
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</tr>
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<td>NR 510</td>
<td>Military Land Sustainability</td>
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<tr>
<td>SSC 410</td>
<td>Soil Judging for Land Evaluation</td>
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<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
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<tr>
<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
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<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
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<td>SSC 462</td>
<td>Soil-Crop Management Systems</td>
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Plant Science Electives

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<tr>
<td>CS 213</td>
<td>Crop Science</td>
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<td>CS 230</td>
<td>Introduction to Agroecology</td>
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</tr>
<tr>
<td>CS 312</td>
<td>Grassland Management for Natural Resources Conservation</td>
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</tr>
<tr>
<td>PB 200</td>
<td>Plant Life</td>
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<tr>
<td>FOR 339</td>
<td>Dendrology</td>
<td>4</td>
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<tr>
<td>FOR 252</td>
<td>Introduction to Forest Science</td>
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<tr>
<td>PB 220</td>
<td>Local Flora</td>
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<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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Water, Wetlands & Ecology Electives

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<tr>
<td>AEC 419</td>
<td>Freshwater Ecology</td>
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<tr>
<td>AEC 519</td>
<td>Freshwater Ecology</td>
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<tr>
<td>BAET 323</td>
<td>Water Management</td>
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<tr>
<td>FOR 260</td>
<td>Forest Ecology</td>
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<tr>
<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>FOR 520</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>NR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>NR 421</td>
<td>Wetland Assessment, Delineation and Regulation</td>
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<tr>
<td>NR 520</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>NR 521</td>
<td>Wetland Assessment, Delineation and Regulation</td>
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**Course** | **Title** | **Hours**
---|---|---
ALS 103 or ALS 303 | Freshman Transitions and Diversity in Agriculture & Life Sciences | 1
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
ENG 101 | Academic Writing and Research | 4
MA 131 | Calculus for Life and Management Sciences A | 3
CSSC 290 | Professional Development in Crop & Soil Sciences | 1
CH 101 | Chemistry - A Molecular Science | 3
CH 102 | General Chemistry Laboratory | 1
MA 231 | Calculus for Life and Management Sciences B | 3
GEP Humanities (p. 1423) | 3
AEC 360 | Ecology | 4
GEP Health and Exercise Studies (p. 1422) | 1
ARE 201 | Introduction to Agricultural & Resource Economics | 3
GEP Health and Exercise Studies (p. 1422) | 1
SSC 200 | Soil Science | 3
SSC 201 | Soil Science Laboratory | 1
ST 311 | Introduction to Statistics | 3
COM 110 or COM 112 | Public Speaking or Interpersonal Communication | 3
MEA 101 | Geology I: Physical | 3
MEA 110 | Geology I Laboratory | 1
PY 131 | Conceptual Physics | 4
SSC 341 | Soil Fertility and Nutrient Management | 3
Economics, Management and Policy Elective | 3
GEP Interdisciplinary Perspectives (p. 1426) | 2
• Nutrient Management/ Waste Management Specialist
• Plant Breeder
• Precision Agriculture Specialist
• Real Estate Manager
• Research Station Manager
• Restoration Specialist
• Seed Production Agronomist
• Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at go.ncsu.edu/careers (http://go.ncsu.edu/careers/)

Soil Science (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Undergraduate Certificate in Soil Science enables students to obtain the course credit hours in soil science necessary for advancement in soil related careers. To become a Soil Scientist in the U.S. Federal Government, the Office of Personnel Management requires 15 credit hours in subjects such as soil genesis, pedology, soil chemistry, soil physics, and soil fertility. In states like North Carolina and others with a soil scientist licensing program, 15 credit hours of soil science related coursework is required to qualify for the licensing exam. Nationally, to become a Professional Soil Scientist certified by the Soil Science Society of America, individuals must have completed 15 course credit hours in soil science or a related area. Those who complete this program will meet the coursework requirements for all three career advancement opportunities.

You can learn more about North Carolina’s licensed soil scientist program at https://ncblss.wordpress.ncsu.edu/. To learn about the national certification program, visit http://soils.org/certifications/become-certified (http://soils.org/certifications/become-certified/)

This program may be completed totally online. For more information about Distance Education [Click here] (http://distance.ncsu.edu/programs/university-certificate-in-soil-science/)

Program Coordinator
Dr. David Crouse
Undergraduate Teaching Coordinator and Director of Distance Education Programs

Admissions Requirements
This program will be open to undergraduate students and those pursuing continuing education credits. It will also be open to students outside of North Carolina State University. A Bachelor of Science is required for admission into this program.

Registration Information
Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
cropsoil-undergraduate-office@ncsu.edu

Academic Structure

Term Effective: 1/2017
Plan Code: 11SSCTU, 32SSCTU
CIP Code: 01.1201
Description: Undergraduate Certificate in Soil Science
Offered via on-campus and Distance Education (http://distance.ncsu.edu/programs/university-certificate-in-soil-science/) format

Plan Requirements

Prerequisites:
To pursue the certificate, students must have the following training in basic sciences:

• 2 semesters of chemistry
• 1 semester of physics
• 1 semester of biology
• mathematics through algebra and trigonometry

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
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<td>Required Courses</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<tr>
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<td>Elective Courses</td>
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<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<tr>
<td>or SSC 541</td>
<td>Soil Fertility</td>
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<tr>
<td>SSC 470/570</td>
<td>Wetland Soils</td>
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<tr>
<td>SSC 532</td>
<td>Soil Microbiology</td>
<td></td>
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<tr>
<td>or SSC 332</td>
<td>Environmental Soil Microbiology</td>
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</tr>
<tr>
<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
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<tr>
<td>SSC 440/540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<td>SSC 442</td>
<td>Soil and Environmental Biogeochemistry</td>
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<tr>
<td>SSC 551</td>
<td>Soil Morphology, Genesis and Classification</td>
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<td>or SSC 452</td>
<td>Soil Classification</td>
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<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
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<tr>
<td>SSC 511</td>
<td>Soil Physics</td>
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<tr>
<td>or SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
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<tr>
<td>CSSC 495</td>
<td>Special Topics in Crop and Soil Sciences</td>
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<tr>
<td>SSC 562</td>
<td>Environmental Applications Of Soil Science</td>
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<tr>
<td>SSC 590</td>
<td>Special Problems</td>
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</table>

Total Hours 15

1 The required courses are available on-campus and via distance education. Prerequisites may be required in some courses. Students should contact instructors before enrolling to discuss eligibility as needed.

2 Available through Distance Education and on-campus. The 500-level courses are graduate level courses.

A grade of C (2.0) or higher in each course is required.
Soil Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The minor in Soil Science is offered to all undergraduate students at NC State University who desire a strong knowledge of the principles of Soil Science to complement their major. It is intended to strengthen the understanding of basic physical, chemical, and microbiological soil properties that would be relevant to a student’s particular land management interest. These interests may include (but are not limited to) Forestry, Geology, Natural Resources, Environmental Science, Plant and Soil Sciences, Landscape Architecture, Horticulture, Biological and Agricultural Engineering, Agricultural Business Management, or Agricultural Education.

Admissions

Admission to the minor requires a cumulative grade point average of 2.0 or better. Students should contact the Crop and Soil Sciences Undergraduate Programs Office to inquire about adding the minor no later than the registration period for the student’s final semester at NC State.

Certification

The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor should be completed no later than the registration period for the student’s final semester at NC State. Students should contact the Crop and Soil Sciences Undergraduate Programs Office for certification of the minor.

Contact Person

Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
cropsoil-undergraduate-office@ncsu.edu

SIS Code: 11SSM

Effective Date: 8.2016

Plan Requirements

- A minimum of 17 hours is required for the minor in Soil Science. Students are required to complete 4 credits of required courses and a minimum of 13 credits of restricted elective courses.
- A minimum grade of ‘C-’ or better is required in each course selected. No courses for the minor may be taken using the S/U option.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>BAET 323</td>
<td>Water Management</td>
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<tr>
<td>SSC 332</td>
<td>Environmental Soil Microbiology</td>
<td></td>
</tr>
<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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</tr>
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</table>

Turfgrass (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The minor in Turf Grass Science is open to all undergraduate students at NC State University, with the exception of those enrolled in the Turfgrass Science major. It is designed for students majoring in Plant and Soil Sciences, Biological Sciences, Horticultural Science, Parks & Recreation and related disciplines but will be of interest to a wide variety of students desiring expertise in establishing and maintaining turfgrass areas. Students will gain an understanding of the techniques required to successfully establish and manage turfgrasses commonly grown throughout the United States. This knowledge will improve the student’s ability to provide high quality turfgrass cover for a variety of situations including home lawns, commercial grounds, parks and other areas.

Admission

Admission to the minor requires a cumulative grade point average of 2.0 or better. Students should contact the Crop and Soil Sciences Undergraduate Programs Office to inquire about adding the minor no later than the registration period for the student’s final semester at NC State. A minor advisor will be assigned to all students interested in completing the Turfgrass minor. Students enrolled in the minor must consult with their minor advisor during each registration period.

Certification

The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor should be completed no later than the registration period for the student’s final semester at NC State. Students should contact the Crop and Soil Sciences Undergraduate Programs Office for certification of the minor.

Contact Person

Undergraduate Programs Office
Crop & Soil Sciences Department
2234 Williams Hall
Campus Box 7620
919-515-5820
Plan Requirements

A minimum of 16 hours is required for the minor in Turfgrass. Students are required to complete 11 credits of required courses and a minimum of 5 credits of restricted elective courses. A minimum grade of 'C-' or better is required to complete 11 credits of required courses and a minimum of 5 credits of restricted elective courses. No courses for the minor may be taken using the S/U option.

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<th>Code</th>
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<tr>
<td></td>
<td><strong>Required Courses</strong></td>
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<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
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<tr>
<td>CS 400</td>
<td>Turf Cultural Systems</td>
<td>3</td>
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<tr>
<td>SSC 200</td>
<td>Soil Science</td>
<td>3</td>
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<tr>
<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<td></td>
<td><strong>Elective Courses</strong></td>
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<td>CS 414</td>
<td>Weed Science</td>
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<tr>
<td>CS 465</td>
<td>Turf Management Systems and Environmental Quality</td>
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<tr>
<td>CS 470</td>
<td>Advanced Turfgrass Pest Management</td>
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<td>ENT 425</td>
<td>General Entomology</td>
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<td>PP 315</td>
<td>Principles of Plant Pathology</td>
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<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<tr>
<td>&amp; SSC 342</td>
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Turfgrass Science (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Bachelor of Science in Turfgrass Science degree has been voted #1 in the US by TurfNet Magazine. Why? Because we have the best turfgrass scientists and extension specialists teaching our classes, because we have a state of the art teaching field lab for hands-on learning, and because our program has classes that cover the basics of environmentally sound turfgrass management. Our graduates find great careers in golf course and athletic field management, home and industrial lawn businesses, sod production, recreational park turf management, agri-business management and agri-business sales.

Plan Requirements

Turfgrass Science (BS): 120 Total Units

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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td></td>
<td><strong>Communication/Advanced Writing</strong></td>
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<tr>
<td>COM 110</td>
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<td>or COM 112</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>Communication for Science and Research</td>
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<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
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<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<td>PB 200</td>
<td>Plant Life</td>
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<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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<td>PB 360</td>
<td>Ecology</td>
<td>4</td>
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<td>PY 131</td>
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<td>ARE 201</td>
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<td>CS 211</td>
<td>Plant Genetics</td>
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<td>CS 400</td>
<td>Turf Cultural Systems</td>
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<td>CS 414</td>
<td>Weed Science</td>
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<td>CS 465</td>
<td>Turf Management Systems and Environmental Quality</td>
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<td>CS 470</td>
<td>Advanced Turfgrass Pest Management</td>
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<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soils Sciences</td>
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<td>HS 471</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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<td>Professional Internship Experience in Crop and Soils Sciences</td>
<td>3</td>
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<tr>
<td>or CSSC 493</td>
<td>Research Experience in Crop and Soils Sciences</td>
<td>3</td>
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<tr>
<td></td>
<td><strong>GEP Courses</strong></td>
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</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>6</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td></td>
<td>3</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>2</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
<td>3</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>5</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td><strong>Free Electives</strong></td>
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SIS Code: 11TFGM
## Economics, Management & Policy Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
<td>3</td>
</tr>
<tr>
<td>BUS 225</td>
<td>Personal Finance</td>
<td>3</td>
</tr>
<tr>
<td>BUS 320</td>
<td>Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 340</td>
<td>Information Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 420</td>
<td>Financial Management of Corporations</td>
<td>3</td>
</tr>
<tr>
<td>CS 418</td>
<td>Introduction to Regulatory Science in Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
<td>3</td>
</tr>
</tbody>
</table>

### Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALS 103 or ALS 303</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
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<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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<td><strong>Total Hours</strong></td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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</tr>
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<td>PB 200</td>
<td>Plant Life</td>
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</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
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<td>15</td>
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<td><strong>Second Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td></td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
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</tr>
<tr>
<td>PB 360</td>
<td>Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
</tbody>
</table>

### Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 315</td>
<td>Principles of Plant Pathology</td>
<td>4</td>
</tr>
<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td></td>
</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td></td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
<td></td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
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### Fourth Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 465</td>
<td>Turf Management Systems and Environmental Quality 1</td>
<td>3</td>
</tr>
<tr>
<td>HS 471</td>
<td>Landscape Ecosystem Management</td>
<td>4</td>
</tr>
<tr>
<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
<td>3</td>
</tr>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 470</td>
<td>Advanced Turfgrass Pest Management</td>
<td>2</td>
</tr>
<tr>
<td>Free Elective</td>
<td></td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

1 A grade of C- or better is required for CS 200 Introduction to Turfgrass Management, CS 400 Turf Cultural Systems, and CS 465 Turf Management Systems and Environmental Quality.
Career Opportunities

The breadth and depth of education and experiences you will gain from our department will set you on a path toward a rewarding career in one of the following specialties:

• Agronomist
• Agronomy Sales and Management
• Athletic Turf Manager
• Crop Advisor
• Conservationist
• Crops Systems Specialist
• Ecologist
• Environmental Scientist and Specialist
• Extension Agent
• Golf Course Superintendent
• Hydrologist
• Nutrient Management/Waste Management Specialist
• Plant Breeder
• Precision Agriculture Specialist
• Real Estate Manager
• Research Station Manager
• Restoration Specialist
• Seed Production Agronomist
• Soil Scientist

Learn more about future job prospects, representative salaries, and major employers for each of the above listed careers at [go.ncsu.edu/careers](http://go.ncsu.edu/careers/)

Department of Entomology and Plant Pathology

Entomology

Undergraduate instruction in entomology provides introductory and advanced courses in the basic science of entomology and the management of beneficial and pest insects. Courses at the 200- and 400-level fulfill General Education Requirements in Natural Sciences or Science and Technology and serve students majoring in biological sciences, agronomy, horticultural science, agricultural education, crop science, forestry and plant biology. They also provide fundamental training for graduate study in entomology (see the Graduate Catalog [http://www.ncsu.edu/grad/catalog/]).

Opportunities

For graduates with advanced degrees in entomology, opportunities include research, teaching, and extension positions in colleges and universities; research, development, production, control, and sales positions in private industries; consultative positions in pest management; research and regulatory positions with state and federal agencies; and curatorial positions in museums.

Curricula

There is no undergraduate major in entomology. Those students with a primary interest in entomology are advised to choose a general biological science curricula and minor in entomology.

Plant Pathology

Plant Pathology is a diverse discipline that provides fundamentally important information to many of the undergraduate degree programs offered in CALS at NC State. Undergraduate instruction in plant pathology provides introductory and advanced courses on the biology of plant pathogens and the nature and control of plant diseases to students majoring in crop science, horticultural science, the life sciences, and forestry. It also provides the fundamental training necessary for graduate study in plant pathology and related fields.

Kelman Scholars

Thanks to the generosity of Dr. Arthur and Mrs. Helen Kelman, family and friends, the department offers the S.E. Kelman Memorial Scholarship to one or more outstanding undergraduates enrolled at NC State or other universities. This competitive program allows selected applicants to gain research experiences as interns working under the supervision of a faculty member in the Department of Plant Pathology. For details about this scholarship program, please see scholarship’s information page ([https://plantpath.cals.ncsu.edu/undergraduate-studies/summer-research](https://plantpath.cals.ncsu.edu/undergraduate-studies/summer-research)).

Opportunities

As a graduate department, our graduates, with advanced degrees in plant pathology, are competitive for employment in many areas. Employment opportunities at the M.S. and Ph.D. levels include research, extension, teaching and regulatory sciences with universities and colleges, the U.S. Department of Agriculture, including APHIS and CPHIST, a wide array of agriculturally related industry, and private consulting. The rapid development of biotechnology, regulatory sciences, agricultural chemicals and biocontrol offers numerous opportunities for exciting and rewarding careers that service societal needs and advance our sciences.

Curricula

There is no undergraduate major or minor in plant pathology. We co-direct with the Department of Entomology a certificate in Plant Pests, Pathogens, and People ([https://oucc.dasa.ncsu.edu/plant-pests-pathogens-and-people](https://oucc.dasa.ncsu.edu/plant-pests-pathogens-and-people)), which offers a course of study in the biology, ecology, economic significance, and management of plant diseases and insects. This program may be completed on-campus or totally online.

For more information about this department, including contact information, visit the department ([http://www.cals.ncsu.edu/entomology/]).

Faculty

Department Head

Eric L. Davis

Undergraduate Coordinator

David Orr

Director of Graduate Programs for Entomology

Clyde E. Sorenson
Director of Graduate Programs for Plant Pathology
David Ritchie

Department Extension Leader
Rick Brandenburg

William Neal Reynolds Professors
R.L. Brandenburg
F.L. Gould
G.G. Kennedy
R.M. Roe
J.F. Walgenbach
B.M. Wiegmann

William Neal Reynolds Distinguished Professor Emeriti
C.S. Apperson

Blanton J. Whitmire Professor
C. Schal

Charles G. Wright Professor
J. Silverman

Alumni Distinguished Professors
J.R. Meyer
C.E. Sorenson

Distinguished University Professor
F.L. Gould

Professors
H.J. Burrack
S.D. Frank
M.J. Scott
D.R. Tarpy
J.F. Walgenbach
D.W. Watson
A.E. Whitfield

Professors Emeriti
J.S. Bacheler
J.R. Baker
F.P. Hain
J.R. Bradley, Jr.
W.M. Brooks
W.V. Campbell
L.L. Dietz
M.H. Farrier
J.D. Harper
H.B. Moore Jr.
H.H. Neunzig
R.L. Robertson
K.A. Sorenson
P.S. Southern
R.E. Stinner
J.W. Van Duyn
C.G. Wright

Adjunct Professors
J.J. Arends
N.M. Hamon
E.L. Vargo

Adjunct Professor Emeritus
A.A. Perez de Leon
D.E. Sonenshine

Associate Professors
M.D. Lorenzen
D.B. Orr
D.D. Reisig
M.H. Reiskind
D. Rotenberg

Associate Professor Emeritus
R.C. Hillmann
Entomology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Entomology offers an undergraduate minor in Entomology intended for students who are interested in insects, their management, and their role in the functioning of nature and agricultural ecosystems. Insects represent the single largest group of animal species — they impact every facet of human life and they are a very important part of our environment. This minor provides an opportunity for students to become familiar with the great diversity of insect life, to explore their form and function, to study their impact on and relationships with plants, humans, and other animals, and to learn about various methods of control.

Admissions

The Undergraduate minor program in Entomology is coordinated by David Orr, the Entomology Undergraduate Teaching Coordinator, who acts as the minor advisor or assigns a minor advisor appropriate to the interests of the student.

Certification

David Orr will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

David Orr
2104 Gardner Hall
919.515.4684
dorr@ncsu.edu

SIS code: 11ENM

Plan Requirements

• Program requires 15 semester hours
• A grade of ‘C-’ or better is required for all courses to fulfill the minor requirements.
• Students must take ENT 425 General Entomology or ENT 402 Forest Entomology plus 12 hours from the elective course list below.
However, of these 12 hours of elective courses, at least 6 hours must be ENT courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td>3</td>
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**Elective Courses**

Select nine credits of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 315</td>
<td>General Parasitology</td>
<td></td>
</tr>
<tr>
<td>ENT 201</td>
<td>Insects and People</td>
<td></td>
</tr>
<tr>
<td>ENT 203</td>
<td>An Introduction to the Honey Bee and Beekeeping</td>
<td></td>
</tr>
<tr>
<td>ENT 207</td>
<td>Insects and Human Disease</td>
<td></td>
</tr>
<tr>
<td>ENT 305</td>
<td>Introduction to Forensic Entomology</td>
<td></td>
</tr>
<tr>
<td>ENT 401</td>
<td>Honey Bee Biology and Management</td>
<td></td>
</tr>
<tr>
<td>ENT 402</td>
<td>Forest Entomology</td>
<td></td>
</tr>
<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td></td>
</tr>
<tr>
<td>ENT 492</td>
<td>External Learning Experience</td>
<td></td>
</tr>
<tr>
<td>ENT 493</td>
<td>Special Problems in Entomology</td>
<td></td>
</tr>
<tr>
<td>ENT 495</td>
<td>Special Topics in Entomology</td>
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</tr>
<tr>
<td>ENT 502</td>
<td>Insect Diversity</td>
<td></td>
</tr>
<tr>
<td>ENT 503</td>
<td>Insect Morphology and Physiology</td>
<td></td>
</tr>
<tr>
<td>ENT 509</td>
<td>Biology of Aquatic Insects</td>
<td></td>
</tr>
<tr>
<td>ENT 550</td>
<td>Fundamentals of Arthropod Management</td>
<td></td>
</tr>
<tr>
<td>ENT/ZO 582</td>
<td>Medical and Veterinary Entomology</td>
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</tr>
<tr>
<td>ENT 620</td>
<td>Special Problems</td>
<td></td>
</tr>
<tr>
<td>ENT 641</td>
<td>Agricultural Entomology Practicum</td>
<td></td>
</tr>
<tr>
<td>ENT 726</td>
<td>Biological Control of Insects and Weeds</td>
<td></td>
</tr>
<tr>
<td>ENT 731</td>
<td>Insect Ecology</td>
<td></td>
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<tr>
<td>ENT 762</td>
<td>Insect Pest Management In Agricultural Crops</td>
<td></td>
</tr>
<tr>
<td>PB 360</td>
<td>Ecology</td>
<td></td>
</tr>
<tr>
<td>PB 403</td>
<td>Systematic Botany</td>
<td></td>
</tr>
<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
<td></td>
</tr>
<tr>
<td>ZO 402</td>
<td>Invertebrate Biology</td>
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</tr>
<tr>
<td>ZO 410</td>
<td>Introduction to Animal Behavior</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours** 15

At least 2 of the 4 courses you choose must be ENT courses.

**Fundamentals of Entomology (Certificate)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Certificate Program in Fundamentals of Entomology is a non-degree program offered through the Department of Entomology by distance education, by on-campus regular classroom course enrollment, or by a combination of the two. The program is designed to increase personal knowledge about insects, the most diverse group of animals on earth, and their importance to mankind and our environment. It will allow the student to appreciate the role of insect biology and diversity in relation to all forms of animal life. The Certificate Program is open to all NC State undergraduate majors and to students who are enrolled as Non-Degree Studies (NDS) students. Students who complete this Program should be better prepared to teach in the field of science education, work in many fields of animal and plant science including the agricultural sciences, and have a better appreciation of the world in which they live. The Program consists of 12 credit hours of entomology courses of which 3 are required  and 9 are electives. Enrollment in 500 or higher numbered elective courses is limited to upper division undergraduates with consent of the instructor or to students who have already earned an undergraduate degree.

**Program Coordinator**

Dr. Clyde Sorenson  
Dept. of Entomology and Plant Pathology  
Gardner Hall 3310, Box 7613  
NCSU Campus  
Raleigh, NC 27695  
919-515-8427  
clyde_sorenson@ncsu.edu

For additional information regarding Distance Education (click here) (http://distance.ncsu.edu/programs/undergraduate-certificate-programs.php)

**Admissions Requirements**

Enrollment in NC State University in a baccalaureate degree program or as a Non-Degree Studies (NDS) student.

**Plan of Study**

Contact the Program Coordinator.

**Registration Information**

Contact the Program Coordinator.

**Academic Structure**

Term Effective: 8/2011  
Plan Code: 11ENTCTU, 32ENTCTU  
CIP Code: 26.0702  
Description: Undergraduate Certificate in Fundamentals of Entomology Offered via on-campus and Distance Education (https://online-distance.ncsu.edu/program/university-undergraduate-certificate-in-fundamentals-of-entomology/) format

**Plan Requirements**

The Program will require completion of 12 credit hours. ENT 425 General Entomology will be required of all students. The remaining nine hours can be taken from the list of additional entomology course electives. Students who have not yet earned at least 60 semester hours of college credit or equivalent must select elective courses from 200, 300 and 400 level courses. Upper division undergraduate students and students who have earned baccalaureate degrees may select from the complete list of electives with consent of individual instructors. A few elective courses have pre-requisites other than entomology courses and may not be suitable for all students. Students will select from these courses in consultation with the Department of Entomology’s certificate coordinator.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Courses**

Select nine credits of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENT 201</td>
<td>Insects and People</td>
<td></td>
</tr>
<tr>
<td>ENT 203</td>
<td>An Introduction to the Honey Bee and Beekeeping</td>
<td></td>
</tr>
</tbody>
</table>
Plant Pests, Pathogens, and People (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Certificate in Plant Pests, Pathogens, and People offers a course of study in the biology, ecology, economic significance, and management of plant diseases and insects. This program may be completed totally online.

Program Coordinators

Dr. Clyde Sorenson
Dept. of Entomology and Plant Pathology
Gardner Hall 3310, Box 7613
NCSU Campus
Raleigh, NC 27695
919-515-8427
clyde_sorenson@ncsu.edu

Dr. David Shew
Plant Pathology Dept.
Gardner Hall 2415, Box 7616
NCSU Campus
Raleigh, NC 27695
919-515-6811
david_shew@ncsu.edu

For additional information regarding Distance Education (click here) (http://distance.ncsu.edu/programs/university-certificate-in-plant-pests-pathogens-and-people/)

Admissions Requirements

This program will be open to undergraduate students and those pursuing continuing education credits. It will also be open to students outside of North Carolina State University.

Plan of Study

The Undergraduate Certificate in Plant Pests, Pathogens and People requires completion of 12 credit hours (four courses). Each course must be completed with a grade of C or better (grades of C- are not accepted). Students pursuing university certificate programs are considered non-degree studies (NDS) students for the purpose of university registration; NDS students may register for a maximum of 6 credit hours per semester. Thus, this certificate may be completed in as little as two semesters. The program must be completed within six (6) semesters, beginning with the initial course enrollment date.

Registration Information

Contact the Program Coordinator.

Academic Structure

Term Effective: 1/2010
Plan Code: 11PLPCTU, 32PLPCTU
CIP Code: 01.1105
Description: Undergraduate Certificate in Plant Pests, Pathogens, and People
Offered via on-campus and Distance Education (http://distance.ncsu.edu/programs/university-certificate-in-plant-pests-pathogens-and-people/) format

Plan Requirements

A grade of “C” (2.0) or better is required for certificate courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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Total Hours 12
Department of Food, Bioprocessing and Nutrition Sciences

The Department of Food, Bioprocessing and Nutrition Sciences offers three undergraduate degree programs:

1. Food Science
2. Bioprocessing Science
3. Nutrition Science

These programs focus on the application and integration of chemistry, biology, biochemistry, biotechnology, and engineering disciplines in the development, production, and delivery of safe and nutritious foods and other products (including drugs) from food and bioprocessing operations, in addition to understanding the role of diet and how it generally affects human health. In support of each program, the department maintains modern, fully-equipped laboratories and a host of Nutrition outreach opportunities for teaching and research. All three undergraduate programs are compatible with pre-professional school curricula, such as pre-med or pre-vet, and many students elect to take on a minor in an area that enhances their major coursework. There are also opportunities to double major both within departmental majors as well as external majors such as Biochemistry.

For more information about this department, including contact information, visit the department (http://fbns.ncsu.edu/).

Faculty

Department Head
K.P. Sandeep

Department Extension Leader
K.P. Sandeep

Food Science Undergraduate Teaching Coordinator
G. Keith Harris

Bioprocessing Science, Undergraduate Teaching Coordinator
John D. Sheppard

Nutrition Undergraduate Teaching Coordinator
Natalie K. Cooke

Director of Graduate Programs
Jonathan C. Allen
Suzie Goodell

Distinguished University Professor
R. Barrangou
T.R. Klaenhammer

William Neal Reynolds Professors
M.A. Drake
E.A. Foegeding
L.A. Jaykus
T.R. Klaenhammer
K.R. Swartzel

David H. Murdock Distinguished Professor
M.A. Lila

Professors
J.C. Allen
S.L. Ash
R. Barrangou
F. Breidt, USDA
L.O. Dean, USDA
M.A. Drake
L.A. Jaykus
S. Kathariou
D.K. Larick
M.A. Lila
K.P. Sandeep
J.D. Sheppard

Associate Professors
A.D. Fogleman
D.J. Hanson
G.K. Harris
S.D. Johanningsmeier, USDA
S. Komarnytsky
I.M Perez-Diaz, USDA
S. Goodell
C.D. Stevenson
Assistant Professors
N.K. Cooke

Professors Emeriti
L.W. Aurand
H.R. Ball
L.C. Boyd
R.E. Carawan
D.E. Carroll
G.L. Catignani, Jr.
J.A. Christian
H.B. Craig
M.E. Gregory
M.W. Hoover
V.A. Jones
T.C. Lanier
R.F. McFeeters
V.A. Jones
T.C. Lanier
W.M. Walter, Jr
D.R. Ward

Associate Members of the Faculty
K.E. Anderson, Poultry Science
B. Chapman, 4-H Youth Development and Family & Consumer Sciences
S.A. Hale, Biological and Agricultural Engineering
H.M. Hassan, Molecular and Structural Biochemistry, Microbiology, Toxicology
S.A. Khan, Chemical and Biomolecular Engineering
D.P. Smith, Poultry Science
S. Thakur, College of Veterinary Medicine

Adjunct Faculty
P.A. Curtis
K. Maloney
S. Sang
R.C. Theuer

Plans

- Bioprocessing Science (BS) (p. 314)
- Food Safety & Quality Management (Certificate) (p. 317)
- Food Science (BS): Science Concentration (p. 318)
- Food Science (BS): Technology Concentration (p. 320)
- Food Science (Minor) (p. 323)
- Nutrition (Minor) (p. 324)
- Nutrition Sciences (BS) (p. 324)
- Nutrition Sciences (BS): Applied Nutrition Concentration (p. 327)

Bioprocessing Science (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Bioprocessing Science Bachelor of Science degree prepares students for technical careers in biomanufacturing through formal training in fundamental sciences, as well as preparing students for careers in industries whose products are based on biological systems, including biopharmaceutical and biotechnology companies.

Plan Requirements

Bioprocessing Science (BS): 120 Total Units

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Natural and Physical Sciences

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### Semester Sequence

This is a sample.

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1. Hours
Spring Semester

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Total Hours 15

1 Students are strongly encouraged to complete a minor in a closely related field, and should consult with an advisor in the minor department for the most current requirements. A list of can be viewed online at http://oucc.ncsu.edu/minors (http://oucc.ncsu.edu/minors/). Free elective courses taken as credit only may not apply toward a minor.

Career Opportunities

Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products, as well as for educational programs designed to promote healthy eating, creates a variety of career opportunities in the food, pharmaceutical and the allied health industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. Public health opportunities include educational program development, delivery, and assessment. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

Bioprocessing Science

The Bioprocessing Science degree is a unique program designed to provide graduates with a special skill set specific to bioprocessing and biomanufacturing. Graduates from this degree program will have exciting opportunities to biomanufacture medicines, vaccines, enzymes and other products that improve the quality of life.

Scholarships

The department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Science.

Food Safety & Quality Management (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The University Certificate in Food Safety & Quality Management provides individuals an opportunity to learn basic food safety, quality control, and operations management concepts that are useful throughout the food manufacturing supply chain. It is available to non-degree seeking students and both undergraduate and graduate students at N.C. State University.

Program Coordinators

Clint Stevenson, Ph.D.

**Admissions Requirements**

- Non-degree seeking and continuing education students: Must demonstrate current or previous enrollment in a 2-year or 4-year degree program at an accredited college or university and provide proof of a 2.5 GPA or higher; OR have received an Associate Degree, Bachelor of Science or Bachelor of Arts Degree.
- NC State students: Must have a GPA of 2.5 or higher.

**Registration Information**

Contact the Program Coordinator.

**Academic Structure**

Term Effective: 8/2017
Plan Code: 11FSQMCTU/32FSQMCTU
CIP Code: 01.1001
Description: Undergraduate Certificate in Food Safety & Quality Management
Offered: Depending on the combination of courses that are selected, the format of this program can either be entirely Distance Education format or a combination of Distance Education (https://online-distance.ncsu.edu/program/university-certificate-in-plant-pests-pathogens-and-people/) and face-to-face.

**Plan Requirements**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Required Courses</td>
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<tr>
<td>FS 250</td>
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<tr>
<td>FS 435/535</td>
<td>Food Safety Management Systems</td>
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<tr>
<td>FS 416</td>
<td>Quality Control in Food and Bioprocessing</td>
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</table>

| Elective Courses |                                      | 3     |
| Select one of the following: |                                      |       |
| BUS 370 | Operations and Supply Chain Management     | 2     |
| ENT 207 | Insects and Human Disease                  |       |
| FS 421 | Food Preservation                          |       |
| PO 425 | Feed Manufacturing Technology              |       |
| FM 480 | Feed Quality Assurance & Formulation       |       |
| HS 462 | Postharvest Physiology                     |       |
| ISE 352 | Fundamentals of Human-Machine Systems Design |       |
| PSY 307 | Industrial and Organizational Psychology   |       |

Total Hours 12

1 There is a pre-requisite of ST 311 Introduction to Statistics for FS 416 Quality Control in Food and Bioprocessing. This pre-requisite may be satisfied by an equivalent course from other institutions by requesting approval from the certificate program director.
Per previous conversations with the Poole College of Management, this course will only be offered to Food Safety & Quality Management Certificate students in the summer session.

**Food Science (BS): Science Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Food Science Bachelor of Science degree is offered through two curricula emphasizing science or technology. The science curriculum is designed for students desiring a more analytically intense program leading to technical careers in the food industry or graduate school. Students with an interest in business opportunities will find the technology program permits greater flexibility to pursue coursework in business, agricultural economics, or related fields.

**Plan Requirements**

**Food Science (BS): Science Concentration: 120 Total Units**

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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
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<tr>
<td>BIO 181</td>
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<tr>
<td>or BIO 183</td>
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<tr>
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<td>CH 223</td>
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<td>CH 224</td>
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**Mathematical Sciences**

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<td>Organic Chemistry I Lab</td>
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<td>CH 223</td>
<td>Organic Chemistry II</td>
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<tr>
<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
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<tr>
<td>BCH 351</td>
<td>General Biochemistry</td>
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<td>MB 351</td>
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**Major Requirements**

**Food Science Electives**

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<tr>
<td>ANS 322</td>
<td>Muscle Foods and Eggs</td>
<td>3</td>
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<tr>
<td>ANS 324</td>
<td>Milk and Dairy Products</td>
<td>3</td>
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<tr>
<td>ANS 415</td>
<td>Comparative Nutrition</td>
<td>3</td>
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<tr>
<td>ANS 515</td>
<td>Comparative Nutrition</td>
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<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
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<td>BAE 525</td>
<td>Industrial Microbiology and Bioprocessing</td>
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<td>BBS 201</td>
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<td>BBS 325</td>
<td>Introduction to Brewing Science and Technology</td>
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<tr>
<td>BEC 220</td>
<td>Introduction to Drug Development and Careers in Biomanufacturing</td>
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<td>Basics of Food Safety &amp; Quality</td>
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<td>FS 322</td>
<td>Muscle Foods and Eggs</td>
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<tr>
<td>FS 324</td>
<td>Milk and Dairy Products</td>
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<td>FS 325</td>
<td>Introduction to Brewing Science and Technology</td>
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<td>FS 330</td>
<td>Science of Food Preparation</td>
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<td>FS 352</td>
<td>Introduction to Microbiological Food Safety Hazards</td>
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<td>FS 354</td>
<td>Food Sanitation</td>
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<td>FS 401</td>
<td>Advanced Nutrition and Metabolism</td>
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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.
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<td>FS 435</td>
<td>Food Safety Management Systems</td>
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<td>FS 453</td>
<td>Food Laws and Regulations</td>
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<td>FS 462</td>
<td>Postharvest Physiology</td>
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<tr>
<td>FS 471</td>
<td>Professionalism &amp; Project Preparation in Food &amp; Bioprocessing Science</td>
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<td>FS 481</td>
<td>Research Experience in Food and Bioprocessing Sciences</td>
<td>3</td>
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<td>FS 501</td>
<td>Advanced Nutrition and Metabolism</td>
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<tr>
<td>FS 516</td>
<td>Quality Control in Food and Bioprocessing</td>
<td>3</td>
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<tr>
<td>FS 520</td>
<td>Pre-Harvest Food Safety</td>
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<td>FS 522</td>
<td>Food Packaging</td>
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<td>FS 530</td>
<td>Post-Harvest Food Safety</td>
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<td>FS 535</td>
<td>Food Safety Management Systems</td>
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<tr>
<td>FS 540</td>
<td>Food Safety and Public Health</td>
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<td>FS 550</td>
<td>Food Industry Study Tour</td>
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<td>Food Laws and Regulations</td>
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<td>FS 554</td>
<td>Lactation, Milk, and Nutrition</td>
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<td>FS 555</td>
<td>Exercise Nutrition</td>
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<tr>
<td>FS 557</td>
<td>Nutraceuticals and Functional Foods</td>
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<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
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<td>FS 567</td>
<td>Sensory Analysis of Foods</td>
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<td>FS 580</td>
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<td>FSA 520</td>
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<td>FSA 530</td>
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<td>FSA 540</td>
<td>Food Safety and Public Health</td>
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<td>FSA 580</td>
<td>Professional Development and Ethics in Food Safety</td>
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<td>Postharvest Physiology</td>
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<td>HS 562</td>
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<td>NTR 401</td>
<td>Advanced Nutrition and Metabolism</td>
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<td>NTR 415</td>
<td>Comparative Nutrition</td>
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<td>NTR 501</td>
<td>Advanced Nutrition and Metabolism</td>
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<td>NTR 515</td>
<td>Comparative Nutrition</td>
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<td>NTR 545</td>
<td>Lactation, Milk, and Nutrition</td>
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<td>NTR 555</td>
<td>Exercise Nutrition</td>
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<td>NTR 557</td>
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<td>PO 322</td>
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<tr>
<td>PO 515</td>
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**Semester Sequence**

This is a sample.

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<tbody>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td>3</td>
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</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
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**Spring Semester**

| CH 101 | Chemistry - A Molecular Science                                       | 3     |
| CH 102 | General Chemistry Laboratory                                          | 1     |
| FS 201 | Introduction to Food Science                                          | 3     |
| MA 131 | Calculus for Life and Management Sciences A                           | 3     |
| GEP Humanities (p. 1423)                                          | 3     |
| GEP Health and Exercise Studies (p. 1422)                          | 1     |
| **Hours** |                                                                    | 14    |

**Second Year**

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<th>Fall Semester</th>
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<tbody>
<tr>
<td>CH 221</td>
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<td>CH 222</td>
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<td>MA 231</td>
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<td>MA 132</td>
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<td>PY 211</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>BCH 351</td>
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<td>FS 403</td>
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<tr>
<td>GEP Additional Breadth (p. 1417)</td>
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**Third Year**

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<td>FS 402</td>
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<tr>
<td>or COM 112</td>
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<table>
<thead>
<tr>
<th>Spring Semester</th>
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<tbody>
<tr>
<td>MB 351</td>
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<tr>
<td>MB 352</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td><strong>Hours</strong></td>
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**Fourth Year**

**Fall Semester**

**Spring Semester**

**Hours**

This is a sample.
Fourth Year

Fall Semester

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<tr>
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<td>3</td>
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<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
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<tr>
<td>Food Science Elective</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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Spring Semester

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<td>3</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
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Total Hours 15

Career Opportunities

Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products, as well as for educational programs designed to promote healthy eating, creates a variety of career opportunities in the food, pharmaceutical and the allied health industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. Public health opportunities include educational program development, delivery, and assessment. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

Food Science

Many career opportunities exist in the food and beverage industry, the world's largest manufacturing sector, for graduates with a Food Science degree. Food science professionals are involved in the discovery of new food sources, new methods of food preservation, advances in food chemistry and sensory science and even product development. Positions are found worldwide, providing technical support to the food, beverage, and pharmaceutical industries and also government agencies. Food scientists work to ensure the safety and quality of foods through the application of basic scientific principles. The demand for food scientists continues to increase as the food industry expands.

The undergraduate Food Science major has two emphasis tracks. One is Science and the other is Technology. The B.S. in Food Science with a Science emphasis is designed for students who want more rigorous science courses to prepare them for graduate school or careers in the food, pharmaceutical, and bioprocessing industries. The B.S. in Food Science with a Technology emphasis is designed for students more interested in business opportunities for technically trained individuals. It offers greater flexibility in complementing Food Science coursework with business, agricultural commodity, and computer science courses.

Scholarships

The department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Science.

Food Science (BS): Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Food Science Bachelor of Science degree is offered through two curricula emphasizing science or technology. The science curriculum is designed for students desiring a more analytically intense program leading to technical careers in the food industry or graduate school. Students with an interest in business opportunities will find the technology program permits greater flexibility to pursue coursework in business, agricultural economics, or related fields.

Plan Requirements

Food Science (BS): Technology Concentration: 120 Total Units

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<th>Hours</th>
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<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>Communication</td>
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<td></td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
<tr>
<td>Mathematical Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A &amp; B</td>
<td>3</td>
</tr>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
<td>3</td>
</tr>
<tr>
<td>MA 132</td>
<td>Computational Mathematics for Life and Management Sciences</td>
<td>1</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>or BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
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<tr>
<td>Select one of the following:</td>
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<td>4</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry &amp; Lab</td>
<td>3</td>
</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I &amp; Lab</td>
<td>3</td>
</tr>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
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Major Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>FS 201</td>
<td>Introduction to Food Science</td>
<td>3</td>
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</table>
# Food Science Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANS 322</td>
<td>Muscle Foods and Eggs</td>
<td>3</td>
</tr>
<tr>
<td>ANS 324</td>
<td>Milk and Dairy Products</td>
<td>3</td>
</tr>
<tr>
<td>ANS 415</td>
<td>Comparative Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>ANS 515</td>
<td>Comparative Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
<td>3</td>
</tr>
<tr>
<td>BAE 525</td>
<td>Industrial Microbiology and Bioprocessing</td>
<td>3</td>
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<tr>
<td>BBS 201</td>
<td>Introduction to Biopharmaceutical Science</td>
<td>3</td>
</tr>
<tr>
<td>BBS 325</td>
<td>Introduction to Brewing Science and Technology</td>
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<tr>
<td>FS 250</td>
<td>Basics of Food Safety &amp; Quality</td>
<td>3</td>
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<tr>
<td>FS 322</td>
<td>Muscle Foods and Eggs</td>
<td>3</td>
</tr>
<tr>
<td>FS 324</td>
<td>Milk and Dairy Products</td>
<td>3</td>
</tr>
<tr>
<td>FS 325</td>
<td>Introduction to Brewing Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>FS 330</td>
<td>Science of Food Preparation</td>
<td>3</td>
</tr>
<tr>
<td>FS 352</td>
<td>Introduction to Microbiological Food Safety</td>
<td>3</td>
</tr>
<tr>
<td>FS 354</td>
<td>Food Sanitation</td>
<td>3</td>
</tr>
<tr>
<td>FS 401</td>
<td>Advanced Nutrition and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>FS 416</td>
<td>Quality Control in Food and Bioprocessing</td>
<td>3</td>
</tr>
<tr>
<td>FS 435</td>
<td>Food Safety Management Systems</td>
<td>3</td>
</tr>
<tr>
<td>FS 453</td>
<td>Food Laws and Regulations</td>
<td>3</td>
</tr>
<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>FS 471</td>
<td>Professionalism &amp; Project Preparation in Food &amp; Bioprocessing</td>
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<tr>
<td>FS 481</td>
<td>Research Experience in Food and Bioprocessing Sciences</td>
<td>3</td>
</tr>
<tr>
<td>FS 501</td>
<td>Advanced Nutrition and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>FS 516</td>
<td>Quality Control in Food and Bioprocessing</td>
<td>3</td>
</tr>
<tr>
<td>FS 520</td>
<td>Pre-Harvest Food Safety</td>
<td>3</td>
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<tr>
<td>FS 522</td>
<td>Food Packaging</td>
<td>3</td>
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<tr>
<td>FS 530</td>
<td>Post-Harvest Food Safety</td>
<td>3</td>
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<tr>
<td>FS 535</td>
<td>Food Safety Management Systems</td>
<td>3</td>
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<tr>
<td>FS 540</td>
<td>Food Safety and Public Health</td>
<td>3</td>
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<tr>
<td>FS 550</td>
<td>Food Industry Study Tour</td>
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<tr>
<td>FS 553</td>
<td>Food Laws and Regulations</td>
<td>3</td>
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<tr>
<td>FS 554</td>
<td>Lactation, Milk, and Nutrition</td>
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<tr>
<td>FS 555</td>
<td>Exercise Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FS 557</td>
<td>Nutraceuticals and Functional Foods</td>
<td>3</td>
</tr>
<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
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<tr>
<td>FS 567</td>
<td>Sensory Analysis of Foods</td>
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<tr>
<td>FS 580</td>
<td>Professional Development and Ethics in Food Safety</td>
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<td>FSA 520</td>
<td>Pre-Harvest Food Safety</td>
<td>3</td>
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<tr>
<td>FSA 530</td>
<td>Post-Harvest Food Safety</td>
<td>3</td>
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<tr>
<td>FSA 540</td>
<td>Food Safety and Public Health</td>
<td>3</td>
</tr>
<tr>
<td>FSA 580</td>
<td>Professional Development and Ethics in Food Safety</td>
<td>1</td>
</tr>
<tr>
<td>HS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>HS 562</td>
<td>Postharvest Physiology</td>
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<tr>
<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NTR 401</td>
<td>Advanced Nutrition and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>NTR 415</td>
<td>Comparative Nutrition</td>
<td>3</td>
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<tr>
<td>NTR 501</td>
<td>Advanced Nutrition and Metabolism</td>
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<tr>
<td>NTR 515</td>
<td>Comparative Nutrition</td>
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<tr>
<td>NTR 554</td>
<td>Lactation, Milk, and Nutrition</td>
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<tr>
<td>NTR 555</td>
<td>Exercise Nutrition</td>
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<tr>
<td>NTR 557</td>
<td>Nutraceuticals and Functional Foods</td>
<td>3</td>
</tr>
<tr>
<td>PO 322</td>
<td>Muscle Foods and Eggs</td>
<td>3</td>
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<tr>
<td>PO 415</td>
<td>Comparative Nutrition</td>
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<tr>
<td>PO 515</td>
<td>Comparative Nutrition</td>
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</table>

# Business/Economics Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
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<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
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</table>
Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<td>16</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>FS 201</td>
<td>Introduction to Food Science</td>
<td>3</td>
</tr>
<tr>
<td>MA 114 or MA 131</td>
<td>Introduction to Finite Mathematics with Applications or Calculus for Life and Management Sciences A</td>
<td>3</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td><strong>Second Year</strong></td>
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<td>14</td>
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<td><strong>Fall Semester</strong></td>
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<td>Select one of the following:</td>
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</table>

| **Third Year** |                                                      |       |
| **Fall Semester** |                                                      |       |
| FS 402         | Chemistry of Food and Bioprocessed Materials           | 4     |
| GEP Interdisciplinary Perspectives (p. 1426) |                                | 3     |
| Food Science Elective |                                                      | 3     |
| BUS/EC/Minor Elective |                                                | 3     |
| MB 351         | General Microbiology                                    | 3     |
| MB 352         | General Microbiology Laboratory                         | 1     |
| **Spring Semester** |                                                      | 17    |
| FS 403         | Analytical Techniques in Food & Bioprocessing Science  | 4     |
| FS 405         | Food Microbiology                                        | 3     |
| FS 406         | Food Microbiology Laboratory                             | 1     |
| GEP Additional Breadth (p. 1417) |                                | 3     |
| BUS/EC/Minor Elective |                                                | 3     |
| **Fourth Year** |                                                      | 14    |
| **Fall Semester** |                                                      |       |
| ST 311         | Introduction to Statistics                               | 3     |
| FS 421         | Food Preservation                                         | 3     |
| GEP Humanities (p. 1423) |                                | 3     |
| Free/Minor Elective |                                                | 3     |
| Free/Minor Elective |                                                | 3     |
| **Spring Semester** |                                                      | 15    |
| FS 475         | Problems and Design in Food and Bioprocessing Science   | 3     |
| FS 416         | Quality Control in Food and Bioprocessing                | 3     |
| Food Science Elective |                                                | 3     |
Career Opportunities

Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products, as well as for educational programs designed to promote healthy eating, creates a variety of career opportunities in the food, pharmaceutical and the allied health industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. Public health opportunities include educational program development, delivery, and assessment. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

Food Science

Many career opportunities exist in the food and beverage industry, the world's largest manufacturing sector, for graduates with a Food Science degree. Food science professionals are involved in the discovery of new food sources, new methods of food preservation, advances in food chemistry and sensory science and even product development. Positions are found worldwide, providing technical support to the food, beverage, and pharmaceutical industries and also government agencies. Food scientists work to ensure the safety and quality of foods through the application of basic scientific principles. The demand for food scientists continues to increase as the food industry expands.

The undergraduate Food Science major has two emphasis tracks. One is Science and the other is Technology. The B.S. in Food Science with a Science emphasis is designed for students who want more rigorous science courses to prepare them for graduate school or careers in the food, pharmaceutical, and or bioprocessing industries. The B.S. in Food Science with a Technology emphasis is designed for students more interested in business opportunities for technically trained individuals. It offers greater flexibility in complementing Food Science coursework with business, agricultural commodity, and computer science courses.

Scholarships

The department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Science.

Food Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The Food Science minor is designed to provide students with important food science principles and concepts. It should give a competitive edge to individuals seeking employment in the food, pharmaceutical and related industries as a chemist, microbiologist, engineer, nutritionist, business specialist, or technical writer. This minor will provide technical information to improve the student's knowledge and understanding of food and its manufacture. While a comprehensive coverage of Food Science cannot be accomplished in 15 credit hours, flexibility in developing the minor permits tailoring each program to complement a student's major. An introductory course (FS 201 Introduction to Food Science) is required, but other courses at the 200, 300 and 400 level may be selected build on the basic discipline courses in the student's major.

Admissions

Students may declare their desire to complete the Food Science minor by contacting Dr. Harris as listed below. Students will be assigned an advisor to help them in selecting coursework for the minor.

Certification

Dr. Harris will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student's final semester at NC State.

Contact Person

Dr. Keith Harris
Associate Professor, Food Science
116B Schaub Hall
919-513-2124
keith_harris@ncsu.edu

SIS Code: 11FDM

Plan Requirements

- Completion of a minimum of 15 credits
- A grade of 'C' or better.
- The minor must include one introductory course (FS 201 Introduction to Food Science), and 12 additional hours at the 200, 300 or 400 level.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS 201</td>
<td>Introduction to Food Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select two of the following:</td>
<td>6</td>
</tr>
<tr>
<td>FS 231</td>
<td>Principles of Food and Bioprocess Engineering</td>
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<tr>
<td>FS 402</td>
<td>Chemistry of Food and Bioprocessed Materials</td>
<td></td>
</tr>
<tr>
<td>FS/MB 405</td>
<td>Food Microbiology</td>
<td></td>
</tr>
<tr>
<td>FS 421</td>
<td>Food Preservation</td>
<td></td>
</tr>
<tr>
<td>FS 231</td>
<td>Principles of Food and Bioprocess Engineering</td>
<td></td>
</tr>
<tr>
<td>FS 290</td>
<td>Careers in Food and Bioprocessing Sciences</td>
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</tr>
<tr>
<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
<td></td>
</tr>
<tr>
<td>FS/ANS/PO 322</td>
<td>Muscle Foods and Eggs</td>
<td></td>
</tr>
<tr>
<td>FS/ANS 324</td>
<td>Milk and Dairy Products</td>
<td></td>
</tr>
<tr>
<td>FS 330</td>
<td>Science of Food Preparation</td>
<td></td>
</tr>
<tr>
<td>FS 435</td>
<td>Food Safety Management Systems</td>
<td></td>
</tr>
<tr>
<td>FS 352</td>
<td>Introduction to Microbiological Food Safety Hazards</td>
<td></td>
</tr>
<tr>
<td>FS 354</td>
<td>Food Sanitation</td>
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</tr>
<tr>
<td>FS 402</td>
<td>Chemistry of Food and Bioprocessed Materials</td>
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<tr>
<td>FS 403</td>
<td>Analytical Techniques in Food &amp; Bioprocessing Science</td>
<td></td>
</tr>
<tr>
<td>FS/MB 405</td>
<td>Food Microbiology</td>
<td></td>
</tr>
<tr>
<td>FS/MB 406</td>
<td>Food Microbiology Lab</td>
<td></td>
</tr>
</tbody>
</table>
Nutrition (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Minor in Nutrition will provide knowledge of the principles of nutrition that are needed to formulate balanced diets and to evaluate information and policies concerning foods and dietary practices. Students may select courses to emphasize human or animal nutrition or a combination of these.

The objectives for students pursuing the Nutrition Minor are to:

1. acquire an understanding of the functions of the nutrients in the health of humans and/or animals,
2. to learn to formulate nutritionally balanced diets for humans and/or animals, and
3. to learn to apply nutritional principles in the evaluation of information and policies concerning foods and dietary practices.

Admissions

Students who plan to minor in Nutrition should contact Dr. Natalie Cooke, 218A Schaub Hall.

Certification

Dr. Cooke will certify the completion of the student's minor program. Certification must be submitted no later than the registration period for the student's final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Dr. Natalie Cooke
nkcooke@ncsu.edu
218A Schaub Hall
919-515-0287

SIS Code: 11NTM

Plan Requirements

Must complete a minimum of 15 credit hours from the list provided below and a grade of 'C-' or better in each course.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Course</td>
<td></td>
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</tr>
<tr>
<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
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<tr>
<td>ANS 230</td>
<td>Animal Nutrition</td>
<td></td>
</tr>
<tr>
<td>ANS 225</td>
<td>Principles of Animal Nutrition</td>
<td></td>
</tr>
<tr>
<td>Elective Courses</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

No more than 1 credit of experimental investigation taken as FS 493 Special Problems in Food Science may be used toward the minor.

Nutrition Sciences (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Nutrition Science Bachelor of Science degree has two sub-plans to choose from: the Science track or the Applied track. The Science curriculum is designed for those students with an interest in graduate school or post-graduate training in a human health profession for which physics and 4 semesters of chemistry are required. The Applied curriculum is designed for those interested in health-related jobs immediately after graduation, obtaining further training to become a Registered Dietitian after graduation, or going on for post-graduate training in a human health profession for which no physics courses and only 3 semesters of chemistry are required.

Plan Requirements

Nutrition Sciences (BS): 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
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</tr>
<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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</tr>
<tr>
<td>Communication</td>
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</tbody>
</table>
Select one of the following:  
- COM 110: Public Speaking  
- COM 112: Interpersonal Communication  
- ENG 333: Communication for Science and Research

**Mathematics & Sciences**

- BIO 181: Introductory Biology: Ecology, Evolution, and Biodiversity  
- BIO 183: Introductory Biology: Cellular and Molecular Biology  
- CH 101: Chemistry - A Molecular Science  
- CH 102: General Chemistry Laboratory  
- CH 201: Chemistry - A Quantitative Science  
- CH 202: Quantitative Chemistry Laboratory  
- CH 221: Organic Chemistry I  
- CH 222: Organic Chemistry I Lab  
- CH 223: Organic Chemistry II  
- CH 224: Organic Chemistry II Lab  
- PY 211: College Physics I  
- PY 212: College Physics II  
- MA 121: Elements of Calculus  
- MA 131: Calculus for Life and Management Sciences A  
- ST 311: Introduction to Statistics  
- PSY 200: Introduction to Psychology

**Required Courses**

- LSC 101: Critical and Creative Thinking in the Life Sciences  
- FS 201: Introduction to Food Science  
- NTR 301: Introduction to Human Nutrition  
- NTR 302: Introduction to Nutrition Research, Communication, and Careers  
- NTR 401: Advanced Nutrition and Metabolism  
- GN 311: Principles of Genetics  
- MB 351: General Microbiology  
- MB 352: General Microbiology Laboratory  
- NTR 490: Senior Capstone Experience in Nutrition

**Restricted Electives**

- Restricted Nutrition Elective (p. 325)  
- Application Electives (p. 325)  
- ZO 250: Animal Anatomy and Physiology  
- Nutrition Electives (p. 326)  

**GEP Courses**

- ENG 101: Academic Writing and Research  
- GEP Humanities (p. 1423)  
- GEP Social Sciences (p. 1430)  
- GEP Health and Exercise Studies (p. 1422)  
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  
- GEP Interdisciplinary Perspectives (p. 1426)  
- GEP U.S. Diversity (p. 1431) (verify requirement)  
- GEP Global Knowledge (p. 1419) (verify requirement)  
- Foreign Language Proficiency (p. 1417) (verify requirement)

**Free Electives**

Free Electives (12 Hr S/U Lmt)  
Total Hours: 120

1 A grade of C- or higher is required.  
2 Students should consult their academic advisors to determine which courses fill this requirement.

**Restricted Nutrition Elective**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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**Application Electives**

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<td>Chemistry of Food and Bioprocessed Materials</td>
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<td>FS 403</td>
<td>Analytical Techniques in Food &amp; Bioprocessing Science</td>
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<td>FS 405</td>
<td>Food Microbiology</td>
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<td>Quality Control in Food and Bioprocessing</td>
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<td>FS 421</td>
<td>Food Preservation</td>
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FS 502  Chemistry of Food and Bioprocessed Materials  4
FS 505  Food Microbiology  3
FS 516  Quality Control in Food and Bioprocessing  3
FS 521  Food Preservation  3
GPH 201  Fundamentals of Global Public Health  3
HESM 478  Exercise Physiology and Sports Science  3
HI 360  U.S. Agricultural History  3
HI 380  History of Nonprofits, Philanthropy, and Social Change  3
MB 405  Food Microbiology  3
MB 505  Food Microbiology  3
NTR 415  Comparative Nutrition  3
NTR 515  Comparative Nutrition  3
PB 213  Plants and Civilization  3
PB 215  Medicinal Plants  3
PB 360  Ecology  4
PHI 325  Bio-Medical Ethics  3
PHI 420  Global Justice  3
PO 415  Comparative Nutrition  3
PO 515  Comparative Nutrition  3
PRT 200  Health, Wellness and the Pursuit of Happiness  3
PS 203  Introduction to Nonprofits  3
PS 231  Introduction to International Relations  3
PS 236  Issues in Global Politics  3
PS 312  Introduction to Public Administration  3
PSY 311  Social Psychology  3
PSY 312  Applied Psychology  3
PSY 360  Community Psychology Principles and Practice  3
PSY 376  Developmental Psychology  3
PSY 410  Learning and Motivation  3
PSY 411  The Psychology of Interdependence and Race  3
PSY 420  Cognitive Processes  3
PSY 430  Biological Psychology  3
PSY 431  Health Psychology  3
SOC 241  Sociology of Agriculture and Rural Society  3
SOC 241A  Sociology of Agriculture and Rural Society  3
SOC 311  Community Relationships  3
SOC 342  International Development  3
SOC 350  Food and Society  3
SOC 351  Population and Planning  3
SOC 381  Sociology of Medicine  3
SOC 404  Families and Work  3
SOC 440  Social Change  3
STS 323  World Population and Food Prospects  3
STS 325  Bio-Medical Ethics  3
WGS 200  Introduction to Women’s and Gender Studies  3
WGS 330  Women and Health  3
WGS 362  Communication and Gender  3

**Nutrition Electives**

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<td>IDS 211</td>
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1 A grade of C- or higher is required.

**Semester Sequence**

This is a sample.

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<td>Exploring Opportunities in the Life Sciences</td>
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<td>BIO 181</td>
<td>Introductory Biology; Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>MA 121</td>
<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
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<td><strong>Spring Semester</strong></td>
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<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Organic Chemistry I</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<td><strong>Second Year</strong></td>
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<tr>
<td>NTR 302</td>
<td>Introduction to Nutrition Research, Communication, and Careers</td>
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| Application Electives II (Max: 3 Units )                                                                 |
| GPH 425  | Global Health and Physiology                                         | 6     |
Industrial opportunities include management, research and development, opportunities in the food, pharmaceutical and the allied health industries. Designed to promote healthy eating, creates a variety of career biopharmaceutical products, as well as for educational programs.

Consumer demand for safe, high quality, nutritious foods and other health-related activities to improve quality of life and lower health care costs. It is also designed for students planning to pursue post-graduate programs to become a nurse, physician assistant or registered dietitian.

Graduates in nutrition are competitive job and professional school applicants because of their deep understanding of the physical, social and life sciences as they relate to human health. They stand out due to the many opportunities to apply their knowledge to the major health challenges facing our country and the world today.

- Note: Only entering freshmen studying Biochemistry, Nutrition Sciences, or Plant Biology participate in the Life Sciences First Year Program (http://catalog.ncsu.edu/undergraduate/collegeofals/).

Scholarships
The department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Science.

Nutrition Sciences (BS): Applied Nutrition Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Nutrition Science Bachelor of Science degree has two sub-plans to choose from: the Science track or the Applied track. The Science curriculum is designed for those students with an interest in graduate school or post-graduate training in a human health profession for which physics and 4 semesters of chemistry are required. The Applied

### Career Opportunities
Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products, as well as for educational programs designed to promote healthy eating, creates a variety of career opportunities in the food, pharmaceutical and the allied health industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. Public health opportunities include educational program development, delivery, and assessment. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

### Nutrition Sciences
Nutrition professionals provide evidence-based guidance on what we should eat, study relationships between diet and health, assess eating behavior, design and evaluate community nutrition programs, teach nutrition and healthy eating skills, and advocate for policies that support good nutrition.

Nutrition students gain a strong foundation by studying chemistry, statistics, genetics, physiology and psychology. They develop skills for applying that knowledge through research, internships and service-learning programs.

Graduates are prepared to tackle health challenges head-on, with a sound understanding of nutrient functions, nutrition in disease processes, life cycle and exercise nutrition, research methods, principles of nutrition education and public health.

Our students have the flexibility to choose between two options when pursuing their B.S. in Nutrition Science. The Nutrition Science option is designed to fulfill the prerequisites for medical school and other health professional programs, such as dentistry, physical therapy and pharmacy.

The Applied Nutrition option helps students become qualified to consult or develop programming for public health initiatives on healthy eating and other health-related activities to improve quality of life and lower health care costs. It is also designed for students planning to pursue post-graduate programs to become a nurse, physician assistant or registered dietitian.

Graduates in nutrition are competitive job and professional school applicants because of their deep understanding of the physical, social and life sciences as they relate to human health. They stand out due to the many opportunities to apply their knowledge to the major health challenges facing our country and the world today.

- Note: Only entering freshmen studying Biochemistry, Nutrition Sciences, or Plant Biology participate in the Life Sciences First Year Program (http://catalog.ncsu.edu/undergraduate/collegeofals/).
The curriculum is designed for those interested in health-related jobs immediately after graduation, obtaining further training to become a Registered Dietitian after graduation, or going on for post-graduate training in a human health profession for which no physics courses and only 3 semesters of chemistry are required.

## Plan Requirements

**Nutrition Sciences (BS): Applied Nutrition Concentration: 120 Total Units**

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<td>Chemistry - A Quantitative Science</td>
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<td>CH 220</td>
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### Required Courses

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<td>NTR 490</td>
<td>Senior Capstone Experience in Nutrition</td>
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### Restricted Electives

- Restricted Nutrition Elective (p. 328)  
- Application Electives (p. 328)  
- ZO 250 Animal Anatomy and Physiology
- Nutrition Electives (p. 329)

### GEP Courses

- ENG 101 Academic Writing and Research
- GEP Humanities (p. 1423)
- GEP Social Sciences (p. 1430)
- GEP Health and Exercise Studies (p. 1422)
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- GEP Interdisciplinary Perspectives (p. 1426)
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

### Free Electives

Free Electives (12 Hr S/U Lmt)

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1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.
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<tr>
<td>FS 330</td>
<td>Science of Food Preparation</td>
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<tr>
<td>FS 402</td>
<td>Chemistry of Food and Bioprocessed Materials</td>
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<tr>
<td>FS 403</td>
<td>Analytical Techniques in Food &amp; Bioprocessing Science</td>
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<tr>
<td>FS 405</td>
<td>Food Microbiology</td>
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<td>FS 416</td>
<td>Quality Control in Food and Bioprocessing</td>
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<td>FS 421</td>
<td>Food Preservation</td>
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<td>FS 502</td>
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<tr>
<td>FS 505</td>
<td>Food Microbiology</td>
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<td>FS 516</td>
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<td>FS 521</td>
<td>Food Preservation</td>
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<tr>
<td>GPH 201</td>
<td>Fundamentals of Global Public Health</td>
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<tr>
<td>HESM 478</td>
<td>Exercise Physiology and Sports Science</td>
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<td>HI 360</td>
<td>U.S. Agricultural History</td>
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<tr>
<td>HI 380</td>
<td>History of Nonprofits, Philanthropy, and Social Change</td>
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<tr>
<td>MB 405</td>
<td>Food Microbiology</td>
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<td>MB 505</td>
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<td>Comparative Nutrition</td>
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<td>NTR 515</td>
<td>Comparative Nutrition</td>
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<tr>
<td>PB 213</td>
<td>Plants and Civilization</td>
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<td>PB 215</td>
<td>Medicinal Plants</td>
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<td>PHI 325</td>
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<td>PRT 200</td>
<td>Health, Wellness and the Pursuit of Happiness</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<td>PS 231</td>
<td>Introduction to International Relations</td>
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<tr>
<td>PS 236</td>
<td>Issues in Global Politics</td>
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<td>PS 312</td>
<td>Introduction to Public Administration</td>
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<tr>
<td>PSY 311</td>
<td>Social Psychology</td>
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<td>Applied Psychology</td>
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<td>Community Psychology Principles and Practice</td>
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<td>Developmental Psychology</td>
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<td>Learning and Motivation</td>
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<td>The Psychology of Interdependence and Race</td>
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<td>PSY 420</td>
<td>Cognitive Processes</td>
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<td>PSY 430</td>
<td>Biological Psychology</td>
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<td>PSY 431</td>
<td>Health Psychology</td>
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<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
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<td>SOC 342</td>
<td>International Development</td>
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<td>SOC 350</td>
<td>Food and Society</td>
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<td>SOC 351</td>
<td>Population and Planning</td>
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<td>SOC 381</td>
<td>Sociology of Medicine</td>
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<td>SOC 404</td>
<td>Families and Work</td>
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<tr>
<td>STS 323</td>
<td>World Population and Food Prospects</td>
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<td>Bio-Medical Ethics</td>
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<td>WGS 200</td>
<td>Introduction to Women’s and Gender Studies</td>
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<td>Women and Health</td>
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<td>WGS 362</td>
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**Application Electives II (Max: 3 Units)**

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<tbody>
<tr>
<td>GPH 425</td>
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### Nutrition Electives

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<tbody>
<tr>
<td>ANS 454</td>
<td>Lactation, Milk and Nutrition</td>
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<tr>
<td>ANS 554</td>
<td>Lactation, Milk and Nutrition</td>
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<td>FS 555</td>
<td>Exercise Nutrition</td>
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<tr>
<td>FS 557</td>
<td>Nutraceuticals and Functional Foods</td>
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<tr>
<td>IDS 211</td>
<td>Eating through American History</td>
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<tr>
<td>NTR 220</td>
<td>Food and Culture</td>
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<td>NTR 320</td>
<td>Nutrition Education</td>
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<td>NTR 330</td>
<td>Public Health Nutrition</td>
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<td>NTR 410</td>
<td>Maternal and Infant Nutrition</td>
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<tr>
<td>NTR 419</td>
<td>Human Nutrition and Chronic Disease</td>
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<td>NTR 420</td>
<td>Applied Nutrition Education</td>
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<td>NTR 421</td>
<td>Life Cycle Nutrition</td>
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<td>NTR 454</td>
<td>Lactation, Milk and Nutrition</td>
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<tr>
<td>NTR 510</td>
<td>Maternal and Infant Nutrition</td>
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<td>NTR 555</td>
<td>Exercise Nutrition</td>
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<td>NTR 557</td>
<td>Nutraceuticals and Functional Foods</td>
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### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
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<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences</td>
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<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>MA 121 or MA 131</td>
<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Hours** 15

### Spring Semester

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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>NTR 301</td>
<td>Introduction to Human Nutrition</td>
<td>3</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>PSY 200</td>
<td>Introduction to Psychology</td>
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**Hours** 14
<table>
<thead>
<tr>
<th>Second Year</th>
<th>Fall Semester</th>
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<tbody>
<tr>
<td>CH 220 &amp; CH 222</td>
<td>Introductory Organic Chemistry and Organic Chemistry I Lab 4</td>
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<td>ST 311</td>
<td>Introduction to Statistics 3</td>
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<td>NTR 302</td>
<td>Introduction to Nutrition Research, Communication, and Careers 1 3</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>Free/Minor Elective 2</td>
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**Hours** 16

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<thead>
<tr>
<th>Spring Semester</th>
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<tbody>
<tr>
<td>CH 201</td>
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<tr>
<td>CH 202</td>
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<tr>
<td>FS 201</td>
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<tr>
<td>Nutrition Elective</td>
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<tr>
<td>Application Elective</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Hours** 16

| Third Year | Fall Semester |
|------------------|
| NTR 401 | Advanced Nutrition and Metabolism 1 3 |
| Physiology Elective | 4 |
| Nutrition Elective | 3 |
| Writing/Speaking Elective | 3 |
| Free/Minor Electives 2 | 3 |

**Hours** 16

<table>
<thead>
<tr>
<th>Spring Semester</th>
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<tbody>
<tr>
<td>GN 311</td>
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<tr>
<td>Restricted Nutrition Elective</td>
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<td>Application Elective</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417)</td>
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**Hours** 14

| Fourth Year | Fall Semester |
|------------------|
| MB 351 | General Microbiology 3 |
| MB 352 | General Microbiology Laboratory 1 |
| Nutrition Elective | 3 |
| Application Elective | 3 |
| GEP Social Sciences (p. 1430) | 3 |
| Free/Minor Elective 2 | 3 |

**Hours** 16

<table>
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<tr>
<th>Spring Semester</th>
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<tbody>
<tr>
<td>NTR 490</td>
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<tr>
<td>Application Elective</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>Free/Minor Elective 2</td>
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**Hours** 13

**Total Hours** 120

1 A grade of C- or higher is required.
2 These electives cannot be remedial nor can they be taken at an elementary level after you have taken comparable coursework at a more advanced level. They can be taken S/U unless they are being used to fulfill the requirements for a minor.

**Career Opportunities**

Consumer demand for safe, high quality, nutritious foods and biopharmaceutical products, as well as for educational programs designed to promote healthy eating, creates a variety of career opportunities in the food, pharmaceutical and the allied health industries. Industrial opportunities include management, research and development, process supervision, quality control and assurance, procurement, distribution, and sales. Public health opportunities include educational program development, delivery, and assessment. In addition, graduates hold positions with government agencies and many with advanced degrees have teaching and/or research positions in colleges and universities.

**Nutrition Sciences**

Nutrition professionals provide evidence-based guidance on what we should eat, study relationships between diet and health, assess eating behavior, design and evaluate community nutrition programs, teach nutrition and healthy eating skills, and advocate for policies that support good nutrition.

Nutrition students gain a strong foundation by studying chemistry, statistics, genetics, physiology and psychology. They develop skills for applying that knowledge through research, internships and service-learning programs.

Graduates are prepared to tackle health challenges head-on, with a sound understanding of nutrient functions, nutrition in disease processes, life cycle and exercise nutrition, research methods, principles of nutrition education and public health.

Our students have the flexibility to choose between two options when pursuing their B.S. in Nutrition Science. The Nutrition Science option is designed to fulfill the prerequisites for medical school and other health professional programs, such as dentistry, physical therapy and pharmacy.

The Applied Nutrition option helps students become qualified to consult or develop programming for public health initiatives on healthy eating and other health-related activities to improve quality of life and lower health care costs. It is also designed for students planning to pursue postgraduate programs to become a nurse, physician assistant or registered dietitian.

Graduates in nutrition are competitive job and professional school applicants because of their deep understanding of the physical, social and life sciences as they relate to human health. They stand out due to the many opportunities to apply their knowledge to the major health challenges facing our country and the world today.

- Note: Only entering freshmen studying Biochemistry, Nutrition Sciences, or Plant Biology participate in the Life Sciences First Year Program (http://catalog.ncsu.edu/undergraduate/collegeofals/).
Scholarships
The department provides both merit and financial need scholarships to encourage and assist students preparing for careers in Food, Bioprocessing, or Nutrition Science.

Department of Horticultural Science
Horticulture is a dynamic segment of agriculture. The development, growth, distribution, and utilization of fruits, vegetables, flowers, and ornamental plants, plus the art and science of landscape designing enrich our lives with nutritious foods and more attractive surroundings. North Carolina’s varied climatic conditions favor the production of a wide variety of horticultural crops on a commercial scale, as well as numerous beautiful parks, gardens, and arboreta. The growing interest in local foods and home gardening has created a demand for more information about fruits and vegetable production and new crop varieties adapted to North Carolina’s environments. Urban population growth fuels a need for ornamental plants and a thriving nursery industry. Designers skilled in residential and commercial landscaping, interior plantscaping, and plant maintenance are in high demand. The growth in demand for horticultural information by the consumer, schools, and state and county government continues to increase.

Undergraduate programs in horticultural science offer a broad based education in physical and biological sciences and a sound production background. Students can concentrate in areas of fruit and vegetable science, floriculture, woody ornamental plant science, landscape design, or pursue a general approach encompassing all the specialties. They are prepared for graduate study or for diverse professional service.

For more information about this department, including contact information, visit the department [website](https://cals.ncsu.edu/horticultural-science/).

Department of Horticultural Science
Campus Box 7609
Raleigh, NC 27695-7609
Phone: 919-515-3131

Frank Louws
Department Head
Phone: 919-513-8177
Email: fjlouws@ncsu.edu

Faculty

Department Head
Frank Louws

Assistant Department Head
Lucy Bradley

Undergraduate Coordinator
Helen T. Kraus

Director of Graduate Programs
Chris Gunter

Department Extension Leader
Lucy Bradley

Director, JC Raulston Arboretum
Mark Weathington

William Neal Reynolds Distinguished Professor
T.C. Wehner
C. Yencho
S. Zeng

JC Raulston Distinguished Professor
T. Ranney

Professors
W.G. Buhler
N.G. Creamer
G.E. Fernandez
W.C. Fonteno
C. Gunter
C.A. Iglesias
J.L. Kornegay
J.C. Neal
P. Perkins-Veazie
T.G. Ranney
J.R. Schultheis
T.C. Wehner
B.E. Whipker
C. Yencho
S. Zeng

Associate Professor
J.D. Burton
D. Carley
J.M. Davis
Agroecology & Sustainable Food Systems (BS): Urban Horticulture Concentration

B.A. Fair
B.E. Jackson
K. Jennings
H.T. Kraus
A.V. LeBude
D.R. Panthee
M.L. Parker
J.T. Sherk
A.M. Spafford

Assistant Professor
H. Ashrafi
R. Hernandez
M. Iorizzo
T.M. Kon
W. Liu

Lecturers
L. Ivy
E.M. Meyer

Researcher
M.E. Clough
S.F. Krasnyanski
K.V. Pecota

Research Associate
B.A. Bergmann
A. Nus
J. Spencer
K. Starke
R. Welker
J. Zhang

Research Assistant Professor
R. Dunning
B.A. Olukolu

Extension Associate
M. Clough
W.E. Mitchem

Adjunct Professor
D.J. Bremer
J.L. Gibson
J. Herbage
M.S. McGinnis
C.B. McKenney
K. Williams
P.S. Zorner

Adjunct Assistant Professor
G. Gusmini
C.E. Niedziela

Plans

- Agroecology & Sustainable Food Systems (BS): Urban Horticulture Concentration (p. 332)
- Horticultural Science (BS): Landscape Design, Gardens & Urban Environments Concentration (p. 335)
- Horticultural Science (BS): Plant Breeding and Biotechnology in Horticulture Concentration (p. 337)
- Horticultural Science (BS): Production Systems and Entrepreneurship in Horticulture Concentration (p. 340)
- Horticultural Science (Minor) (p. 343)
- Horticulture (Undergraduate Certificate) (p. 344)

Agroecology & Sustainable Food Systems (BS): Urban Horticulture Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Bachelor of Science in Agroecology and Sustainable Food Systems: Urban Horticulture Concentration is one of the four concentrations offered in by the Department of Horticultural Science. Students are offered a unique look at various aspects of Horticulture.

Students learn the methods, processes, art, and science of horticulture. Courses in each concentration vary and are taught in classroom and laboratory settings or, for some classes, online. Internships are required, which provide hands-on experience and learning.

Students can follow paths toward industry, entrepreneurship, research, and an advanced degree.
Plan Requirements

Agroecology & Sustainable Food Systems (BS): Urban Horticulture
Concentration: 120 Total Units

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<tr>
<td></td>
<td><strong>Orientation</strong></td>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>or</td>
<td>ALS 303 Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>BIO 183</td>
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<td>COM 110</td>
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**Major Requirements**

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<td>Introduction to Agroecology</td>
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<td>CS 415</td>
<td>Integrated Pest Management</td>
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<td>Advanced Agroecology</td>
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<td>HS 410</td>
<td>Community Food Systems</td>
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<td>Sustainable Food Production (capstone)</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>Soil Science Laboratory</td>
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<tr>
<td>STS 323</td>
<td>World Population and Food Prospects</td>
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<tr>
<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
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<tr>
<td>or</td>
<td>SSC 332 Environmental Soil Microbiology</td>
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<tr>
<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
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<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<td>Select one of the following:</td>
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<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
<td>3</td>
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<tr>
<td>IDS 211</td>
<td>Eating through American History</td>
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</tr>
<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
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**Concentration Electives**

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<th>Hours</th>
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<tr>
<td>CSSC 290</td>
<td>Professional Development in Crop &amp; Soil Sciences</td>
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<td>CSSC 492</td>
<td>Professional Internship Experience in Crop and Soil Sciences</td>
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<tr>
<td>CSSC 493</td>
<td>Research Experience in Crop and Soil Sciences</td>
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<td>HS 492</td>
<td>Horticulture Internship</td>
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<tr>
<td>HS 493</td>
<td>Research Experience in Horticultural Science</td>
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**Foundational Electives**

<table>
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<tbody>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
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<td>ANS 215</td>
<td>Agricultural Genetics</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
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<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<td>CS 211</td>
<td>Plant Genetics</td>
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<td>HS 215</td>
<td>Agricultural Genetics</td>
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<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
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<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
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<tr>
<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
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<tr>
<td>HS 432</td>
<td>Introduction to Permaculture</td>
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<td>HS 532</td>
<td>Introduction to Permaculture</td>
<td>3</td>
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<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
### Restricted Electives

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<td>ARE 303</td>
<td>Farm Management</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>EC 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<td>ENT 203</td>
<td>An Introduction to the Honey Bee and Beekeeping</td>
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<tr>
<td>ENT 401</td>
<td>Honey Bee Biology and Management</td>
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<td>ENT 425</td>
<td>General Entomology</td>
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<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
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<td>FS 520</td>
<td>Pre-Harvest Food Safety</td>
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<tr>
<td>FS 530</td>
<td>Post-Harvest Food Safety</td>
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<td>FS 562</td>
<td>Postharvest Physiology</td>
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<td>FSA 520</td>
<td>Pre-Harvest Food Safety</td>
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<td>FSA 530</td>
<td>Post-Harvest Food Safety</td>
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<td>HS 421</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<td>HS 422</td>
<td>Small Fruit Production</td>
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<td>HS 423</td>
<td>Viticulture</td>
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<td>HS 431</td>
<td>Vegetable Production</td>
<td>4</td>
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<td>HS 440</td>
<td>Greenhouse Management</td>
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<td>HS 451</td>
<td>Plant Nutrition</td>
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<td>HS 462</td>
<td>Postharvest Physiology</td>
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<td>HS 521</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
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<td>HS 523</td>
<td>Viticulture</td>
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<td>HS 551</td>
<td>Plant Nutrition</td>
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<tr>
<td>HS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
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<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<tr>
<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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</table>

### Semester Sequence

#### First Year

**Fall Semester**

- **ALS 103** Freshman Transitions and Diversity in Agriculture & Life Sciences | 1
- **BIO 181** Introductory Biology: Ecology, Evolution, and Biodiversity | 4
- **ENG 101** Academic Writing and Research | 4
- **MA 107** Precalculus I | 3
- **HS 201** The World of Horticulture: Principles and Practices | 3
- **GEP Health and Exercise Studies (p. 1422)** | 1

**Spring Semester**

- **BIO 183** or **PB 200** Introductory Biology: Cellular and Molecular Biology or Plant Life | 4
- **MA 121** Elements of Calculus | 3-4

#### Second Year

**Fall Semester**

- **CH 101** Chemistry - A Molecular Science | 3
- **CH 102** General Chemistry Laboratory | 1
- **CS 230** Introduction to Agroecology | 3
- **MA 121** or **MA 131** Elements of Calculus | 3-4
- **GEP Humanities (p. 1423)** | 3

**Spring Semester**

- **ARE 201** Introduction to Agricultural & Resource Economics | 3
- **AEC/PB 360** Ecology | 4
- **SSC 200** Soil Science | 3
- **SSC 201** Soil Science Laboratory | 1
- **Foundation Elective** | 4

#### Third Year

**Fall Semester**

- **SOC 241** Sociology of Agriculture and Rural Society | 3
- **SSC 427** Biological Approaches to Sustainable Soil Systems | 3
- **CS/HS 410** Community Food Systems | 3
- **Foundation Elective** | 4
- **Select one of the following:** | 3
  - **ENG 331** Communication for Engineering and Technology
  - **ENG 332** Communication for Business and Management
  - **ENG 333** Communication for Science and Research
  - **AEE 311** Communication Methods and Media

**Spring Semester**

- **CS 430** Advanced Agroecology | 4
- **SSC/H 428** Service-Learning in Urban Agriculture Systems | 1
- **STS 323** World Population and Food Prospects | 3
- **Restricted Elective** | 3
- **Restricted Elective** | 3

Hours | 16

- **MA 131** Calculus for Life and Management Sciences A
- **MA 141** Calculus I
- **GEP Humanities (p. 1423)** | 3
- **COM 110** or **COM 112** Public Speaking or Interpersonal Communication | 3
- **HS 290** Horticulture: Careers and Opportunities | 1
- **GEP Health and Exercise Studies (p. 1422)** | 1

Hours | 15-16
Fourth Year

Fall Semester

CS/HS 480 Sustainable Food Production (capstone) 1
Restricted Elective 3
Restricted Elective 3
Restricted Elective 3
HS 492/493 Horticulture Internship 3
Free Elective 3

| Hours | 16 |

Spring Semester

CS 415 Integrated Pest Management 3
GEP Additional Breadth (p. 1417) 3
Restricted Elective 3
Restricted Elective 3
Free Elective 3

| Hours | 15 |

Total Hours 120-121

Horticultural Science (BS): Landscape Design, Gardens & Urban Environments Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orig.ncsu.edu/pfas/)

The Bachelor of Science in Horticultural Science: Landscape Design, Gardens & Urban Environments Concentration is one of the four concentrations offered in by the Department of Horticultural Science. Students are offered a unique look at various aspects of Horticulture.

Students learn the methods, processes, art, and science of horticulture. Courses in each concentration vary and are taught in classroom and laboratory settings or, for some classes, online. Internships are required, which provide hands-on experience and learning.

Students can follow paths toward industry, entrepreneurship, research, and an advanced degree.

Dr. Helen Kraus (https://cals.ncsu.edu/horticultural-science/people/hkraus/)
Undergraduate Coordinator and Professor
Department of Horticultural Science
114 Kilgore Hall, Campus Box 7609
North Carolina State University
Raleigh, NC 27695-7609
Phone: 919-515-1208

Plan Requirements

Horticultural Science (BS): Landscape Design, Gardens & Urban Environments Concentration: 120 Total Units

<table>
<thead>
<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
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</table>

 or ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences

Communication
Select one of the following:
COM 110 Public Speaking 3
COM 112 Interpersonal Communication 3
COM 202 Small Group Communication 3

Mathematics & Sciences
MA 107 Precalculus I 3
Select one of the following:
MA 114 Introduction to Finite Mathematics with Applications 3
MA 121 Elements of Calculus 3
MA 131 Calculus for Life and Management Sciences A 3
ST 311 Introduction to Statistics 3
CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1
BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4

BIO 183 Introductory Biology: Cellular and Molecular Biology 4

or PB 200 Plant Life 3
Select one of the following:
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
EC 201 Principles of Microeconomics 3
EC 205 Fundamentals of Economics 3

Foundational Courses
HS 201 The World of Horticulture: Principles and Practices 3
HS 242 Introduction to Small Scale Landscape Design 3
HS 272 Landscape Design/Build 6
HS 290 Horticulture: Careers and Opportunities 1
HS 301 Plant Propagation 4
HS 303 Ornamental Plant Identification I 3
HS 304 Ornamental Plant Identification II 3
HS 471 Landscape Ecosystem Management 4
SSC 200 Soil Science 3
SSC 201 Soil Science Laboratory 1
PB 321 Introduction to Whole Plant Physiology 3
PB 360 Ecology 4
Select one of the following:
AEC 380 Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy 3
ES 200 Climate Change and Sustainability 3
IDS 201 Environmental Ethics 3
IDS 303 Humans and the Environment 3
NR 303 Humans and the Environment 3
Select one of the following:
HS 492 Horticulture Internship 3
HS 493 Research Experience in Horticultural Science 3
HS 494 Teaching Experience in Horticultural Science 3

Electives
Plant Protective Electives (p. 336) 6
Business Elective (p. 336) 3  
Broad-Scope Elective (p.   ) 3  
Advised Electives (p.   ) 13  

**GEP Courses**

ENG 101 Academic Writing and Research 1 4  
GEP Humanities (p. 1423) 6  
GEP Social Sciences (p. 1430) 3  
GEP Health and Exercise Studies (p. 1422) 2  
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3  
GEP Interdisciplinary Perspectives (p. 1426) 2  
GEP U.S. Diversity (p. 1431) (verify requirement)  
GEP Global Knowledge (p. 1419) (verify requirement)  
Foreign Language Proficiency (p. 1417) (verify requirement)  

**Free Electives**

Free Electives (12 Hr S/U Lmt) 2 6  

Total Hours 120  

1 A grade of C- or higher is required.  
2 Students should consult their academic advisors to determine which courses fill this requirement.

### Plant Protective Electives

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
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<tr>
<td>CS 415</td>
<td>Integrated Pest Management</td>
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<tr>
<td>ENT 425</td>
<td>General Entomology</td>
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Select a maximum of one of the following:  

- FOR 318 Forest Pathology  
- PP 315 Principles of Plant Pathology  
- PP 318 Forest Pathology

### Business Electives

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<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
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<td>ARE 215</td>
<td>Small Business Accounting</td>
<td>3</td>
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<td>ARE 304</td>
<td>Agribusiness Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
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<tr>
<td>ARE 321</td>
<td>Agricultural Financial Management</td>
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<tr>
<td>ARE 323</td>
<td>Agribusiness Finance</td>
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<tr>
<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
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<tr>
<td>HS 475</td>
<td>Horticulture Entrepreneurship</td>
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<td>HS 491</td>
<td>Sustainable Agriculture Entrepreneurship Study Abroad</td>
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<tr>
<td>HS 520</td>
<td>Green Infrastructure</td>
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<td>HS 532</td>
<td>Introduction to Permaculture</td>
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<tr>
<td>HS 551</td>
<td>Plant Nutrition</td>
<td>3</td>
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<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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<tr>
<td>PB 215</td>
<td>Medicinal Plants</td>
<td>3</td>
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<tr>
<td>or PB 220</td>
<td>Local Flora</td>
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### Landscape Design Electives

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<tbody>
<tr>
<td>HS 252</td>
<td>Landscape Graphic Communication</td>
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<tr>
<td>HS 357</td>
<td>Landscape Grading and Drainage</td>
<td>4</td>
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<tr>
<td>HS 400</td>
<td>Residential Landscaping</td>
<td>6</td>
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<tr>
<td>HS 416</td>
<td>Planting Design</td>
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<tr>
<td>HS 418</td>
<td>Digital Media Graphic for Landscape Designers</td>
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<td>HS 516</td>
<td>Planting Design</td>
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### Gardens & Urban Environments

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<tbody>
<tr>
<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
<td>3</td>
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<tr>
<td>HS 400</td>
<td>Residential Landscaping</td>
<td>6</td>
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<tr>
<td>HS 418</td>
<td>Digital Media Graphic for Landscape Designers</td>
<td>3</td>
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<tr>
<td>HS 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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<tr>
<td>HS 433</td>
<td>Public Garden Administration</td>
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<td>HS 533</td>
<td>Public Garden Administration</td>
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<td>NPS 340</td>
<td>Fundamentals of Grant Development for Nonprofits</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<tr>
<td>SSC 428</td>
<td>Service-Learning in Urban Agriculture Systems</td>
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### Semester Sequence

This is a sample.

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<td><strong>Fall Semester</strong></td>
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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences or Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
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<td>Horticulture: Principles and Practices</td>
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<td>MA 107</td>
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<td><strong>Spring Semester</strong></td>
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<td>BIO 183 or PB 200</td>
<td>Introductory Biology: Cellular and Molecular Biology or Plant Life</td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<td>COM 112</td>
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<td>Introduction to Finite Mathematics with Applications</td>
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<td>Calculus for Life and Management Sciences A</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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**Hours**

**Second Year**

**Fall Semester**

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<td>GEP Humanities (p. 1423)</td>
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<td>Ornamental Plant Identification I</td>
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<tr>
<td>PB/AEC 360</td>
<td>Ecology</td>
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**Hours**

**Spring Semester**

**Advised Elective**

Select one of the following:

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<th>Units</th>
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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>HS 242</td>
<td>Introduction to Small Scale Landscape Design</td>
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<td>HS 304</td>
<td>Ornamental Plant Identification II</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>SSC 201</td>
<td>Soil Science Laboratory</td>
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**Hours**

**Third Year**

**Fall Semester**

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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
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<tr>
<td>HS 272</td>
<td>Landscape Design/Build</td>
<td>6</td>
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Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>HS 492</td>
<td>Horticulture Internship</td>
<td>3</td>
</tr>
<tr>
<td>HS 493</td>
<td>Research Experience in Horticultural Science</td>
<td>3</td>
</tr>
<tr>
<td>HS 494</td>
<td>Teaching Experience in Horticultural Science</td>
<td>3</td>
</tr>
<tr>
<td>Plant Protection Elective</td>
<td></td>
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</tbody>
</table>

**Hours**

**Spring Semester**

**Advised Elective**

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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<tbody>
<tr>
<td>AEC 380</td>
<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>ES 200</td>
<td>Climate Change and Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>NR/IDS 303</td>
<td>Humans and the Environment</td>
<td>3</td>
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</table>

**GEP Social Sciences (p. 1430)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>PB 321</td>
<td>Introduction to Whole Plant Physiology</td>
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</table>

**Fourth Year**

**Fall Semester**

<table>
<thead>
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<tbody>
<tr>
<td>Advised Elective</td>
<td></td>
<td>4</td>
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<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td></td>
<td>3</td>
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<tr>
<td>HS 301</td>
<td>Plant Propagation</td>
<td>4</td>
</tr>
<tr>
<td>HS 471</td>
<td>Landscape Ecosystem Management</td>
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**Hours**

**Spring Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Advised Electives</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Plant Protection Elective</td>
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<td>3</td>
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<tr>
<td>Free Elective</td>
<td></td>
<td>3</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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</table>

**Hours**

**Total Hours**

120

**Career Opportunities**

Horticulture graduates fill positions in production, processing, sales, service, and outreach. Among these are:

- County extension agents
- Vocational agriculture teachers
- Plant breeders
- Landscape designers and landscape contractors
- Floral crop grower or floral designer
- Fruit and vegetable growers
- Business owners
- Orchard, nursery, greenhouse, and garden center managers
- Research, production, and promotional specialists with commercial seed, fertilizer chemical, and food companies
- Urban horticulture specialists
- Garden writers
- Quality control technologists
- USDA specialists
- County and state government planners
- Leaders in other phases of agricultural and industrial developments
- Students also prepare for careers in research, teaching or extension in horticulture

**Horticultural Science (BS): Plant Breeding and Biotechnology in Horticulture Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Bachelor of Science in Horticultural Science: Plant Breeding & Biotechnology in Horticulture Concentration is one of the four concentrations offered in by the Department of Horticultural Science. Students are offered a unique look at various aspects of Horticulture.
Students learn the methods, processes, art, and science of horticulture. Courses in each concentration vary and are taught in classroom and laboratory settings or, for some classes, online. Internships are required, which provide hands-on experience and learning.

Students can follow paths toward industry, entrepreneurship, research, and an advanced degree.

Dr. Helen Kraus (https://cals.ncsu.edu/horticultural-science/people/hkraus/) Undergraduate Coordinator and Professor Department of Horticultural Science 114 Kilgore Hall, Campus Box 7609 North Carolina State University Raleigh, NC 27695-7609 Phone: 919-515-1208

Plan Requirements

Horticultural Science (BS): Plant Breeding and Biotechnology in Horticulture Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Communication

Select one of the following: 3

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<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td></td>
</tr>
<tr>
<td>COM 202</td>
<td>Small Group Communication</td>
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</table>

Mathematics & Sciences

MA 107 Pre Calculus I 3

Select one of the following: 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td>3</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>2</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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Electives

Plant Protective Electives (p. 338) 6

Business Elective (p. 339) 3

Broad-Scope Elective (p. 339) 3

Advised Electives (p. 339) 9

GEP Courses

ENG 101 Academic Writing and Research 1 4

GEP Humanities (p. 1423) 6

GEP Social Sciences (p. 1430) 3

GEP Health and Exercise Studies (p. 1422) 2

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

GEP Interdisciplinary Perspectives (p. 1426) 2

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) 2 5

Total Hours 120-121

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

Plant Protective Electives

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
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<td>CS 415</td>
<td>Integrated Pest Management</td>
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<td>ENT 425</td>
<td>General Entomology</td>
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Select a maximum of one of the following:

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<th>Hours</th>
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<tbody>
<tr>
<td>FOR 318</td>
<td>Forest Pathology</td>
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**Business Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 311</td>
<td>Agricultural Markets</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
<td>3</td>
</tr>
<tr>
<td>HS 475</td>
<td>Horticulture Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
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</tr>
<tr>
<td>MIE 413</td>
<td>New Venture Planning</td>
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**Semester Sequence**

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
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<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALS 103 or ALS 303</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences or Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
<td>3</td>
</tr>
<tr>
<td>HS 290</td>
<td>Horticulture: Careers and Opportunities</td>
<td>1</td>
</tr>
<tr>
<td>MA 121 or MA 131</td>
<td>Elements of Calculus or Calculus for Life and Management Sciences</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
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<tr>
<td>Select one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td></td>
</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td></td>
</tr>
<tr>
<td>COM 202</td>
<td>Small Group Communication</td>
<td></td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
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<td></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
<td></td>
</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<tr>
<td>HS 303</td>
<td>Ornamental Plant Identification I</td>
<td>3</td>
</tr>
<tr>
<td>SSC 200</td>
<td>Soil Science</td>
<td>3</td>
</tr>
</tbody>
</table>
Horticultural Science (BS): Production Systems and Entrepreneurship in Horticulture Concentration

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Dr. Helen Kraus (https://cals.ncsu.edu/horticultural-science/people/htkraus/)
Undergraduate Coordinator and Professor
Department of Horticultural Science
114 Kilgore Hall, Campus Box 7609
North Carolina State University
Raleigh, NC 27695-7609
Phone: 919-515-1208

Career Opportunities

Horticulture graduates fill positions in production, processing, sales, service, and outreach. Among these are:

- County extension agents
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- Plant breeders
- Landscape designers and landscape contractors
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- Fruit and vegetable growers
- Business owners
- Orchard, nursery, greenhouse, and garden center managers
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- Garden writers
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- USDA specialists
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North Carolina State University
Raleigh, NC 27695-7609
Phone: 919-515-1208
## Plan Requirements

**Horticultural Science (BS): Production Systems and Entrepreneurship in Horticulture Concentration: 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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</tr>
<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td></td>
</tr>
</tbody>
</table>

### Communication

Select one of the following: 3

- COM 110 Public Speaking
- COM 112 Interpersonal Communication
- COM 202 Small Group Communication

### Mathematics & Sciences

**MA 107** Precalculus I 3

Select one of the following: 3

- MA 114 Introduction to Finite Mathematics with Applications
- MA 121 Elements of Calculus
- MA 131 Calculus for Life and Management Sciences A

**ST 311** Introduction to Statistics 3

**CH 101** Chemistry - A Molecular Science 3

**CH 102** General Chemistry Laboratory 1

**CH 220** Introductory Organic Chemistry 3

**CH 222** Organic Chemistry I Lab 1

**BIO 181** Introductory Biology: Ecology, Evolution, and Biodiversity 4

**BIO 183** Introductory Biology: Cellular and Molecular Biology 4

or **PB 200** Plant Life 3

Select one of the following: 3

- ARE 201 Introduction to Agricultural & Resource Economics
- ARE 201A Introduction to Agricultural & Resource Economics
- EC 201 Principles of Microeconomics
- EC 205 Fundamentals of Economics

### Foundational Courses

**HS 201** The World of Horticulture: Principles and Practices 3

**HS 290** Horticulture: Careers and Opportunities 1

**SSC 200** Soil Science 3

**SSC 201** Soil Science Laboratory 1

**HS 301** Plant Propagation 4

**PB 321** Introduction to Whole Plant Physiology 3

**ANS/HS 215** Agricultural Genetics 3

or **CS 211** Plant Genetics 3

**HS 451** Plant Nutrition 3

**AEC 360** Ecology 4

Select one of the following: 3

- AEC 380 Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy 3
- CS 224 Seeds, Biotechnology and Societies 3
- ES 200 Climate Change and Sustainability 3

### Electives

- **IDS 201** Environmental Ethics 3
- **HS 492** Horticulture Internship 3
- **HS 493** Research Experience in Horticultural Science 3
- **HS 494** Teaching Experience in Horticultural Science 3

### GEP Courses

- **ENG 101** Academic Writing and Research 4
- **GEP Humanities (p. 1423)** 6
- **GEP Social Sciences (p. 1430)** 3
- **GEP Health and Exercise Studies (p. 1422)** 2
- **GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)** 3
- **GEP Interdisciplinary Perspectives (p. 1426)** 2
- **GEP U.S. Diversity (p. 1431) (verify requirement)**
- **GEP Global Knowledge (p. 1419) (verify requirement)**

### Foreign Language Proficiency

(p. 1417) (verify requirement)

### GEP Courses

(p. 1417) (verify requirement)

### Free Electives

Free Electives (12 Hr S/U Lmt) 2 6

### Total Hours

120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

3 19 credits minimum; At least 3 credits from Broad Scope; Remaining 16 credits from can be from Broad-Scope, Ornamental, or Edible Plant Electives

### Plant Protective Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CS 414</td>
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<td>CS 415</td>
<td>Integrated Pest...</td>
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</tr>
<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td>3</td>
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Select a maximum of one of the following:

- FOR 318 Forest Pathology
- PP 315 Principles of Plant Pathology
- PP 318 Forest Pathology

### Business Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 321</td>
<td>Agricultural Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 370</td>
<td>Operations and Supply Chain Management</td>
<td>3</td>
</tr>
<tr>
<td>HS 475</td>
<td>Horticulture Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
<td>3</td>
</tr>
<tr>
<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MIE 413</td>
<td>New Venture Planning</td>
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</tr>
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### Management Electives

(p. 342) 19
### Horticultural Science (BS): Production Systems and Entrepreneurship in Horticulture Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ARE 303</td>
<td>Farm Management</td>
<td>3</td>
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<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 311</td>
<td>Agricultural Markets</td>
<td>3</td>
</tr>
<tr>
<td>ARE 312</td>
<td>Agribusiness Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ARE 332</td>
<td>Human Resource Management for Agribusiness</td>
<td>3</td>
</tr>
<tr>
<td>BUS 360</td>
<td>Marketing Methods</td>
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### Advised Electives

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENT 203</td>
<td>An Introduction to the Honey Bee and Beekeeping</td>
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<tr>
<td>ENT 401</td>
<td>Honey Bee Biology and Management</td>
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<tr>
<td>HS 242</td>
<td>Introduction to Small Scale Landscape Design</td>
<td>3</td>
</tr>
<tr>
<td>HS 280</td>
<td>Hands-On-Horticulture</td>
<td>3</td>
</tr>
<tr>
<td>HS 471</td>
<td>Landscape Ecosystem Management</td>
<td>4</td>
</tr>
<tr>
<td>HS 440</td>
<td>Greenhouse Management</td>
<td>3</td>
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<tr>
<td>HS 476</td>
<td>Crop Physiology and Production in Controlled Environments</td>
<td>3</td>
</tr>
<tr>
<td>HS 491</td>
<td>Sustainable Agriculture Entrepreneurship Study Abroad</td>
<td>3</td>
</tr>
<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<tr>
<td>SSC 342</td>
<td>Soil and Plant Nutrient Analysis</td>
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<tr>
<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>PY 212</td>
<td>College Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

### Broad-Scope Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
<td>4</td>
</tr>
<tr>
<td>HS 302</td>
<td>Gardening with Herbaceous Perennials</td>
<td>3</td>
</tr>
<tr>
<td>HS 303</td>
<td>Ornamental Plant Identification I</td>
<td>3</td>
</tr>
<tr>
<td>HS 304</td>
<td>Ornamental Plant Identification II</td>
<td>3</td>
</tr>
<tr>
<td>HS 411</td>
<td>Nursery Management</td>
<td>3</td>
</tr>
<tr>
<td>HS 442</td>
<td>Floriculture Crop Production</td>
<td>3</td>
</tr>
<tr>
<td>PB 220</td>
<td>Local Flora</td>
<td>3</td>
</tr>
</tbody>
</table>

### Ornamental Plant Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAE 435</td>
<td>Precision Agriculture Technology</td>
<td>3</td>
</tr>
<tr>
<td>BAE 535</td>
<td>Precision Agriculture Technology</td>
<td>3</td>
</tr>
<tr>
<td>CS 230</td>
<td>Introduction to Agroecology</td>
<td>3</td>
</tr>
<tr>
<td>CS 430</td>
<td>Advanced Agroecology</td>
<td>4</td>
</tr>
<tr>
<td>FS 250</td>
<td>Basics of Food Safety &amp; Quality</td>
<td>3</td>
</tr>
<tr>
<td>FS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>FS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>HS 421</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
<td>3</td>
</tr>
<tr>
<td>HS 422</td>
<td>Small Fruit Production</td>
<td>3</td>
</tr>
<tr>
<td>HS 423</td>
<td>Viticulture</td>
<td>3</td>
</tr>
<tr>
<td>HS 431</td>
<td>Vegetable Production</td>
<td>4</td>
</tr>
<tr>
<td>HS 462</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>HS 521</td>
<td>Temperate-Zone Tree Fruits: Physiology and Culture</td>
<td>3</td>
</tr>
<tr>
<td>HS 523</td>
<td>Viticulture</td>
<td>3</td>
</tr>
<tr>
<td>HS 562</td>
<td>Postharvest Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PB 215</td>
<td>Medicinal Plants</td>
<td>3</td>
</tr>
<tr>
<td>PB 325</td>
<td>Culinary Botany</td>
<td>3</td>
</tr>
</tbody>
</table>

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALS 103 or ALS 303</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences or Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
<td>3</td>
</tr>
<tr>
<td>HS 290</td>
<td>Horticulture: Careers and Opportunities</td>
<td>1</td>
</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
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### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 183 or PB 200</td>
<td>Introductory Biology: Cellular and Molecular Biology or Plant Life</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td></td>
</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td></td>
</tr>
<tr>
<td>COM 202</td>
<td>Small Group Communication</td>
<td></td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
<td></td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td></td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td></td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>14</td>
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</table>

### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advised Elective 1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>AEC 380</td>
<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
<td></td>
</tr>
<tr>
<td>ES 200</td>
<td>Climate Change and Sustainability</td>
<td></td>
</tr>
<tr>
<td>CS 224</td>
<td>Seeds, Biotechnology and Societies</td>
<td></td>
</tr>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
<td></td>
</tr>
<tr>
<td>ANS/HS 215 or CS 211</td>
<td>Agricultural Genetics or Plant Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>

**Hours: 34**
### Spring Semester

**Advised Elective**  
Select one of the following:  
- ARE 201 Introduction to Agricultural & Resource Economics  
- EC 201 Principles of Microeconomics  
- EC 205 Fundamentals of Economics  
- CH 220 Introductory Organic Chemistry  
- CH 222 Organic Chemistry I Lab  
- GEP Health and Exercise Studies (p. 1422)  
- SSC 200 Soil Science  
- SSC 201 Soil Science Laboratory  

**Hours** 15

### Third Year

#### Fall Semester

**Advised Elective**  
**GEP Additional Breadth (p. 1417)**  
**HS 301 Plant Propagation**  
Select one of the following:  
- HS 492 Horticulture Internship (Select one of the following):  
- HS 493 Research Experience in Horticultural Science (Select one of the following):  
- HS 494 Teaching Experience in Horticultural Science (Select one of the following):  

**Plant Protection Elective**  

**Hours** 16

### Spring Semester

**Advised Elective**  
**ARE/BUS Elective**  
**HS 451 Plant Nutrition**  
**PB 321 Introduction to Whole Plant Physiology**  
**Plant Protection Elective**  

**Hours** 15

### Fourth Year

#### Fall Semester

**Advised Elective**  
**ARE/BUS Elective**  
**Free Elective**  
**GEP Social Sciences (p. 1430)**  
**PB/AEC 360 Ecology**  

**Hours** 16

#### Spring Semester

**Advised Elective**  
**ARE/BUS Elective**  
**Free Elective**  
**GEP Humanities (p. 1423)**  
**GEP Interdisciplinary Perspectives (p. 1426)**  

**Hours** 15

**Total Hours** 120

### Career Opportunities

Horticulture graduates fill positions in production, processing, sales, service, and outreach. Among these are:

- County extension agents  
- Vocational agriculture teachers  
- Plant breeders  
- Landscape designers and landscape contractors  
- Floral crop grower or floral designer  
- Fruit and vegetable growers  
- Business owners  
- Orchard, nursery, greenhouse, and garden center managers  
- Research, production, and promotional specialists with commercial seed, fertilizer chemical, and food companies  
- Urban horticulture specialists  
- Garden writers  
- Quality control technologists  
- USDA specialists  
- County and state government planners  
- Leaders in other phases of agricultural and industrial developments  
- Students also prepare for careers in research, teaching or extension in horticulture

### Horticultural Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The academic minor in Horticultural Science is offered to students who desire a strong foundation in the principles of horticultural science. Students may choose to enhance their own major by selecting courses in a specialized area of horticulture such as fruits and vegetables, ornamentals, floriculture, or landscape horticulture, or they may pursue a more general approach to the entire field of study.

### Admissions

Students who plan to minor in Horticultural Science should contact the Coordinator listed below for consultation and approval. The Undergraduate Coordinator will assign a minor advisor who will monitor the student’s progress. Students should complete a Declare a Minor ([http://ncsu.edu/registrar/forms/pdf/minor.pdf](http://ncsu.edu/registrar/forms/pdf/minor.pdf)) form and submit to Registration and Records.

### Certification

The student must complete the “Application for Minor” form be kept on file in the Undergraduate Coordinator’s office until the student’s final semester at which time the proper procedure for certification of the minor will be completed.

### Coordinator

Dr. Helen T. Kraus  
Department of Horticultural Science  
Box 7609, N.C. State University  
(Kilgore Hall 132)  
Raleigh, NC 27695-7609  
919-515-1208
Plan Requirements

- Completion of at least 16 credit hours.
- A grade of “C-” or better must be achieved in each course.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
<td>3</td>
</tr>
<tr>
<td>HS 301</td>
<td>Plant Propagation</td>
<td>4</td>
</tr>
</tbody>
</table>

Elective Courses

Select three of the following:

- HS 200 Home Horticulture
- HS 242 Introduction to Small Scale Landscape Design
- HS 280 Hands-On-Horticulture
- HS 302 Gardening with Herbaceous Perennials
- HS 303 Ornamental Plant Identification I
- HS 304 Ornamental Plant Identification II
- HS 411 Nursery Management
- HS 421 Temperate-Zone Tree Fruits: Physiology and Culture
- HS 422 Small Fruit Production
- HS 431 Vegetable Production
- HS 432 Introduction to Permaculture
- HS 440 Greenhouse Management
- HS 442 Floriculture Crop Production
- HS 451 Plant Nutrition
- HS 462 Postharvest Physiology
- HS 471 Landscape Ecosystem Management

Horticulture (Undergraduate Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Regardless of your educational background, the online Undergraduate Certificate in Horticultural Science provides comprehensive education from award-winning faculty. Requiring only 15 credit hours of coursework, the program is designed to increase personal knowledge and skills. Deepen your knowledge and pursue a passion for horticulture through an online program designed for working adults.

The undergraduate certificate is a non-degree, individually-tailored program offered through the Department of Horticultural Science at NC State University. Courses are available both online and campus, so students don’t need to take time off from work or face long commutes to campus.

Tailor your coursework and education based on your interests. Note: Students with a bachelor’s degree in the sciences interested in advancing a career through graduate work will find the Graduate Certificate in Horticultural Science (https://horticulture.cals.ncsu.edu/online/online-horticulture-programs/graduate-certificate-program/) more appropriate.

Eligibility

Participants must hold a high school diploma or equivalent to enroll in this program. Online Horticulture applicants are enrolled, students must receive a minimum grade of C (2.0) in all courses.

Students may begin taking courses for the certificate in Summer, Fall, or Spring.

Cost

Visit NC State’s Undergraduate Online and Distance Education Tuition rates page (https://studentservices.ncsu.edu/your-money/tuition-and-fees/distance-education/#distance-education-tuition-and-fees-for-fall-2016-spring-2017) for detailed information about graduate tuition and fees.

The total Online Undergraduate Certificate in Horticultural Science cost estimate (North Carolina residents) for Fall 2018-2019 is $3,540 for all 15 hours of coursework.

NC State University also offers a monthly payment plan (https://studentservices.ncsu.edu/your-money/bill/pay-your-bill/enroll-in-a-payment-plan/) to make paying your education easier.

Advisor

Undergraduate Certificate students are assigned an academic advisor from the Horticultural Science undergraduate faculty. The student and advisor reflect on the student’s personal and professional goals to design an individual course of study.

After starting or completing the Online Horticulture Undergraduate Certificate, students may wish to count their earned credits toward a Bachelor of Horticultural Science degree (https://horticulture.cals.ncsu.edu/academics/undergraduate-programs/bachelor-of-science/). To transfer credits from the Undergraduate Certificate program to the Bachelor’s degree, the following conditions must be met:

- The course number must be at the 200 level or higher
- The course must be letter graded
- The student must have earned a C or better in the course

Undergraduate Certificate Program Coordinator

Ms. Elisabeth Meyer (https://cals.ncsu.edu/horticultural-science/people/emmeyer/)

Undergraduate Certificate Coordinator and Lecturer

Department of Horticultural Science
112 Kilgore Hall, Campus Box 7609
North Carolina State University
Raleigh, NC 27695-7609
Phone: 919.513.1786

Plan Requirements

Enrollees must complete a total of 15 credit hours. All the course work is available as online and distance education courses. Two foundational horticultural courses are required for the certificate, taking up six of the total fifteen credit hours:
### Foundational Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 201</td>
<td>The World of Horticulture: Principles and Practices</td>
<td>3</td>
</tr>
<tr>
<td>HS 203</td>
<td>Home Plant Propagation</td>
<td>3</td>
</tr>
</tbody>
</table>

### Horticultural Science Elective Courses

Select three of the following: 1

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 200</td>
<td>Home Horticulture</td>
<td></td>
</tr>
<tr>
<td>HS 202</td>
<td>Home Plant Identification</td>
<td></td>
</tr>
<tr>
<td>HS 205</td>
<td>Home Food Production</td>
<td></td>
</tr>
<tr>
<td>HS 250</td>
<td>Home Landscape Design: Creating Garden Spaces</td>
<td></td>
</tr>
<tr>
<td>HS 280</td>
<td>Hands-On-Horticulture</td>
<td></td>
</tr>
<tr>
<td>HS 432</td>
<td>Introduction to Permaculture</td>
<td></td>
</tr>
<tr>
<td>HS 451</td>
<td>Plant Nutrition</td>
<td></td>
</tr>
<tr>
<td>HS 462</td>
<td>Postharvest Physiology</td>
<td></td>
</tr>
</tbody>
</table>

### Approved Classes

Select a maximum of three credit hours from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 315</td>
<td>Principles of Plant Pathology</td>
<td></td>
</tr>
<tr>
<td>PP 318</td>
<td>Forest Pathology</td>
<td></td>
</tr>
<tr>
<td>CS 210</td>
<td>Lawns and Sports Turf</td>
<td></td>
</tr>
<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td></td>
</tr>
<tr>
<td>SSC 200</td>
<td>Soil Science</td>
<td></td>
</tr>
<tr>
<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours:** 15

1. The student and his or her advisor will select the remaining nine hours of courses that will constitute the student’s certificate requirements. Students enrolled in the Certificate program may take all 15 hours from the Department of Horticultural Science. Or, they may choose at least 12 hours from Horticultural Science, with remaining credit hours from approved classes in other departments.

With completion of 15 credit hours and a grade of C (2.0) or better in each course, the student will be award a certificate acknowledging their accomplishments.

## Curricula

The curriculum emphasizes the fundamentals of biological, chemical, and physical sciences, offering students both breadth of knowledge and depth of understanding. It is designed to provide students with broad experience in biological and chemical sciences and to encourage the development of experimental skills. Because of the breadth of the course requirements, many students can add a second major in a variety of science disciplines such as Biological Sciences, Microbiology, Genetics, or Chemistry. Minors can also be added from various disciplines.

- Note: Only entering freshmen studying Biochemistry, Nutrition Sciences, or Plant Biology participate in the Life Sciences First Year Program (http://catalog.ncsu.edu/undergraduate/collegeofals/).

For more information about this department, including contact information, visit the department (http://biochem.ncsu.edu).

## Faculty

### Department Head
Melanie Simpson

### Director of Graduate Programs
Joseph J. Barycki

### Undergraduate Coordinators
Trino Ascencio-Ibanez
Charles Hardin

### William Neal Reynolds Professors
Dennis T. Brown

### Professors
Joseph Barycki
Dennis Brown
John Mackenzie Jr.
E. Stuart Maxwell
Melanie A. Simpson

### Adjunct Professors
K.S. Korach
M. Luther
D.F. Ferreira

### Professors Emeriti
H.R. Horton
James Knopp

## Department of Molecular and Structural Biochemistry

Biochemistry is the science which is concerned with the discovery and understanding of the chemical principles of life. It is a wide-ranging field from the composition, biosynthesis, structure and function of biomolecules to the control and regulation of biochemical processes within organelles, cells, organs and organisms. Biochemical principles form the basis of most laboratory procedures within the life cycle.

### Awards

The H. Robert Horton Award is given to the outstanding student in Biochemistry based on scholarly and research achievements.

### Honors

The honors program in Biochemistry is jointly administered within the College of Agriculture and Life Sciences and the College of Sciences. It is designed for students who wish to explore advanced courses and/or research and be rewarded for outstanding academic achievement.
Biochemistry (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

Program Requirements

Biochemistry: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BCH 103</td>
<td>Introduction to Biochemistry</td>
<td></td>
</tr>
<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
<td></td>
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</table>

English & Advanced Writing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (C- or better)</td>
<td>4</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
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</tbody>
</table>

Mathematical Science & Physics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
</tr>
<tr>
<td>or MA 141</td>
<td>Calculus I</td>
<td></td>
</tr>
<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
<td>3</td>
</tr>
<tr>
<td>or MA 241</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
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<td>3-4</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
<td></td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>1</td>
</tr>
<tr>
<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
<td>1</td>
</tr>
<tr>
<td>Advised Elective MA, ST or CSC</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>or PY 211</td>
<td>College Physics I</td>
<td></td>
</tr>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
<td>4</td>
</tr>
<tr>
<td>or PY 212</td>
<td>College Physics II</td>
<td></td>
</tr>
</tbody>
</table>

Chemistry/Lab Analysis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
<td>1</td>
</tr>
<tr>
<td>CH 223</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
<td>1</td>
</tr>
<tr>
<td>Select one of the following:</td>
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<td>6</td>
</tr>
<tr>
<td>CH 331</td>
<td>Introductory Physical Chemistry (and Advised Elective)</td>
<td>1</td>
</tr>
<tr>
<td>CH 431 &amp; CH 433</td>
<td>Physical Chemistry I and Physical Chemistry II</td>
<td></td>
</tr>
<tr>
<td>Laboratory Analysis Elective (p. 347)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Life Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences</td>
<td>2</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>Advised Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry</td>
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### Laboratory Analysis Elective

<table>
<thead>
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<tbody>
<tr>
<td>BCH 453</td>
<td>Biochemistry of Gene Expression ¹</td>
<td>3</td>
</tr>
<tr>
<td>or BCH 553</td>
<td>Biochemistry of Gene Expression</td>
<td></td>
</tr>
<tr>
<td>BCH 455</td>
<td>Proteins and Molecular Mechanisms ¹</td>
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<tr>
<td>or BCH 555</td>
<td>Proteins and Molecular Mechanisms</td>
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Select two of the following:

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<th>Title</th>
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<tbody>
<tr>
<td>ALS 499</td>
<td>Honors Research or Teaching II ¹</td>
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<td>BCH 452</td>
<td>Introductory Biochemistry Laboratory ¹</td>
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<tr>
<td>BCH 492</td>
<td>External Learning Experience ¹</td>
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<tr>
<td>BCH 493</td>
<td>Special Problems in Biochemistry ¹</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology ¹</td>
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<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory ¹</td>
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</tr>
<tr>
<td>or MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
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</tr>
<tr>
<td>GN 311</td>
<td>Principles of Genetics ¹</td>
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Select one of the following:

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<th>Hours</th>
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<tbody>
<tr>
<td>BIO 414</td>
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<td>PB 421</td>
<td>Plant Physiology ¹</td>
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**GEP Courses**

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<thead>
<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td>GEP 1423</td>
<td>Humanities (p. 1423)</td>
<td>6</td>
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<tr>
<td>GEP 1430</td>
<td>Social Sciences (p. 1430)</td>
<td>6</td>
</tr>
<tr>
<td>GEP 1422</td>
<td>Health and Exercise Studies (p. 1422)</td>
<td>2</td>
</tr>
<tr>
<td>GEP 1417</td>
<td>Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
<td>3</td>
</tr>
<tr>
<td>GEP 1426</td>
<td>Interdisciplinary Perspectives (p. 1426)</td>
<td>3</td>
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<tr>
<td>GEP 1431</td>
<td>U.S. Diversity (p. 1431) (verify requirement)</td>
<td></td>
</tr>
<tr>
<td>GEP 1419</td>
<td>Global Knowledge (p. 1419) (verify requirement)</td>
<td></td>
</tr>
<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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</tbody>
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**Free Electives**

Free Electives (12 Hr S/U Lmt) ² 8

**Total Hours** 120-121

¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine how to complete this requirement.

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCH 103</td>
<td>Introduction to Biochemistry</td>
<td>1</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory ¹</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Critical and Creative Thinking in the Life Sciences</td>
<td>2</td>
</tr>
<tr>
<td>MA 141 or MA 131 or MA 131</td>
<td>Calculus I ¹ (or Calculus for Life and Management Sciences A)</td>
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<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology ¹</td>
<td>4</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science ¹</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory ¹</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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**NC State University** 347
### Second Year

#### Fall Semester

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I $^1$</td>
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<td>Organic Chemistry I Lab $^1$</td>
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<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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<td>Select one of the following: $^1$</td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
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<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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</tr>
<tr>
<td>Life Science Elective $^1$</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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#### Spring Semester

<table>
<thead>
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<tbody>
<tr>
<td>CH 223</td>
<td>Organic Chemistry II $^1$</td>
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<td>CH 224</td>
<td>Organic Chemistry II Lab $^1$</td>
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<td>MB 351</td>
<td>General Microbiology $^1$</td>
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<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory $^1$</td>
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<tr>
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<tr>
<td>PY 212</td>
<td>College Physics II $^1$</td>
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</tr>
<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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<tr>
<td>Select one of the following: $^1$</td>
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<tr>
<td>Computer Elective</td>
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<tr>
<td>Math Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistics Elective $^1$</td>
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<td>Free Elective</td>
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### Third Year

#### Fall Semester

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<th>Course</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry $^1$</td>
<td>4</td>
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<tr>
<td>BCH 452</td>
<td>Introductory Biochemistry Laboratory $^1$</td>
<td>2</td>
</tr>
<tr>
<td>GN 311</td>
<td>Principles of Genetics $^1$</td>
<td>4</td>
</tr>
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<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 453</td>
<td>Biochemistry of Gene Expression $^1$</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following: $^1$</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>BCH 454</td>
<td>Advanced Biochemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>Research Elective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG 331 or ENG 333</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
<td>3</td>
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</tbody>
</table>

### Fourth Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Cell Biology or Physiology Elective $^1$</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>CH 431 or CH 331</td>
<td>Physical Chemistry I $^1$ or Introductory Physical Chemistry</td>
<td>3-4</td>
</tr>
<tr>
<td>Free Elective</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
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#### Spring Semester

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<td>CH 433</td>
<td>Physical Chemistry II</td>
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<td>Advised Elective</td>
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<tr>
<td>BCH 455</td>
<td>Proteins and Molecular Mechanisms $^1$</td>
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</tr>
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<td>GEP Additional Breadth (p. 1417)</td>
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<td>3</td>
</tr>
<tr>
<td>Lab Analysis</td>
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<td>3-4</td>
</tr>
<tr>
<td>Free Elective</td>
<td></td>
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</table>

### Career Opportunities

The Biochemistry program provides B.S. graduates with the scientific background and skills required for employment in biochemistry, molecular biology, biotechnology, and genetics and for the health professions of medicine, dentistry, veterinary medicine, pharmacology and related fields.

### Department of Plant and Microbial Biology

For more information about this department, including contact information, visit the department (https://pmb.cals.ncsu.edu).

The instructional program in Plant Biology provides classroom, laboratory, and field experience in the fundamental areas of the plant sciences. Undergraduates majoring in plant biology select major courses that are tailored to their interests within the discipline and are required to have a supervised research or teaching experience that allows them to work closely with departmental faculty. Majors, as pre-professionals in the plant sciences, are prepared for advanced study in plant biology and other biological fields, as well as in the applied plant sciences, such as horticulture, crop science, plant pathology, natural resource management, and conservation.

### Curricula

The Bachelor of Science degree with a major in Plant Biology is offered under the science curriculum of the College of Agriculture and Life Sciences. Students can choose to pursue a general major with courses in different areas of Plant Biology, or can specialize in one of the following areas: Ethnobotany, Plant Biotechnology and Molecular Biology, and Plant Systematics and Ecology. The Bachelor of Science in Plant Biology with a double major in another life science or applied plant science is possible, as is a double major in a humanities and
social sciences discipline (anthropology, English, history, philosophy, psychology, or political science). Selected faculty in Plant and Microbial Biology also work with the Biological Sciences faculty in the College of Sciences to offer the B.S. degree in Microbiology, details about which are located at: http://catalog.ncsu.edu/undergraduate/collegeofsciences/biology (p. 1312)

Certificate in Field Botany

The Department of Plant and Microbial Biology and the Department of Forestry and Environmental Resources offers a joint certificate in Field Botany (https://oucc.dasa.ncsu.edu/field-botany-11fboctu/) to any student enrolled in an undergraduate program or as a non-degree seeking student. This is a non-degree program that will allow students to develop skills in vascular plant identification through both sight recognition and use of keys, and knowledge of specific domain terminology. Students who complete the certificate will find it helpful in securing positions with US Army Corps of Engineers, US Fish and Wildlife Services, private consulting companies, private conservation companies, and Natural Heritage programs. They could be working to help preserve wetlands, conserve endangered plants to improve wildife habitat, conserve rare plants, and prepare impact statements and reports of areas of development. Students interested in the Field Botany certificate program should contact Dr. Alexander Krings at akrings@ncsu.edu.

Biotechnology (Minor)

To see what you will learn while pursuing this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The undergraduate Minor in Biotechnology is a university-wide program and draws upon NC State’s strength in the life sciences, agriculture, and engineering. Students in the minor will participate in a series of cutting-edge laboratory-intensive courses. Upon completion of the minor, students will have a conceptual understanding of a wide array of research applications in biotechnology, as well as mastery of numerous techniques.

Biotechnology is not universally accepted, and one role of a university is to ensure that this technology is used wisely. A key part of the training provided by the Biotechnology Minor is the requirement for an ethics course that promotes critical thinking of ethical issues and discussions of individual and collective rights and responsibilities. By active participation in break-out sessions, each student can contribute their concerns and thoughts regarding the complex issues that accompany the use of genetically engineered organisms.

Admissions and Certification of Minor

Students who have questions or who would like to be admitted to the minor should complete the University Minor Declaration Form. The minor must be completed no later than the semester in which the student expects to graduate from their degree program. The University Minor Declaration Form is the paperwork necessary for certification and should be completed during the registration period that will complete the requirements for the minor or during the registration period for the student’s final semester at NC State.

Contact Persons

Carlos C. Goller
6104 Jordan Hall
919-513-4231

Email: cccgoller@ncsu.edu

Robert M. Kelly
Partners II Bldg., Room 3309
840 Main Campus Drive
919-515-6396
Email: rmkelly@eos.ncsu.edu

Plan Requirements

The requirements for the Biotechnology Minor include 8-11 credits of biotechnology-related laboratory courses (see Group B and C), and a 1-3 credit biotechnology ethics course (Group E). A 3 credit research experience related to biotechnology (Group D) is strongly recommended but may be replaced with an additional 2 credit biotechnology-related laboratory course (Group C) and a 1 credit biotechnology professional development course (Group D). Group A describes the pre-requisite courses a student will need to have completed satisfactorily in order to be eligible to start the minor. The minor requires 19-22 credit hours depending on course selection.

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<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group A: Preparatory Classes</strong></td>
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</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CH 223</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
<td>4</td>
</tr>
<tr>
<td>or BCH 454</td>
<td>Advanced Biochemistry Laboratory</td>
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</tr>
<tr>
<td><strong>Group C</strong></td>
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<td></td>
</tr>
<tr>
<td>Biotechnology Techniques Module Pairs</td>
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<td>4-5</td>
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<tr>
<td><strong>Group D</strong></td>
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</tr>
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<td>Select one of the following:</td>
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<tr>
<td>ALS 499</td>
<td>Honors Research or Teaching II</td>
<td></td>
</tr>
<tr>
<td>CHE 497</td>
<td>Chemical Engineering Projects I</td>
<td></td>
</tr>
<tr>
<td>Any 492 or 493 course in a Science Department, providing that a biotechnology-related research topic is pursued</td>
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<td></td>
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<tr>
<td><strong>Group E</strong></td>
<td></td>
<td></td>
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<tr>
<td>Any of these courses will fulfill this requirement. Other courses may be used with departmental approval.</td>
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<tr>
<td>1-3</td>
<td></td>
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<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
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<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
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<td>PHI/STS 325</td>
<td>Bio-Medical Ethics</td>
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<tr>
<td>BIT 501</td>
<td>Ethical Issues in Biotechnology</td>
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</table>

Total Hours: 19-22

1 This course is required after the above course has been completed.
2 One of these courses should be taken preferably during the junior or senior year, prior to or concurrently with the research internship in Group D. BIT 410 Manipulation of Recombinant DNA is the preferred course for students to take and will be offered in fall, spring, and most summer semesters.
Plant Biology (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

Plan Requirements

Plant Biology (BS): 120 Total Units

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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<td>PB 103</td>
<td>Perspectives on Botany</td>
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<td><strong>Communication</strong></td>
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<td>Communication Elective (p. 350)</td>
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<td></td>
<td><strong>Mathematics &amp; Sciences</strong></td>
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<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>MA 141</td>
<td>Calculus I</td>
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<td>ST 101</td>
<td>Statistics by Example</td>
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<tr>
<td>or ST 311</td>
<td>Introduction to Statistics</td>
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<td></td>
<td><strong>GEP Courses</strong></td>
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<td>ENG 101 Academic Writing and Research 1</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td></td>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td></td>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Communication Elective

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MA 531 Dynamic Systems and Multivariable Control I 3
MA 532 Ordinary Differential Equations I 3
MA 534 Introduction To Partial Differential Equations 3
MA 537 Nonlinear Dynamics and Chaos 3
MA 540 Uncertainty Quantification for Physical and Biological Models 3
MA 544 Computer Experiments In Mathematical Probability 3
MA 546 Probability and Stochastic Processes I 3
MA 547 Financial Mathematics 3
MA 548 Monte Carlo Methods for Financial Math 3
MA 551 Financial Risk Analysis 3
MA 555 Introduction to Topology 3
MA 557 Introduction to Manifold Theory 3
MA 561 Set Theory and Foundations Of Mathematics 3
MA 565 Graph Theory 3
MA 573 Mathematical Modeling of Physical and Biological Processes I 3
MA 574 Mathematical Modeling of Physical and Biological Processes II 3
MA 580 Numerical Analysis I 3
MA 583 Introduction to Parallel Computing 3
MA 584 Numerical Solution of Partial Differential Equations--Finite Difference Methods 3
MA 587 Numerical Solution of Partial Differential Equations--Finite Element Method 3
MA 591 Special Topics 1-6
MBA 528 Options and Derivatives Pricing 3
MEA 100 Earth System Science: Exploring the Connections 4
MEA 101 Geology I: Physical 3
MEA 110 Geology I Laboratory 1
MEA 130 Introduction to Weather and Climate 3
MEA 135 Introduction to Weather and Climate Laboratory 1
MEA 202 Geology II: Historical 3
MEA 211 Geology II Laboratory 1
MEA 300 Environmental Geology 4
MEA 312 Atmospheric Thermodynamics 4
MEA 315 Mathematics Methods in Atmospheric Sciences 4
MEA 320 Fundamentals of Air Pollution 3
MEA 321 Fundamentals of Air Quality and Climate Change 3
MEA 323 Geochemistry of Natural Waters 3
MEA 409 Watershed Forensics 3
MEA 410 Introduction to Mineralogy and Petrology 4
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MEA 444 Mesoscale Analysis and Forecasting 4
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MEA 450 Introductory Sedimentology and Stratigraphy 4
MEA 451 Structural Geology 4
MEA 454 Marine Physical-Biological Interactions 3
MEA 455 Micrometeorology 3
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MEA 466 Preparatory Course for Field Camp 1
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MEA 471 Exploration and Engineering Geophysics 3
MEA 473 Principles of Chemical Oceanography 3
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</tr>
<tr>
<td>SSC 470</td>
<td>Wetland Soils</td>
<td>3</td>
</tr>
<tr>
<td>SSC 540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>SSC 570</td>
<td>Wetland Soils</td>
<td>3</td>
</tr>
<tr>
<td>TOX 201</td>
<td>Poisons, People and the Environment</td>
<td>3</td>
</tr>
<tr>
<td>TOX 401</td>
<td>Principles of Toxicology</td>
<td>4</td>
</tr>
<tr>
<td>TOX 415</td>
<td>Environmental Toxicology and Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>TOX 501</td>
<td>Principles of Toxicology</td>
<td>4</td>
</tr>
</tbody>
</table>

### Semester Sequence

This is a sample.
teaching positions in community colleges, prominent colleges and universities, for research positions in major federal and state government laboratories, and in private industry. Research technician positions in many life science areas in governmental and industrial laboratories are also career possibilities. The field of plant biotechnology provides additional opportunities with several graduates seeking employment in the biotechnology industry including companies in nearby Research Triangle Park. Graduates are also well qualified for professional training in the health professions.

### Plant Biology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

The Department of Plant Biology offers a Minor in Plant Biology to all baccalaureate students at North Carolina State University in any major except Plant Biology. As the fundamental discipline of the plant sciences, plant biology involves the study of the structure, function, classification, diversity, and interactions of plants. The program also provides a strong background for research in all areas of the plant sciences and plant molecular biology.

#### Admissions

Students may declare their intention to complete the Plant Biology minor by consulting with Dr. Jordan.

#### Certification

Dr. Jordan will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. An electronic application to graduate with the minor should be made in MyPack Portal no later than during the registration period for the student's final semester at NC State.

#### Contact Person

Chad V. Jordan  
2214-A Gardner Hall  
919.515.2222  
chad_jordan@ncsu.edu

*SIS Code: 11PBM*

#### Plan Requirements

- Completion of a minimum of 15 semester hours.
- Courses counting toward the minor must be taken for a letter grade unless noted otherwise.
- A grade of 'C' or above in each course for it to be included in the minor.
- Transfer credit will only be allowed for the PB 200 Plant Life/PB 250 Plant Biology requirement.

#### Code | Title | Hours
---|---|---
PB 200 | Plant Life | 4
or PB 250 | Plant Biology | 4

#### Elective Courses

Select 11 credits of the following:

- PB 213 | Plants and Civilization | 3

---

1. Students Entering NC State through the Life Sciences First Year (LSFY) Program must take LSC 101 Critical and Creative Thinking in the Life Sciences
2. Credit is not allowed for more than one of MA 121 Elements of Calculus, MA 131 Calculus for Life and Management Sciences A, and MA 141 Calculus I
3. Credit is not allowed for both ST 101 Statistics by Example and ST 311 Introduction to Statistics. Students interested in research are strongly encouraged to take both ST 311 Introduction to Statistics and ST 312 Introduction to Statistics II
4. A minimum of four Plant Biology elective courses are required and must total 12 credit hours. At least two of these courses must be at the 300-level or higher and must total 6 credit hours. A minimum GPA of 2.00 is required across all PB coursework.
5. At least one course PB Elective course must have a laboratory or be a laboratory or field-based course.
6. Students interested in pursuing graduate and professional training should take PY 211 College Physics I to meet the PY requirement followed by PY 212 College Physics II as a Restricted Elective.

### Career Opportunities

The undergraduate degree is an excellent pre-professional degree in the plant sciences. Graduates are employed as researchers in academic, government, or industrial labs, as field botanists and conservationists in state and national parks, and as employees of environmental education, or public service organizations. Many majors continue with graduate studies in a plant science discipline, after which they are qualified for the graduate programs in many areas of plant science. Some seek research technicians positions in major federal and state government laboratories, and in private industry. Research technician positions in many life science areas in governmental and industrial laboratories are also career possibilities. The field of plant biotechnology provides additional opportunities with several graduates seeking employment in the biotechnology industry including companies in nearby Research Triangle Park. Graduates are also well qualified for professional training in the health professions.
Life Sciences First Year

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Life Sciences First Year (LSFY) program at NC State University was developed with the goal of helping students find the right fit in a degree program at NC State. LSFY is a joint program between the College of Agriculture and Life Sciences and the College of Sciences. Designed for students who enter NC State with an interest in any aspect of the life sciences, the LSFY curriculum allows students to begin laying the foundation for further studies in any of the life science degree programs at NC State. At the same time, the advising program and specially designed courses encourage and provide the means for students to explore their academic interests to settle on the academic home that is best for them, while understanding what they need to do to achieve their professional goals. After learning more about degree requirements and exploring their own interests and aptitudes (both in and out of class), LSFY students apply by the end of their first year to transfer into a degree program.

The LSFY program includes all incoming first-year students who express interest in earning a degree in one of the following majors: Biochemistry, Biological Sciences, Genetics, Microbiology, Nutrition Science, Plant Biology, or Zoology. There is no need to fill out a special application for the program.

To learn more about the LSFY program, visit the website (https://departments.sciences.ncsu.edu/lsfy/).

Life Sciences First Year Program
Bostian Hall
2721 Pillsbury Circle
Campus Box 7611
Raleigh, NC 27695-7611
Email: LifeSciencesFY@ncsu.edu

Dr. Erica Kosal
Director, LSFY Program
Email: efkosal@ncsu.edu

Semester Sequence
This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences</td>
<td>2</td>
</tr>
<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry and Lab ²</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Calculus ³</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>Chemistry and Lab ²</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Calculus ³</td>
<td></td>
<td>3-4</td>
</tr>
</tbody>
</table>

Total Hours 30-32

¹ **Exploring Opportunities in the Life Sciences**
- Most LSFY students will take LSC 103 Exploring Opportunities in the Life Sciences, which allows them to explore a variety of degree programs at NC State. Some students may instead choose a section that explores a single area within the life sciences in more depth—examples include BCH 103 Introduction to Biochemistry, MB 103 Introductory Topics in Microbiology, and PB 103 Perspectives on Botany. All sections of 103 will also address transition issues common to many first-semester college students as well as resources and opportunities available at NC State.

² **Chemistry**
- Chemistry Placement: Students who do not place into CH 101 Chemistry - A Molecular Science or more advanced chemistry should try to complete preparatory coursework (CH 111 Preparatory Chemistry or equivalent) in the summer prior to their freshman year.
- First Semester: Life science students take CH 101 Chemistry - A Molecular Science and CH 102 General Chemistry Laboratory to start their required coursework in chemistry, but those interested in pursuing chemistry, biochemistry, or chemical engineering will want to consider CH 103 General Chemistry I for Students in Chemical Sciences and CH 104 General Chemistry Laboratory I for Students in Chemical Sciences instead—these students should consult with an advisor to select the appropriate chemistry course.
- Second Semester: Students should work with their advisor and/or the Undergraduate Coordinator(s) in their major(s) of interest to decide on the appropriate chemistry course to take during their second semester. Some will want to take quantitative chemistry (CH 201 Chemistry - A Quantitative Science/CH 202 Quantitative Chemistry Laboratory) and some will want to start organic chemistry. Degree programs in the life sciences at NC State typically require two semesters of organic chemistry (CH 221 Organic Chemistry I/CH 222 Organic Chemistry I Lab and CH 223 Organic Chemistry II/CH 224 Organic Chemistry II Lab), but there are exceptions. The following require only one semester of organic chemistry (CH 220 Introductory Organic Chemistry or CH 221 Organic Chemistry I/CH 222 Organic Chemistry I Lab); Environmental Sciences and Marine Science Biological Oceanography. **Note:** CH 220 Introductory Organic Chemistry is not a replacement for CH 221 Organic Chemistry I and does not serve as a pre-requisite for CH 223 Organic Chemistry II.
Calculus

- Most NC State majors in life sciences require MA 131 Calculus for Life and Management Sciences A and MA 231 Calculus for Life and Management Sciences B, but some students (particularly those interested in Biochemistry and some aspects of Environmental Science) may wish to pursue the three semester sequence instead (MA 141 Calculus I, MA 241 Calculus II, and MA 242 Calculus III). Two life science majors (Nutrition Science and Plant Biology) and some related majors require only one semester of calculus, and therefore accept MA 121 Elements of Calculus in place of MA 131 Calculus for Life and Management Sciences A. However, MA 121 Elements of Calculus cannot be used as a prerequisite for MA 231 Calculus for Life and Management Sciences B, so you should not take that option unless you are absolutely sure you will not want or need to take a second semester of calculus.

- Students who decide not to take a second semester of calculus should work with their advisor and/or the Undergraduate Coordinator(s) in their major(s) of interest to decide on an appropriate course to take during their second semester instead of calculus.

- Students who place into a pre-calculus course should try to complete preparatory coursework (MA 107 Precalculus I or equivalent) in the summer.

ENG 101 Academic Writing and Research and the General Education Program (GEP)

- All NC State students take 39 credit hours as part of the General Education Program (GEP). For students in the life sciences, 15 of those credit hours are met by major requirements. The remaining 24 GEP credit hours include ENG 101 Academic Writing and Research, which can be taken either the first or second semester of the first year. Any students taking an additional GEP Elective in the first year are encouraged to explore First Year Inquiry (http://www.ncsu.edu/firstyearinquiry/current_courses.htm) and the GEP course lists (http://oucc.dasa.ncsu.edu/general-education-program/) for Humanities or Social Sciences or Interdisciplinary Perspectives for courses of interest.

General Notes:

- Students entering NC State with credit for college courses will work with an advisor to determine appropriate course choices based on their interests and program requirements.

- All students are required to take online placement exams in chemistry and math before they finalize their first-semester schedules.

- Minimum requirements to be eligible for any degree program in the life sciences are C- or better grades in LSC 101 Critical and Creative Thinking in the Life Sciences, BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity, BIO 183 Introductory Biology: Cellular and Molecular Biology, CH 101 Chemistry - A Molecular Science or CH 103 General Chemistry I for Students in Chemical Sciences, and ENG 101 Academic Writing and Research. An overall GPA of 2.0 or better is required for continued enrollment at NC State.

North Carolina Cooperative Extension Service

The NC Cooperative Extension at NC State University is part of a national Extension network that transforms the research knowledge of the university system into practical learning experiences and opportunities for all residents of NC to improve their lives.

Client’s value Cooperative Extension based on our proven ability to help people improve their lives though their personal application of the new knowledge they learn. Dedicated staff are committed to finding the best unbiased information and then helping individuals one-on-one or creating educational programs to help solve real problems and address relevant issues. Respect for individual needs and the belief that education can improve lives has built a strong and respected relationship throughout the state and nation.

The NC Cooperative Extension partners with all one hundred County Governments and the Eastern Band of Cherokee Indian Tribal leadership to provide locally based Agents with the skills and passion to provide the education and hands-on training needed to impact local issues. Agents use advisory councils of local residents to identify key issues and concerns in their families, businesses, and communities. Once key issues are identified, agents develop educational programs and appropriate teaching and experiential learning methodologies to help targeted audiences learn what they can do to improve their practices, behaviors and lives. Outcomes and impacts of these programs are determined through evaluations to ensure public trust and accountability of resources provided.

North Carolina Cooperative Extension key areas of educational expertise include: Strengthening the economic and environmental vitality of NC food, feed, fiber and forest systems and ornamental plant based industries; Family health and nutrition; Positive youth development and leadership (4-H); and Community Development.

NC State Extension
Patterson Hall, Room 120
Campus Box 7602
Phone: (919) 515-2813
Website: ces.ncsu.edu (https://ces.ncsu.edu)

Faculty

Dean, College of Agriculture and Life Sciences
Richard H. Linton

Associate Dean, College of Agriculture and Life Sciences and Director, NC State Extension
A. Richard Bonanno

Associate Director and State Program Leader, ANR/CRD
Dale Monks

Associate Director and State Program Leader, 4-H Youth Development
Michael J. Yoder

Assistant Director and State Program Leader, FCS
Sarah Kirby
Prestage Department of Poultry Science

The Prestage Department of Poultry Science provides a program that encompasses multiple disciplines. Poultry Science is the study of poultry species and the core and traditional sciences involved in animal agriculture production. These sciences include but are not limited to: biology, chemistry, math, and physics. Instruction includes the principles of vertically integrated poultry production and related disciplines such as nutrition, physiology, genetics, immunology, toxicology, biotechnology, and general poultry management.

Through teaching, research, and extension, the department serves students, poultry producers, and allied industries. Poultry production has increased rapidly during the last two decades and ranks first in North Carolina as a source of agricultural income. Growing demand for poultry products, our climate and economic conditions in the state provide a sound base for continued expansion.

The Prestage Department of Poultry Science is one of only six land-grant academic departments in the U.S. dedicated to poultry science. We produce nearly a third of all poultry science graduates. With abundant scholarship opportunities and a 95% job placement rate, our graduates have opportunities that range from flock supervisors and processing managers to geneticists and vaccine sales representatives.

For more information about this department, including contact information, visit our website (https://cals.ncsu.edu/prestage-department-of-poultry-science/).

Prestage Department of Poultry Science
Campus Box 7608
NC State University Campus
Raleigh, NC 27695-7608

Contact
Dr. Lynn Worley-Davis
Undergraduate Teaching Coordinator
Email: lwdavis@ncsu.edu

Faculty

Department Head
Patricia Curtis

Department Extension Leader
Jesse L. Grimes

Director of Undergraduate Programs
Lynn Worley-Davis

Director of Graduate Programs
Jesse L. Grimes

William Neal Reynolds Professors
P.R. Ferket

Professors
K.E. Anderson
C.M. Ashwell
R. Beckstead
D.K. Carver
P. Curtis
F.W. Edens
J.L. Grimes
H.M. Hassan
M.D. Koci
P.E. Mozdziak
E.O. Oviedo-Rondon
J.N. Petitte

Associate Professors
A.C. Fahrenholz

Assistant Professors
M.V. Joseph
P. Regme

Teaching Associate Professor
E.B. Bohorquez

Teaching Assistant Professors
L. Worley-Davis

Adjunct Professors
T. Ao
J. Bruno-Barcena
Z.S. Lowman
M.A. Qureshi
O. Toomer

Professors emeriti
J. Croom
G. Havenstein

**Plans**

- Feed Milling (Certificate) (p. 369)
- Feed Milling (Minor) (p. 369)
- Poultry Science (BS): Science Concentration (p. 370)
- Poultry Science (BS): Technology Concentration (p. 372)
- Poultry Science (Minor) (p. 374)

**Feed Milling (Certificate)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Undergraduate Certificate in Feed Milling offers a course of study that will focus on teaching, developing, and implementing new technology associated with feed milling and animal agriculture in North Carolina, the U.S., and internationally. The Feed Milling Certificate program seeks to provide an educational opportunity to individuals in the feed industry who live and work in remote areas of the country, to increase the technical knowledge of individuals working in the feed and allied industries, to increase awareness of government regulations that apply to the feed industry, and to develop skills of feed mill employees. This certificate is available on-campus and via Distance Education.

**Program Coordinator**

Dr. Adam Fahrenholz  
Poultry Science Dept.  
Campus Box 7608  
North Carolina State University  
Raleigh, NC 27695  
919-515-5408  
adam_fahrenholz@ncsu.edu  
For additional information regarding Distance Education (click here) (http://distance.ncsu.edu/programs/university-certificate-in-feed-milling/)

**Admissions Requirements**

Contact the Program Coordinator.

**Academic Structure**

Term Effective: 1/2010  
Plan Code: 11FMCTU, 32FMCTU  
CIP Code: 01.0907  
Description: Undergraduate Certificate in Feed Milling  
Offered via on-campus and Distance Education (http://distance.ncsu.edu/programs/university-certificate-in-feed-milling/) format

**Plan Requirements**

Any pre-requisite courses listed for courses within the certificate program.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM/ANS 425</td>
<td>Feed Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>FM 460</td>
<td>Feed Mill Operations and Leadership</td>
<td>3</td>
</tr>
<tr>
<td>FM 480</td>
<td>Feed Quality Assurance &amp; Formulation</td>
<td>3</td>
</tr>
<tr>
<td>FM 490</td>
<td>Feed Science Seminar</td>
<td>1</td>
</tr>
<tr>
<td>FM 494</td>
<td>Feed Mill Learning Experience</td>
<td>1</td>
</tr>
</tbody>
</table>

**Elective Courses**

Select one of the following:  
PO/ANS/NTR Comparative Nutrition  
415  
ANS 225 Principles of Animal Nutrition  
ANS 230 Animal Nutrition

**Total Hours**  14

**Feed Milling (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Minor in Feed Milling is designed to provide a foundation in animal feed milling technology. The objectives of the minor are for the student to: acquire an understanding of the functions of a modern feed mill; to learn procedures to assist in operating a feed mill; and to apply academic skills to the challenges of operating a manufacturing facility.

**Admissions**

Students interested in this minor can contact the following Coordinator of Advising:

Dr. Adam Fahrenholz, 234C Scott Hall  
919.515.5408  
adam_fahrenholz@ncsu.edu  
The application for the minor is available in 212/213 Scott Hall (Poultry Science).

**Certification**

Certification for Minor in Feed Milling must be submitted to Dr. Adam Fahrenholz, 234C Scott Hall, no later than the registration period for the student’s final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

**Contact Person**

Dr. Adam Fahrenholz  
234C Scott Hall  
919.515.5408  
adam_fahrenholz@ncsu.edu  

*SIS code: 11FEM*

**Plan Requirements**

A minimum of 15 credit hours from the prescribed list of courses and a grade of ‘C’ or better in these courses is required to receive the Minor in Feed Milling. An overall GPA of 2.0 is required to pursue and graduate from the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO 201</td>
<td>Poultry Science and Production or ANS 150 Introduction to Animal Science</td>
<td></td>
</tr>
<tr>
<td>FM/ANS/PO 425</td>
<td>Feed Manufacturing Technology</td>
<td></td>
</tr>
<tr>
<td>FM 460</td>
<td>Feed Mill Operations and Leadership</td>
<td></td>
</tr>
</tbody>
</table>
in the communication and public relations sectors, as teachers, and extension and research specialists and as veterinarians.

## Plan Requirements

### Poultry Science (BS): Science Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS 103</td>
<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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</tr>
<tr>
<td>or ALS 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
<td>4</td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>or COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td>3</td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
<td>3</td>
</tr>
</tbody>
</table>

### Social Sciences & Business

| Are 201  | Introduction to Agricultural & Resource Economics | 3     |
| Business/Finance Elective (p. 371) | 3     |

### Physical and Biological Science

| MA 107  | Precalculus I | 3     |
| Select one of the following: | 3     |
| MA 121  | Elements of Calculus | 3     |
| MA 131  | Calculus for Life and Management Sciences A | 3     |
| MA 141  | Calculus I | 3     |
| ST 311  | Introduction to Statistics | 3     |
| BIO 181  | Introductory Biology: Ecology, Evolution, and Biodiversity | 4     |
| BIO 183  | Introductory Biology: Cellular and Molecular Biology | 4     |

### Departmental Requirements

| CH 101  | Chemistry - A Molecular Science ¹ | 3     |
| CH 102  | General Chemistry Laboratory ¹ | 3     |
| PY 131  | Conceptual Physics | 4     |
| or PY 211 | College Physics I | 4     |
| CH 221  | Organic Chemistry I | 3     |
| CH 222  | Organic Chemistry I Lab | 3     |
| CH 223  | Organic Chemistry II | 3     |
| CH 224  | Organic Chemistry II Lab | 3     |
| CH 201  | Chemistry - A Quantitative Science | 3     |
| CH 202  | Quantitative Chemistry Laboratory | 3     |
| GN 311  | Principles of Genetics | 4     |
| MB 351  | General Microbiology | 3     |
| MB 352  | General Microbiology Laboratory | 3     |

### Elective Courses

| ARE 304 | Agribusiness Management | 3     |
| ARE 311 | Agricultural Markets | 3     |
| BAE 201 | Shop Processes and Management | 3     |
| BAE 202 | Introduction to Biological and Agricultural Engineering Methods | 3     |
| BAE 333 | Processing Agricultural Products | 3     |
| BAE 343 | Agricultural Electrification | 3     |
| BAE 432 | Agricultural and Environmental Safety and Health | 3     |
| FS 435 | Food Safety Management Systems | 3     |
| AEE 350 | Personal Leadership Development in Agriculture and Life Sciences | 3     |
| AEE 360 | Developing Team Leadership in Agriculture and Life Sciences | 3     |
| CS 216 | Southern Row Crop Production - Cotton, Peanuts, and Tobacco | 3     |
| CS 218 | Southern Row Crop Production - Corn, Small Grains and Soybeans | 3     |

Total Hours: 17

¹ Students need enough credits from the elective list below to make at least 15 total credits for the minor.

## Poultry Science (BS): Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

### Curricula

Students desiring a Bachelor of Science degree with a major in Poultry Science may choose either the science or technology curriculum offered by the Prestage Department of Poultry Science. Students interested in research or veterinary/medical fields can meet the pre-requisites for these professional schools through the science concentration. These students are also better prepared for advanced study in various disciplines such as genetics, nutrition, physiology, and pathology. The technology curriculum in Poultry Science allows a greater selection of courses in business and economics; and offers a student both basic and applied knowledge in poultry production which can be utilized in the poultry or allied industries upon graduation. One may obtain a double major in other curricula by the Prestage Department of Poultry Science. Students interested in research or veterinary/medical fields can meet the pre-requisites for these programs.

### Career Opportunities

The transition from small farm to large commercial poultry operations has created more specialized positions than there are available poultry science graduates. Production-oriented positions and off-the-farm operations in areas such as processing and distribution offer new job opportunities. Allied industries such as: feed manufacturing, equipment sales, financing, pharmaceutical development and research — need additional employees trained in Poultry Science. Graduates are employed in the communication and public relations sectors, as teachers, and extension and research specialists and as veterinarians.
NC State University

PO 415 Comparative Nutrition 1 3
PO 435 Poultry Incubation & Breeding 1 4
VMP 401 Poultry Diseases 1 4

GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2 16

Total Hours 120

1  A grade of C- or higher is required.
2  Students should consult their academic advisors to determine which courses fill this requirement.

Business/Finance Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 303</td>
<td>Farm Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 304</td>
<td>Agribusiness Management</td>
<td>3</td>
</tr>
<tr>
<td>ARE 306</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
<td>3</td>
</tr>
<tr>
<td>ARE 311</td>
<td>Agricultural Markets</td>
<td>3</td>
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<tr>
<td>ARE 312</td>
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<td>ARE 321</td>
<td>Agricultural Financial Management</td>
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<td>Human Resource Management for Agribusiness</td>
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<tr>
<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<tr>
<td>BUS 225</td>
<td>Personal Finance</td>
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<tr>
<td>EC 202</td>
<td>Principles of Macroeconomics</td>
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<tr>
<td>EC 301</td>
<td>Intermediate Microeconomics</td>
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<tr>
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<tr>
<td>EC 348</td>
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<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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</table>

Semester Sequence

This is a sample.

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
</table>
| First Year
| Fall Semester
| ALS 103 | Freshman Transitions and Diversity in Agriculture & Life Sciences | 1 |
| ENG 101 | Academic Writing and Research                 | 4 |
| MA 107  | Precalculus I                                 | 3 |
| PO 201  | Poultry Science and Production 1              | 3 |
| PO 202  | Poultry Science and Production Laboratory 1   | 1 |
| BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4 |

| Spring Semester
| BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4 |
| COM 110  | Public Speaking or Interpersonal Communication | 3 |
| MA 121  | Elements of Calculus or Calculus for Life and Management Sciences A | 3 |
| GEP Social Sciences (p. 1430) | 3 |
| Free Elective | 3 |

| Second Year
| Fall Semester
| ARE 201 | Introduction to Agricultural & Resource Economics | 3 |
| CH 101  | Chemistry - A Molecular Science                 | 3 |
| CH 102  | General Chemistry Laboratory                    | 1 |
| PO 290  | Poultry Seminar 1                              | 1 |
| GEP Humanities (p. 1423) | 3 |
| GEP Health and Exercise Studies (p. 1422) | 1 |
| Free Electives | 3 |

| Spring Semester
| CH 221  | Organic Chemistry I                            | 3 |
| CH 222  | Organic Chemistry I Lab                        | 1 |
| ST 311  | Introduction to Statistics                     | 3 |
| GEP Health and Exercise Studies (p. 1422) | 1 |
| GEP Humanities (p. 1423) | 3 |
| Free Electives | 3 |

| Third Year
| Fall Semester
| CH 223  | Organic Chemistry II                           | 3 |
| CH 224  | Organic Chemistry II Lab                       | 1 |
| PO/ANS/FS 322 or PO 433 | Muscle Foods and Eggs or Poultry Processing and Products | 3 |
| PO/ANS 415 | Comparative Nutrition 1 or Conceptual Physics | 3 |
| PY 211  | College Physics I                              | 4 |
| or PY 131 | or Conceptual Physics                         |     |
Spring Semester

CH 201 Chemistry - A Quantitative Science 3
CH 202 Quantitative Chemistry Laboratory 1

Select one of the following: 3

ENG 331 Communication for Engineering and Technology
ENG 332 Communication for Business and Management
ENG 333 Communication for Science and Research

GN 311 Principles of Genetics 4

ACC/ARE/BUS/EC Elective 3
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

Hours 17

Fourth Year

Fall Semester

MB 351 General Microbiology 3
MB 352 General Microbiology Laboratory 1
GEP Interdisciplinary Perspectives (p. 1426) 3
PO 404 Avian Anatomy and Physiology 4
Free Elective 3

Hours 14

Spring Semester

PO 435 Poultry Incubation & Breeding 1 4
VMP 401 Poultry Diseases 1 4
GEP Interdisciplinary Perspectives (p. 1426) 2
Free Elective 4

Hours 14

Total Hours 120

1 A grade of C- or higher is required.

Poultry Science (BS): Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

Curricula

Students desiring a Bachelor of Science degree with a major in Poultry Science may choose either the science or technology curriculum offered by the Prestage Department of Poultry Science. Students interested in research or veterinary/medical fields can meet the pre-requisites for these professional schools through the science concentration. These students are also better prepared for advanced study in various disciplines such as genetics, nutrition, physiology, and pathology. The technology curriculum in Poultry Science allows a greater selection of courses in business and economics; and offers a student both basic and applied knowledge in poultry production which can be utilized in the poultry or allied industries upon graduation. One may obtain a double major in other curricula through careful use of electives and/or summer school attendance. These students should consult the undergraduate advisers in the department(s) concerned.

Career Opportunities

The transition from small farm to large commercial poultry operations has created more specialized positions than there are available poultry science graduates. Production-oriented positions and off-the-farm operations in areas such as processing and distribution offer new job opportunities. Allied industries such as: feed manufacturing, equipment sales, financing, pharmaceutical development and research — need additional employees trained in Poultry Science. Graduates are employed in the communication and public relations sectors, as teachers, and extension and research specialists and as veterinarians.

Plan Requirements

Poultry Science (BS): Technology Concentration: 120 Total Units

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<th>Hours</th>
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<tr>
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<td>Freshman Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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<tr>
<td>or AL 303</td>
<td>Transfer Transitions and Diversity in Agriculture &amp; Life Sciences</td>
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Communications

ENG 101 Academic Writing and Research 1 4
COM 110 Public Speaking 3
or COM 112 Interpersonal Communication 3

Select one of the following: 3

ENG 331 Communication for Engineering and Technology
ENG 332 Communication for Business and Management
ENG 333 Communication for Science and Research

Social Sciences & Business

ARE 201 Introduction to Agricultural & Resource Economics 3
Business/Finance Elective (p. 373) 6

Physical and Biological Science

MA 107 Precalculus I 3
Select one of the following: 3

MA 114 Introduction to Finite Mathematics with Applications
MA 121 Elements of Calculus
MA 131 Calculus for Life and Management Sciences A
MA 141 Calculus I

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
BIO 183 Introductory Biology: Cellular and Molecular Biology 4

CH 101 Chemistry - A Molecular Science 1 3
CH 102 General Chemistry Laboratory 1 1
Select one of the following: 4

CH 220 Introductory Organic Chemistry & CH 222 and Organic Chemistry I Lab
CH 221 Organic Chemistry I & CH 222 and Organic Chemistry I Lab

GN 301 Genetics in Human Affairs 3
or ANS 215 Agricultural Genetics 3

MB 351 General Microbiology 3
MB 352 General Microbiology Laboratory 1

Departmental Requirements
PO 201  Poultry Science and Production  4
& PO 202  Poultry Science and Production Laboratory  1
PO 290  Poultry Seminar  1
PO 322  Muscle Foods and Eggs  3
or PO 433  Poultry Processing and Products  
PO 406  Physiological Aspects of Poultry Management  3
PO 415  Comparative Nutrition  3
PO 435  Poultry Incubation & Breeding  4
VMP 401  Poultry Diseases  4
PO 340  Live Poultry and Poultry Product Evaluation, Grading, and Inspection  3

GEP Courses
GEP Humanities (p. 1423)  6
GEP Social Sciences (p. 1430)  3
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP Interdisciplinary Perspectives (p. 1426)  5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt)  21

Total Hours  120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Business/Finance Electives

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<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
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<tr>
<td>ARE 215</td>
<td>Small Business Accounting</td>
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<td>ARE 301</td>
<td>Intermediate Microeconomics</td>
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<td>ARE 303</td>
<td>Farm Management</td>
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<td>ARE 304</td>
<td>Agribusiness Management</td>
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<td>ARE 306</td>
<td>Agricultural Law</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 311</td>
<td>Agricultural Markets</td>
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<td>Human Resource Management for Agribusiness</td>
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<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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Semester Sequence

This is a sample.

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<th>Hours</th>
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<td>Fall Semester</td>
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<td>Poultry Science and Production</td>
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<td>Poultry Science and Production Laboratory</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>COM 110</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>MA 114</td>
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<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>PO 290</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>PO 340</td>
<td>Live Poultry and Poultry Product Evaluation, Grading, and Inspection</td>
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</table>
Poultry Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Upon completion of the minor in Poultry Science curriculum, students will be able to describe the management of poultry including advanced topics such as genetics, nutrition, physiology and pathology.

Admissions and Certification of Minor

In both instances, students should contact Ms. Lynn Worley-Davis, 919.515.6852, lwdavis@ncsu.edu. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Ms. Lynn Worley-Davis
919.515.6852
lwdavis@ncsu.edu

SIS Code: 11POM

Plan Requirements

- Students must maintain a grade of ‘C’ or better in each course used toward the minor.
- Students may only count up to 2 hours of PO 492 External Learning Experience toward the minor.
- Students may only count up to 2 hours of PO 493 Special Problems in Poultry Science toward the minor.

Code | Title |
--- | --- |
PO 201 | Poultry Science and Production |
PO 202 | Poultry Science and Production Laboratory |
PO 290 | Poultry Seminar |
PO 322 | Muscle Foods and Eggs |
PO 340 | Live Poultry and Poultry Product Evaluation, Grading, and Inspection |
PO 404 | Avian Anatomy and Physiology |
PO 406 | Physiological Aspects of Poultry Management |
PO 407 | Physiological Aspects of Poultry Management Laboratory |
PO 410 | Production and Management of Game Birds in Confinement |
PO 411 | Agrosecurity |
PO 415 | Comparative Nutrition |
PO 421 | Commercial Egg Production |
PO 424 | Poultry Meat Production |
PO 425 | Feed Manufacturing Technology |
PO 433 | Poultry Processing and Products |
PO 435 | Poultry Incubation & Breeding |
PO 492 | External Learning Experience |
PO 493 | Special Problems in Poultry Science |
VMP 401 | Poultry Diseases |
PO 524 | Comparative Endocrinology |

Total Hours | 15
The College of Design teaches design thinking in an interdisciplinary environment that makes sense of the world for the benefit of the public. The College integrates practical, ethical, and aesthetic thought and action to enhance the meaning and quality of life through the creation of knowledge informing the critical study of artifacts and places.

The College of Design gathers creative minds from around the world whose interests and expertise span a variety of disciplines. An inspiring and elite group of faculty prepare our designers to go out and shape the world.

The world needs good design. It plays a major role in the development of branding, product development, business practices and procedures, and more. The size and shape of mobile devices, the animation we see on the big screen, the materials used in the buildings we enter—design touches everything around us.

Faculty
Dean
Mark Elison Hoversten

Associate Dean
Sharon Joines

Assistant Dean
Dr. Celen Palasar, Assistant Dean for Research and Extension
Tameka Whitaker, Assistant Dean of Student and Academic Services
Felicia Womack, Assistant Dean for Budget and Administration

Departments
- Department of Art + Design (p. 375)
- Department of Graphic Design and Industrial Design (p. 405)
- Department of Landscape Architecture (p. 409)
- School of Architecture (p. 410)
- The First Year Experience (p. 414)

Majors
- Architecture (Bachelor) (p. 412)
- Art and Design (Bachelor) (p. 376)
- Design Studies (BA) (p. 379)
- Design Studies (BA): Business Administration Concentration (p. 389)
- Design Studies (BA): Nonprofit Studies Concentration (p. 396)
- Environmental Design in Architecture (Bachelor) (p. 412)
- Graphic Design (Bachelor) (p. 405)
- Industrial Design (Bachelor) (p. 407)

Minors
- Art and Design (Minor) (p. 378)
- Design Studies (Minor) (p. 404)
- Landscape Architecture (Minor) (p. 409)

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Department of Art + Design

The Department of Art and Design awards the Bachelor of Art and Design degree and the Bachelor of Arts in Design Studies. The pedagogical core of the program aims to reinforce foundation principles of design theory as applied to two-and three-dimensional design. Our curriculum addresses broad cultural, ecological, and societal considerations and promotes in our graduates the ability to meet the challenges of collaborative design. We emphasize the application of creative thinking and problem solving to design projects ranging from single to mass-produced artifacts. The areas of application span the range from formal design, fibers and surface design to emerging areas in media arts. Examples of current areas of study are hybrid applications of traditional and digital media that encompass imaging, animation, fiber and surface design, photography, printmaking, illustration, form generation and installations.

The Department of Art and Design believes there is an essential need for students in a technically-based research university to engage in course work that fosters creative thinking and problem solving. To meet this need, the department offers courses to all students in the university a minor in Art and Design. Minors are guided through a selection of courses with the consultation from a design adviser.

For more information about this department, including contact information, visit the department (http://design.ncsu.edu/academics/art-design/).

Faculty
Interim Head
Kathleen Rieder, Interim Head

CoDirector of Graduate Program
Tania Allen, Associate Professor
E. Polvak, Assistant Professor

Professors
C. Cox
P. Jennings
H. Marchant
M. Scearce

Professors Emeriti
S. Brandeis
C. Joyner
D. Raymond

Associate Professor
T. Allen
The curriculum is to provide structure for the creation of a new model of art for graduate study in a specific art or design discipline. The goal of the Bachelor of Art and Design degree may wish to use it as a foundation providing students skills that allow them to perform and succeed in a wide variety of art and design professions after graduation. These individual artistic and practical talents are developed as different expressions of one potentiality.

**Plan Requirements**

**Art and Design (Bachelor): 120 Total Units**

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<td><strong>Design Studios</strong></td>
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<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
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<td>D 104</td>
<td>First Year Studio I</td>
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<td>D 105</td>
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<td>Design Studio: Art &amp; Design in Context</td>
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<td>ADN 219</td>
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<td>Art History or Design History (p. 377)</td>
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<td>ADN 418</td>
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<td><strong>General Education Program (GEP) Courses</strong></td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td></td>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Free Electives</strong></td>
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<td>Free Electives (12 Hr S/U Lmt)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td>120</td>
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</table>

1  A grade of C- or higher is required.  
2  Students should consult their academic advisors to determine which courses fill this requirement.
## Advanced Writing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td>3</td>
</tr>
<tr>
<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
<td>3</td>
</tr>
<tr>
<td>ENG 325</td>
<td>Spoken and Written Traditions of American English Dialects</td>
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## Sophomore Studio V-VIII

### Design Studios

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<tr>
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<tr>
<td>ADN 460</td>
<td>Creative Technology Studio II</td>
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</tr>
<tr>
<td>ADN 470</td>
<td>Fibers and Surface Design Studio</td>
<td>6</td>
</tr>
<tr>
<td>ADN 480</td>
<td>Intermediate Studio</td>
<td>6</td>
</tr>
<tr>
<td>ADN 490</td>
<td>Art and Design International Studio</td>
<td>6</td>
</tr>
<tr>
<td>ADN 560</td>
<td>Graduate Studio I: Immersive and Experimental Narratives</td>
<td>6</td>
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<tr>
<td>ADN 570</td>
<td>Graduate Studio III: Final Project Definition</td>
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### Swing Studios

Select a maximum of 6 units:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>GD 201</td>
<td>Design, Context, and Experience</td>
<td>6</td>
</tr>
<tr>
<td>GD 202</td>
<td>Designing for Settings, People, and Use</td>
<td>6</td>
</tr>
<tr>
<td>ID 201</td>
<td>Industrial Design Studio I</td>
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</tr>
<tr>
<td>LAR 400</td>
<td>Landscape Architecture Studio</td>
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## Digital Media Elective

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ADN 311</td>
<td>Art + Design Laboratory I</td>
<td>3</td>
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<tr>
<td>ADN 319</td>
<td>Animation I</td>
<td>3</td>
</tr>
<tr>
<td>ADN 411</td>
<td>Art + Design Laboratory II</td>
<td>3</td>
</tr>
<tr>
<td>ADN 419</td>
<td>Creative Technology Studio I</td>
<td>3</td>
</tr>
<tr>
<td>ADN 481</td>
<td>Drawing II</td>
<td>3</td>
</tr>
<tr>
<td>ADN 492</td>
<td>Special Topics in Art + Design</td>
<td>1-3</td>
</tr>
<tr>
<td>ADN 592</td>
<td>Graduate Art + Design Special Topics</td>
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<tr>
<td>ARC 251</td>
<td>Digital Representation</td>
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<tr>
<td>FTM 271</td>
<td>Computer-Aided Textile Design</td>
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</tr>
<tr>
<td>ID 110</td>
<td>Introduction to Digital Techniques</td>
<td>3</td>
</tr>
<tr>
<td>ID 210</td>
<td>Intermediate Digital Techniques</td>
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</tr>
<tr>
<td>ID 310</td>
<td>Advanced Digital Techniques</td>
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## Drawing Elective

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ADN 411</td>
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<td>3</td>
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<tr>
<td>ADN 481</td>
<td>Drawing II</td>
<td>3</td>
</tr>
<tr>
<td>ADN 492</td>
<td>Special Topics in Art + Design</td>
<td>1-3</td>
</tr>
<tr>
<td>ARC 251</td>
<td>Digital Representation</td>
<td>3</td>
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<tr>
<td>ID 216</td>
<td>Visualization I</td>
<td>3</td>
</tr>
<tr>
<td>ID 316</td>
<td>Visualization II</td>
<td>3</td>
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## Art History or Design History Elective

<table>
<thead>
<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td>ADN 475</td>
<td>Pre-Industrial World Textiles</td>
<td>3</td>
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<td>ADN 492</td>
<td>Special Topics in Art + Design</td>
<td>1-3</td>
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<tr>
<td>ADN 575</td>
<td>Pre-Industrial World Textiles</td>
<td>3</td>
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<tr>
<td>ARC 242</td>
<td>History of Western Architecture</td>
<td>3</td>
</tr>
<tr>
<td>GD 203</td>
<td>History of Graphic Design</td>
<td>3</td>
</tr>
<tr>
<td>HA 201</td>
<td>History of Art from Caves to the Renaissance</td>
<td>3</td>
</tr>
<tr>
<td>HA 202</td>
<td>History of Art From the Renaissance Through the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>HA 298</td>
<td>Special Topics in Art History</td>
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<tr>
<td>ID 244</td>
<td>History of Industrial Design</td>
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<tr>
<td>LAR 444</td>
<td>History of Landscape Architecture</td>
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## Design Advised Core

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<th>Code</th>
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<tbody>
<tr>
<td>ADN 224</td>
<td>Digital Motion</td>
<td>3</td>
</tr>
<tr>
<td>ADN 226</td>
<td>Sequential Imaging</td>
<td>3</td>
</tr>
<tr>
<td>ADN 272</td>
<td>Introduction to Printing and Surface Design</td>
<td>3</td>
</tr>
<tr>
<td>ADN 273</td>
<td>Fibers Materials and Processes</td>
<td>3</td>
</tr>
<tr>
<td>ADN 276</td>
<td>Soft Construction I: Sewing</td>
<td>3</td>
</tr>
<tr>
<td>ADN 319</td>
<td>Animation I</td>
<td>3</td>
</tr>
<tr>
<td>ADN 414</td>
<td>Color and Light</td>
<td>3</td>
</tr>
<tr>
<td>ADN 423</td>
<td>Digital Modeling</td>
<td>3</td>
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<tr>
<td>ADN 480</td>
<td>Intermediate Studio</td>
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## Semester Sequence

This is a sample.

### First Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
<td>3</td>
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<tr>
<td>D 104</td>
<td>First Year Studio I 1,2</td>
<td>6</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research 1</td>
<td>4</td>
</tr>
<tr>
<td>ADN 219</td>
<td>Digital Imaging I 1</td>
<td>3</td>
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</tbody>
</table>

### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>D 105</td>
<td>First Year Studio II 1,2</td>
<td>6</td>
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<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
<td>3</td>
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<tr>
<td>ADN 281</td>
<td>Drawing I 1</td>
<td>3</td>
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<tr>
<td>GEP 1422</td>
<td>Health and Exercise Studies (p. 1422)</td>
<td>1</td>
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</table>

### Second Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ADN 202</td>
<td>Design Studio: Art &amp; Design in Context 1,2</td>
<td>6</td>
</tr>
<tr>
<td>ADN Advised Elective - Drawing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Advanced Writing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEP 1428</td>
<td>Mathematical Sciences (p. 1428)</td>
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### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADN 204</td>
<td>Art + Design Sophomore Studio Spring 1,2</td>
<td>6</td>
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</tbody>
</table>
### ADN Advised Elective - Digital Media 3
### History of Art, History of Design 3
### GEP Natural Sciences (p. 1429) 3

**Hours** 15

### Third Year

#### Fall Semester

- **International Experience recommended** 3
- **Design Studio** 1,2 6
- **GEP Natural Sciences (p. 1429)** 4
- **Design Advised Core** 3
- **GEP Social Sciences (p. 1430)** 3
- **Free Elective** 2

**Hours** 18

#### Spring Semester

- **Design Studio** 1,2 6
- **GEP Social Sciences (p. 1430)** 3
- **GEP Humanities (p. 1423)** 3
- **ADN 418 Contemporary Issues in Art and Design** 1 3

**Hours** 15

### Fourth Year

#### Fall Semester

- **Design Studio** 1,2 6
- **Design Advised Core** 3
- **ADN 493 Art and Design Senior Lecture** 1,2 3
- **GEP Additional Breadth (p. 1417)** 3

**Hours** 15

#### Spring Semester

- **Design Studio** 1,2 6
- **Design Elective** 3
- **GEP Humanities (p. 1423)** 3
- **GEP Health and Exercise Studies (p. 1422)** 1

**Hours** 13

**Total Hours** 120

1. A grade of C- or higher is required.
2. No more than six-credit-hours of studio may be taken in any semester. No more than one non-ADN studio course can fulfill the studio requirement.
3. The Spring semester of Junior year opens the opportunity to fulfill the College's International Experience requirement. Please consult your advisor and the Department Head.

### Career Opportunities

Career opportunities for graduates of the Department of Art and Design range from independent artist-designers to corporate level art-design directors. Graduates of this department are currently working in fields such as software design, multimedia, illustration, textile design, fashion and apparel design, art and design education, photography, filmmaking, special effects-digital, set design, exhibition design, museum education, public art and entrepreneurs.

### Art and Design (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Art + Design believes that there is an essential need for students in the broader university to engage in coursework that fosters creative thinking, problem-solving, and making. To meet this need, the department offers an undergraduate minor in Art + Design, available to university students in majors offered outside of the College of Design. The minor in Art + Design consists of 15 total credit hours of study, of which 6 hours must be satisfied at the basic course level. The remaining 9 hours of courses may be selected from the elective course list provided below. A grade of “B” or better will be required for credit in all courses in the minor. Although all efforts are made to accommodate minors, it is important for potential students to know and understand that access to Art + Design courses are based on a hierarchy where priority access goes to Art + Design majors.

### Program Objectives

- To discover basic art + design principles through hands-on activities
- To apply art + design process and theory to solve problems creatively and efficiently
- To increase awareness of one’s self and environment
- To foster an appreciation and understanding of the disciplines of art and design

### Admissions

Admissions into this minor program requires that the student be in good academic standing at the university with a minimum overall GPA of at least 2.0. Students must also complete all Art + Design minor courses with a grade of ‘B’ or better. To officially add or drop the Art + Design Minor, students must complete the “Declare Minor Form” form that is available online here (https://studentservices.ncsu.edu/forms/Registrar/declare_minor.pdf). After completing the “Declare Minor Form”, students should bring it to the College of Design Department Heads Suite that is located in Brooks Hall 215.

### Contact Person

Kathleen Rieder  
215B Brooks Hall  
(919) 515-2079  
Email: kathleen_reieder@ncsu.edu

**SIS Code: 12DNM**

### Plan Requirements

Minor in Art + Design consists of 15 credit hours of study of the approved courses and has the following requirements:

- Completion of a minimum of 15 credit hours for Art + Design minor designated courses.
- A university grade of 2.0 or above.
- A grade of ‘B’ or better in all courses required and credited to the minor
- No course used for the minor can be taken for credit only (S/U)
- Only courses offered from the department of Art + Design will count toward the minor degree.
Design Studies is:

- Open to students whose interests and talents in design are more general and/or cross-disciplinary than those in the specific student-based programs
- Broadly engaged in issues of material culture.
- Preparatory for later advanced study in the design professions
- A blend of aesthetic, cultural, historical, social, physical, technological, business and entrepreneurial knowledge
- Collaborative in providing the learning and background necessary for further study in archival and cultural preservation, museum practice, conversation, collections administration, costume and theatre design, criticism, research, and arts and nonprofits management

Design Studies is not a transitional program from which to transfer into one of the studio-based degree programs in the College of Design. Design Studies students who wish to change majors will need to apply for competing seats in the freshmen class of a studio-based program and are subject to the select admissions process that requires a portfolio review.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php).

**Plan Requirements**

**Design Studies (BA): 120 Total Units**

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research 1</td>
<td>4</td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<tr>
<td>Advanced Writing Elective (p. 380)</td>
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<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<tr>
<td>Humanities Elective (p. 380)</td>
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</tr>
<tr>
<td>Intermediate Foreign Language Electives (p. 381)</td>
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</table>

**Intermediate Foreign Language Electives**

- 6

**Departmental Requirements**

- 3

**Design History Electives**

- 9

**Design Studies Advised Electives**

- 6

**Application Unit Electives (p. 383)**

- 6

**Theory Unit Electives (p. 383)**

- 6

**History Unit Electives (p. 383)**

- 6

**Application, Theory, or History Unit Elective (p. 384)**

- 3

**Certification**

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Students must contact the Art + Design minor advisor to check that all minor degree requirements have been met. If they have met, the student can apply for their minor degree in the MyPack online portal at the same time that they apply for graduation their final semester at NC State.

**Design Studies (BA)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Arts in Design Studies is a non-studio based program that provides an interdisciplinary orientation to the history and theory of the design disciplines, material culture and design thinking. Design Studies focuses on the social, historical, technological and physical contexts in which design is produced. It presents the formative role of design in shaping human values and experiences.

Undergraduate students will be introduced to the breadth of the design disciplines expanding their awareness of design and the design process. Students can explore the range of career options in the fields of design through Design Studies concentrations in Non-Profits Studies, Business Administration. Individuals preparing for a graduate education in design theory and criticism, museum practice, business management, entrepreneurship or marketing in design may choose from courses suited to their unique objectives. Students who want more general education will develop an understanding of design and its intrinsic relationship to the broader culture.

Design Studies is:
### General Education Program (GEP) Courses

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<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>HI 233</td>
<td>Humanities (p. 1423)</td>
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<td>HI 232</td>
<td>Advanced Writing Electives (p. 1428)</td>
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<td>HI 222</td>
<td>GEP Mathematical Sciences (p. 1429)</td>
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<td>HI 240</td>
<td>GEP Additional Breadth (p. 1417)</td>
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<td>HI 231</td>
<td>GEP U.S. Diversity (p. 1431)</td>
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<td>HI 250</td>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>HI 230</td>
<td>Foreign Language Proficiency (p. 1417)</td>
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**Free Electives**

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<tbody>
<tr>
<td>HI 238</td>
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Total Hours: 120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

### Advanced Writing Electives

<table>
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<tbody>
<tr>
<td>ENG 214</td>
<td>Introduction to Editing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
<td>3</td>
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<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 236</td>
<td>Introduction to News and Article Writing</td>
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<tr>
<td>HI 261</td>
<td>Writing in the Rhetorical Tradition</td>
<td>3</td>
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<td>HI 235</td>
<td>Spoken and Written Traditions of American English Dialects</td>
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<tr>
<td>HI 330</td>
<td>Screenwriting</td>
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### Humanities Electives

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<th>Hours</th>
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<tbody>
<tr>
<td>HI 237</td>
<td>Introduction to History of South and East Africa</td>
<td>3</td>
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<td>HI 236</td>
<td>Introduction to History of West Africa</td>
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<tr>
<td>HI 235</td>
<td>African-American History Through the Civil War, 1619-1865</td>
<td>3</td>
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<tr>
<td>HI 233</td>
<td>African-American History Since 1865</td>
<td>3</td>
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<td>HI 240</td>
<td>Introduction to Visual Culture</td>
<td>3</td>
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<tr>
<td>HI 249</td>
<td>American History I</td>
<td>3</td>
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<tr>
<td>HI 251</td>
<td>History of Common Law and Constitution</td>
<td>3</td>
</tr>
<tr>
<td>HI 252</td>
<td>History of Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>HI 253</td>
<td>American History</td>
<td>3</td>
</tr>
<tr>
<td>HI 254</td>
<td>Modern American History</td>
<td>3</td>
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<td>HI 255</td>
<td>Asian Civilizations to 1800</td>
<td>3</td>
</tr>
<tr>
<td>HI 256</td>
<td>Modern Asia: 1800 to Present</td>
<td>3</td>
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<tr>
<td>HI 257</td>
<td>Modern Middle East</td>
<td>3</td>
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<td>HI 258</td>
<td>Introduction to History of South and East Africa</td>
<td>3</td>
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<tr>
<td>HI 259</td>
<td>Introduction to History of West Africa</td>
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<tr>
<td>HI 260</td>
<td>Frauds and Mysteries of the Past</td>
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<tr>
<td>HI 261</td>
<td>Jewish History</td>
<td>3</td>
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<tr>
<td>HI 262</td>
<td>Cuba Today: Historical and Sociopolitical Perspectives</td>
<td>3</td>
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<td>HI 263</td>
<td>Religion in American History</td>
<td>3</td>
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<td>HI 264</td>
<td>Scientific Revolution and European Society, 1500-1800</td>
<td>3</td>
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<td>HI 265</td>
<td>History of the Civil War in Popular Culture</td>
<td>3</td>
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<td>HI 266</td>
<td>American Military History</td>
<td>3</td>
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<td>HI 267</td>
<td>U.S. Naval History</td>
<td>3</td>
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<td>HI 268</td>
<td>The Rise of the American Empire</td>
<td>3</td>
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<td>HI 269</td>
<td>U.S. Agricultural History</td>
<td>3</td>
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ID 262  | Professional Practice in Industrial Design    | 3     |
LAR 221 | Introduction to Environment and Behavior for Designers | 3 |
LAR 542 | Human Use of the Urban Landscape              | 3     |

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HI 525 Tudor and Stuart England 3
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HI 588 Family and Community History 3
HI 589 Interpretation in Historic Sites and Parks 3
HI 591 Museum Studies 3
HI 593 Material Culture 3
HI 594 Cultural Heritage 3
HI 595 Special Topics in History 1-6
HI 596 Introduction To Public History 3
HI 597 Historiography and Historical Method 3
HI 598 Historical Writing 3
HI 599 Independent Study 1-3
ID 240 Human-Centered Design 3
ID 492 Special Topics in Industrial Design 1-3
LAR 444 History of Landscape Architecture 3
LAR 542 Human Use of the Urban Landscape 3
REL 320 Religion in American History 3
REL 402 Early Christianity to the Time of Eusebius 3
REL 407 Islamic History to 1798 3
REL 408 Islam in the Modern World 3
REL 502 Early Christianity to the Time of Eusebius 3
REL 507 Islamic History to 1798 3
REL 508 Islam in the Modern World 3
WGS 447 Women in America: From Contact to the Civil War 3
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WGS 547 Women in America: From Contact to the Civil War 3
WGS 548 American Women in the Twentieth Century 3

Semester Sequence

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<td>GEP Humanities (p. 1423)</td>
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**Hours**

16

**Third Year**

**Fall Semester**

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<td>GEP Social Sciences (p. 1430)</td>
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**Hours**

14

**Spring Semester**

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**Hours**

13

**Summer**

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**Advised Electives**

**Hours**

6

**Fourth Year**

**Fall Semester**

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**Hours**

12

**Spring Semester**

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<td></td>
<td>GEP Additional Breadth (p. 1417)</td>
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**Hours**

12

**Total Hours**

120

1 Required in the first year of Design Studies.

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**Career Opportunities**

Career opportunities for graduates of the Department of Art and Design range from independent artist-designers to corporate level art-design directors. Graduates of this department are currently working in fields such as software design, multimedia, illustration, textile design, fashion and apparel design, art and design education, photography, filmmaking, special effects-digital, set design, exhibition design, museum education, public art and entrepreneurs.

**Design Studies (BA): Business Administration Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Arts in Design Studies is a non-studio based program that provides an interdisciplinary orientation to the history and theory of the design disciplines, material culture and design thinking. Design Studies focuses on the social, historical, technological and physical contexts in which design is produced. It presents the formative role of design in shaping human values and experiences.

Undergraduate students will be introduced to the breadth of the design disciplines expanding their awareness of design and the design process. Students can explore the range of career options in the fields of design through Design Studies concentrations in Non-Profits Studies, Business Administration. Individuals preparing for a graduate education in design theory and criticism, museum practice, business management, entrepreneurship or marketing in design may choose from courses suited to their unique objectives. Students who want more general education will develop an understanding of design and its intrinsic relationship to the broader culture.

Design Studies is:

- Open to students whose interests and talents in design are more general and/or cross-disciplinary than those in the specific student-based programs
- Broadly engaged in issues of material culture.
- Preparatory for later advanced study in the design professions
- A blend of aesthetic, cultural, historical, social, physical, technological, business and entrepreneurial knowledge
- Collaborative in providing the learning and background necessary for further study in archival and cultural preservation, museum practice, conversation, collections administration, costume and theatre design, criticism, research, and arts and nonprofits management

Design Studies is not a transitional program from which to transfer into one of the studio-based degree programs in the College of Design. Design Studies students who wish to change majors will need to apply for competing seats in the freshmen class of a studio-based program and are subject to the select admissions process that requires a portfolio review.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php).

**Plan Requirements**

Design Studies (BA), Business Administration Concentration: 117 Total Units
### Humanities Electives

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<td>African-American History Through the Civil War, 1619-1865</td>
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<td>African-American History Since 1865</td>
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<td>Ancient Mediterranean World</td>
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<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<tr>
<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>History and Archaeology of Ancient Latin America</td>
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<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>American History I</td>
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<td>Early American History</td>
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<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>Frauds and Mysteries of the Past</td>
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<td>Jewish History</td>
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<td>Cuba Today: Historical and Sociopolitical Perspectives</td>
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<td>Religion in American History</td>
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<td>Scientific Revolution and European Society, 1500-1800</td>
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<td>History of Common Law and Constitution</td>
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<td>Germany and the World Wars</td>
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<td>The World at War</td>
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<td>Spy vs. Spy: Cold War Intelligence History</td>
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<td>Empire, War, and Revolution in Russia</td>
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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.
Intermediate Foreign Language Electives

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<td>Intermediate Arabic I</td>
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<td>FLA 202</td>
<td>Intermediate Arabic II</td>
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<td>Intermediate Arabic Conversation I</td>
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<td>Advanced Intermediate Arabic I</td>
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<td>FLA 318</td>
<td>Egyptian Culture through Film</td>
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<td>FLA 320</td>
<td>Media Arabic</td>
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<td>French Phonetics and Pronunciation</td>
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<td>German Oral and Written Expression</td>
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<td>New German Cinema and Beyond</td>
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<td>German Lyric Poetry</td>
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<td>Cultural Artifacts in the German-Speaking Countries</td>
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<td>Green Germany: Nature and Environment in German Speaking Cultures</td>
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<td>Internship in Germany, Austria, or German-Speaking Switzerland</td>
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<td>Early Modern Japanese Literature in Translation</td>
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<td>Contemporary Culture in Japan</td>
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### Application Unit Electives

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<td>Sculpture I</td>
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### History Unit Electives

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### Modern Europe

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### History of South Africa

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<td>African-American History Since 1865</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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HI 210  Modern Europe 1815-Present  3
HI 214  History and Archaeology of Ancient Latin America  3
HI 215  Latin America to 1826  3
HI 216  Latin America Since 1826  3
HI 217  Caribbean History  3
HI 221  British History to 1688  3
HI 222  History of British Cultures and Societies From 1688  3
HI 232  The World from 1200 to 1750  3
HI 233  The World Since 1750  3
HI 240  Introduction to Visual Culture  3
HI 251  American History I  3
HI 252  American History II  3
HI 253  Early American History  3
HI 254  Modern American History  3
HI 263  Asian Civilizations to 1800  3
HI 264  Modern Asia: 1800 to Present  3
HI 270  Modern Middle East  3
HI 275  Introduction to History of South and East Africa  3
HI 276  Introduction to History of West Africa  3
HI 305  Frauds and Mysteries of the Past  3
HI 307  Jewish History  3
HI 317  Cuba Today: Historical and Sociopolitical Perspectives  3
HI 320  Religion in American History  3
HI 321  Scientific Revolution and European Society, 1500-1800  3
HI 324  History of Common Law and Constitution  3
HI 332  Germany and the World Wars  3
HI 335  The World at War  3
HI 337  Spy vs. Spy: Cold War Intelligence History  3
HI 338  Empire, War, and Revolution in Russia  3
HI 340  History of Agriculture  3
HI 345  American Popular Culture  3
HI 346  The Civil War Era in Popular Culture  3
HI 350  American Military History  3
HI 351  U.S. Naval History  3
HI 354  The Rise of the American Empire  3
HI 360  U.S. Agricultural History  3
HI 364  History of North Carolina  3
HI 365  The American West  3
HI 366  Native American History  3
HI 370  Modern Egypt  3
HI 371  Modern Japan, 1850 to Present  3
HI 372  African-American History Through the Civil War, 1619-1865  3
HI 373  African-American History Since 1865  3
HI 374  Visual Culture of Modern South Asia  3
HI 380  History of Nonprofits, Philanthropy, and Social Change  3
HI 381  NGO Nonprofits in a Global Context  3
HI 385  Introduction to Public History  3
HI 403  Ancient Greek Civilization  3
HI 407  Islamic History to 1798  3
HI 408  Islam in the Modern World  3
HI 409  The High Middle Ages  3
HI 410  Italian Renaissance  3
HI 411  Colonial and Revolutionary U.S  3
HI 445  Early American Borderlands  3
HI 446  Topics in Civil War and Reconstruction  3
HI 447  Women in America: From Contact to the Civil War  3
HI 448  American Women in the Twentieth Century  3
HI 452  Recent America  3
HI 453  United States-Latin American Relations Since 1823  3
HI 454  History of U.S. Foreign Relations, 1900-Present  3
HI 503  Ancient Greek Civilization  3
HI 509  The High Middle Ages  3
HI 541  Colonial and Revolutionary U.S  3
HI 546  Topics in Civil War and Reconstruction  3
HI 547  Women in America: From Contact to the Civil War  3
HI 548  American Women in the Twentieth Century  3
HI 552  Recent America  3
HI 553  United States-Latin American Relations Since 1823  3
REL 320  Religion in American History  3
REL 407  Islamic History to 1798  3
REL 408  Islam in the Modern World  3
WGS 447  Women in America: From Contact to the Civil War  3
WGS 448  American Women in the Twentieth Century  3
WGS 547  Women in America: From Contact to the Civil War  3
WGS 548  American Women in the Twentieth Century  3

**Humanities History List 2**

AFS 455  History of the Civil Rights Movement  3
AFS 475  History of the Republic of South Africa  3
AFS 476  Leadership in Modern Africa  3
AFS 479  Africa (sub-Saharan) in the Twentieth Century  3
AFS 555  History of the Civil Rights Movement  3
AFS 575  History of the Republic of South Africa  3
AFS 576  Leadership in Modern Africa  3
AFS 579  Africa (sub-Saharan) in the Twentieth Century  3
HI 455  History of the Civil Rights Movement  3
HI 459  The Early American Republic  3
HI 461  Civilization of the Old South  3
HI 462  Southern History since the Civil War  3
HI 475  History of the Republic of South Africa  3
HI 476  Leadership in Modern Africa  3
HI 478  Islam and Christianity in Sub-Saharan Africa  3
HI 479  Africa (sub-Saharan) in the Twentieth Century  3
HI 486  Science and Empire  3
HI 555  History of the Civil Rights Movement  3
HI 559  The Early American Republic  3
HI 561  Civilization of the Old South  3
HI 562  Southern History since the Civil War  3
HI 575  History of the Republic of South Africa  3
HI 576 Leadership in Modern Africa 3
HI 579 Africa (sub-Saharan) in the Twentieth Century 3
HI 586 Science and Empire 3

Business Administration Advised Electives

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<td>BUS 360</td>
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<td>BUS 370</td>
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Semester Sequence

This is a sample.

Course       Title                                      Hours
First Year    Fall Semester
ENG 101       Academic Writing and Research             4
Mathematical Sciences Elective                        3
D 100         Design Inquiry I: Methods and Processes (required in the first year) 3
Art History Survey Elective                           3
ADN 281       Drawing I                                 3

Spring Semester
GEP Health and Exercise Studies (p. 1422)              1
Mathematical Sciences Elective                         3
DS 100       Design in Culture and Context (required in the first year) 3
Art History Survey Elective                           3
COM 110       Public Speaking                           3
ADN 219       Digital Imaging I                         3

Second Year
Fall Semester
GEP Health and Exercise Studies (p. 1422)              1
GEP Social Sciences (p. 1430)                         3
DS 200       A Survey of Design Studies (required in the second year) 3
Select one of the following:                          3
ENG 214       Introduction to Editing                  3
ENG 316       Introduction to News and Article Writing  3
ENG 422       Writing Theory and the Writing Process    3
MIE 201       Introduction to Business Processes       3
Intermediate Foreign Language Elective                 3

Spring Semester
Intermediate Foreign Language Elective                 3
GEP Interdisciplinary Perspectives (p. 1426)           3
ACC 210       Concepts of Financial Reporting          3
GEP Humanities (p. 1423)                              3
Advised Design Studies Elective                        3

Third Year
Fall Semester
GEP Natural Sciences (p. 1429)                         3
EC 205       Fundamentals of Economics                 3
ADN 418       Contemporary Issues in Art and Design    3
GEP Humanities (p. 1423)                              3

Spring Semester
GEP Natural Sciences (p. 1429)                         4
Advised Design Studies Elective                        3
Business Administration Advised Elective               3
Design History Elective                                3

Summer
Select one of the following:                           6
ADN 490       Art and Design International Studio      6
Advised Electives                                      6

Fourth Year
Fall Semester
DS 481       Design Studies Senior Research Seminar    3
Business Administration Advised Elective               3
Design History Elective                                3
Advised Design Studies Elective                        3
Free Elective                                          2

Spring Semester
DS 483       Design Studies Capstone Research Paper    3
Business Administration Advised Elective               3
Advised Design Studies Elective                        3

Career Opportunities

Career opportunities for graduates of the Department of Art and Design range from independent artist-designers to corporate level art-design directors. Graduates of this department are currently working in fields such as software design, multimedia, illustration, textile design, fashion and apparel design, art and design education, photography, filmmaking, special effects-digital, set design, exhibition design, museum education, public art and entrepreneurs.

Design Studies (BA): Nonprofit Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Bachelor of Arts in Design Studies is a non-studio based program that provides an interdisciplinary orientation to the history and theory of the design disciplines, material culture and design thinking. Design Studies focuses on the social, historical, technological and physical contexts in which design is produced. It presents the formative role of design in shaping human values and experiences.

Undergraduate students will be introduced to the breadth of the design disciplines expanding their awareness of design and the design process. Students can explore the range of career options in the fields of design through Design Studies concentrations in Non-Profits Studies, Business Administration. Individuals preparing for a graduate education in design theory and criticism, museum practice, business management, entrepreneurship or marketing in design may choose from courses suited to their unique objectives. Students who want more general education will develop an understanding of design and its intrinsic relationship to the broader culture.

Design Studies is:

• Open to students whose interests and talents in design are more general and/or cross-disciplinary than those in the specific student-based programs
• Broadly engaged in issues of material culture.
• Preparatory for later advanced study in the design professions
• A blend of aesthetic, cultural, historical, social, physical, technological, business and entrepreneurial knowledge
• Collaborative in providing the learning and background necessary for further study in archival and cultural preservation, museum practice, conversation, collections administration, costume and theatre design, criticism, research, and arts and nonprofits management

Design Studies is not a transitional program from which to transfer into one of the studio-based degree programs in the College of Design. Design Studies students who wish to change majors will need to apply for competing seats in the freshmen class of a studio-based program and are subject to the select admissions process that requires a portfolio review.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php).

Plan Requirements

Design Studies (BA): Nonprofit Studies Concentration: 120 Total Units

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Humanities Electives

- HI 332 Germany and the World Wars 3
- HI 335 The World at War 3
- HI 337 Spy vs. Spy: Cold War Intelligence History 3
- HI 338 Empire, War, and Revolution in Russia 3
- HI 340 History of Agriculture 3
- HI 345 American Popular Culture 3
- HI 346 The Civil War Era in Popular Culture 3
- HI 350 American Military History 3
- HI 351 U.S. Naval History 3
- HI 354 The Rise of the American Empire 3
- HI 360 U.S. Agricultural History 3
- HI 364 History of North Carolina 3
- HI 365 The American West 3
- HI 366 Native American History 3
- HI 370 Modern Egypt 3
- HI 371 Modern Japan, 1850 to Present 3
- HI 372 African-American History Since 1865 3
- HI 373 African-American History Through the Civil War, 1619-1865 3
- HI 374 Visual Culture of Modern South Asia 3
- HI 380 History of Nonprofits, Philanthropy, and Social Change 3
- HI 381 NGO Nonprofits in a Global Context 3
- HI 385 Introduction to Public History 3
- HI 403 Ancient Greek Civilization 3
- HI 407 Islamic History to 1798 3
- HI 408 Islam in the Modern World 3
- HI 409 The High Middle Ages 3
- HI 410 Italian Renaissance 3
- HI 441 Colonial and Revolutionary U.S 3
- HI 445 Early American Borderlands 3
- HI 446 Topics in Civil War and Reconstruction 3
- HI 447 Women in America: From Contact to the Civil War 3
- HI 448 American Women in the Twentieth Century 3
- HI 449 Recent America 3
- HI 451 United States-Latin American Relations Since 1823 3
- HI 452 American Popular Culture 3
- HI 453 History of U.S. Foreign Relations, 1900-Present 3
- HI 454 History of Agriculture 3
- HI 455 The High Middle Ages 3
- HI 456 Topics in Civil War and Reconstruction 3
- HI 457 Women in America: From Contact to the Civil War 3
- HI 458 American Women in the Twentieth Century 3
- HI 459 Recent America 3
- HI 460 United States-Latin American Relations Since 1823 3

Free Electives

Free Electives (12 Hr S/U Lmt) 1

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
**Humanities HI 2**

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**Intermediate Foreign Language Electives**

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<td>HI 479</td>
<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<td>HI 486</td>
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<td>HI 555</td>
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<td>HI 559</td>
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### Application, Theory, or History Unit Electives

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### Humanities History List 2

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<tr>
<td>AFS 479</td>
<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<tr>
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### History Unit

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ARC 241  History of World Architecture  3
ARC 242  History of Western Architecture  3
ARC 441  History of Contemporary Architecture  3
D 292  Special Topics in Design  1-3
D 492  Special Topics in Design  1-6
D 592  Special Topics in Design  1-6
GD 203  History of Graphic Design  3
HI 591  Museum Studies  3
ID 244  History of Industrial Design  3
ID 492  Special Topics in Industrial Design  1-3
LAR 444  History of Landscape Architecture  3

**Humanities History List 1**

AFS 275  Introduction to History of South and East Africa  3
AFS 276  Introduction to History of West Africa  3
AFS 372  African-American History Through the Civil War, 1619-1865  3
AFS 373  African-American History Since 1865  3
HA 240  Introduction to Visual Culture  3
HI 207  Ancient Mediterranean World  3
HI 208  The Middle Ages  3
HI 209  From Renaissance to Revolution: The Origins of Modern Europe  3
HI 210  Modern Europe 1815-Present  3
HI 214  History and Archaeology of Ancient Latin America  3
HI 215  Latin America to 1826  3
HI 216  Latin America Since 1826  3
HI 217  Caribbean History  3
HI 221  British History to 1688  3
HI 222  History of British Cultures and Societies From 1688  3
HI 232  The World from 1200 to 1750  3
HI 233  The World Since 1750  3
HI 240  Introduction to Visual Culture  3
HI 251  American History I  3
HI 252  American History II  3
HI 253  Early American History  3
HI 254  Modern American History  3
HI 263  Asian Civilizations to 1800  3
HI 264  Modern Asia: 1800 to Present  3
HI 270  Modern Middle East  3
HI 275  Introduction to History of South and East Africa  3
HI 276  Introduction to History of West Africa  3
HI 305  Frauds and Mysteries of the Past  3
HI 307  Jewish History  3
HI 317  Cuba Today: Historical and Sociopolitical Perspectives  3
HI 320  Religion in American History  3
HI 321  Scientific Revolution and European Society, 1500-1800  3
HI 324  History of Common Law and Constitution  3
HI 332  Germany and the World Wars  3
HI 335  The World at War  3
HI 337  Spy vs. Spy: Cold War Intelligence History  3
HI 338  Empire, War, and Revolution in Russia  3
HI 340  History of Agriculture  3
HI 345  American Popular Culture  3
HI 346  The Civil War Era in Popular Culture  3
HI 350  American Military History  3
HI 351  U.S. Naval History  3
HI 354  The Rise of the American Empire  3
HI 360  U.S. Agricultural History  3
HI 364  History of North Carolina  3
HI 365  The American West  3
HI 366  Native American History  3
HI 370  Modern Egypt  3
HI 371  Modern Japan, 1850 to Present  3
HI 372  African-American History Through the Civil War, 1619-1865  3
HI 373  African-American History Since 1865  3
HI 374  Visual Culture of Modern South Asia  3
HI 380  History of Nonprofits, Philanthropy, and Social Change  3
HI 381  NGO Nonprofits in a Global Context  3
HI 385  Introduction to Public History  3
HI 403  Ancient Greek Civilization  3
HI 407  Islamic History to 1798  3
HI 408  Islam in the Modern World  3
HI 409  The High Middle Ages  3
HI 410  Italian Renaissance  3
HI 441  Colonial and Revolutionary U.S  3
HI 445  Early American Borderlands  3
HI 446  Topics in Civil War and Reconstruction  3
HI 447  Women in America: From Contact to the Civil War  3
HI 448  American Women in the Twentieth Century  3
HI 452  Recent America  3
HI 453  United States-Latin American Relations Since 1823  3
HI 454  History of U.S. Foreign Relations, 1900-Present  3
HI 503  Ancient Greek Civilization  3
HI 509  The High Middle Ages  3
HI 541  Colonial and Revolutionary U.S  3
HI 545  Early American Borderlands  3
HI 546  Topics in Civil War and Reconstruction  3
HI 547  Women in America: From Contact to the Civil War  3
HI 548  American Women in the Twentieth Century  3
HI 552  Recent America  3
HI 553  United States-Latin American Relations Since 1823  3
REL 320  Religion in American History  3
REL 407  Islamic History to 1798  3
REL 408  Islam in the Modern World  3
WGS 447  Women in America: From Contact to the Civil War  3
WGS 448  American Women in the Twentieth Century  3
WGS 547  Women in America: From Contact to the Civil War  3
WGS 548  American Women in the Twentieth Century  3

**Humanities History List 2**
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<td>AFS 476</td>
<td>Leadership in Modern Africa</td>
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<tr>
<td>AFS 479</td>
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<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<td>The Early American Republic</td>
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<td>HI 461</td>
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<td>Islam and Christianity in Sub-Saharan Africa</td>
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### Nonprofit Studies Electives

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<td>COM 456</td>
<td>Organizational Communication</td>
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<td>NPS 395</td>
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<td>PHI 420</td>
<td>Global Justice</td>
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<td>PS 202</td>
<td>State and Local Government</td>
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<td>PS 310</td>
<td>Public Policy</td>
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<td>PSY 753</td>
<td>Principles and Practice Of Ecological/Community Psychology</td>
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<td>SOC 311</td>
<td>Community Relationships</td>
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<td>SOC 410</td>
<td>Sociology of Organizations</td>
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<td>SW 201</td>
<td>Introduction to Social Work</td>
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<td>Social Welfare Policy: Analysis and Advocacy</td>
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### Nonprofit Studies Internship Electives

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<tbody>
<tr>
<td>ADN 494</td>
<td>Internship in Art + Design</td>
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<tr>
<td>COM 496</td>
<td>Communication Internship</td>
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<td>DS 494</td>
<td>Design Studies Internship</td>
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<tr>
<td>ENG 350</td>
<td>Professional Internships</td>
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<td>PS 391</td>
<td>Internship in Political Science</td>
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<td>PSY 495</td>
<td>Community-Based Applied Psychology</td>
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<td>SOC 413</td>
<td>Criminal Justice Field Work</td>
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<td>SW 490</td>
<td>Field Seminar</td>
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### Semester Sequence

This is a sample.

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#### Hours 16

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<td>DS 200</td>
<td>A Survey of Design Studies (required in the second year)</td>
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<td>ENG 214</td>
<td>Introduction to Editing</td>
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<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
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Free Elective

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**Spring Semester**

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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Humanities (p. 1423)</td>
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Summer

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**Fourth Year**

**Fall Semester**

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**Spring Semester**

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<td>NPS 498 Capstone Seminar in Nonprofit Studies</td>
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**Total Hours**

| 130 |

**Program Objectives**

- To provide a general orientation to the practice and theory of design for students whose primary study and employment will be in other disciplines
- To clarify the role design plays in society
- To create informed consumers who are able to make intelligent decisions about communication, products, and environments in work and in their personal lives

**Admissions**

Any student seeking this minor should contact Dr. Chandra Cox, for a registration form.

**Certification**

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Students may turn in either their original Design Minor Certification, or complete a new one for signatures. This should be turned in no later than during the registration period for the student’s final semester at NC State.

**Contact Person**

Kathleen Rieder
215B Brooks Hall
(919) 515-2079
Email: kathleen_rieder@ncsu.edu

**SIS Code: 12DSM**

**Plan Requirements**

- The minor in Design Studies consists of 15 credit hours of study selected from the following courses.
- A grade of ‘C’ or better in all courses credited to the minor

<table>
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<tr>
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<td>Structures and Materials</td>
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<td>ARC 241</td>
<td>History of World Architecture</td>
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<tr>
<td>ARC 242</td>
<td>History of Western Architecture</td>
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<tr>
<td>ADN 281</td>
<td>Drawing I</td>
<td></td>
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<tr>
<td>ADN 414</td>
<td>Color and Light</td>
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<td>Design History for Engineers and Scientists</td>
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<td>Contemporary Manufacturing Processes I</td>
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<td>Introduction to Environment and Behavior for Designers</td>
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<tr>
<td>LAR 444</td>
<td>History of Landscape Architecture</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours**

| 15  |

**Note:** Other courses offered by the College of Design may be substituted with permission of the Minor Advisor.

---

**Career Opportunities**

Career opportunities for graduates of the Department of Art and Design range from independent artist-designers to corporate level art-design directors. Graduates of this department are currently working in fields such as software design, multimedia, illustration, textile design, fashion and apparel design, art and design education, photography, filmmaking, special effects-digital, set design, exhibition design, museum education, public art and entrepreneurs.

**Design Studies (Minor)**

**No New Admissions**

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/)

The College of Design offers an undergraduate minor in Design Studies, available to university students in majors other than design. Academic Majors who will benefit from this minor: Any undergraduate student in the university who is not majoring in a design discipline.
Department of Graphic Design and Industrial Design

Graphic design is the process of bringing meaningful visual form to communication. Graphic designers translate communication goals through printed, environmental, and electronic presentations of information. Graphic designers use words and images to express messages that inform, persuade, and incite people to action. Graphic designers are active in all aspects of communication design. For example, they design books, magazines and newspapers for the publishing industry. They also create printed materials such as logotypes, symbols, annual reports, newsletters, business forms, and other related literature for corporations, institutions, businesses, and governmental agencies. Graphic designers also design user experiences (UX), websites, computer interfaces, and motion graphics such as film titles and typographic treatments for video, as well as on-air graphics for television. Graphic designers are employed in a variety of settings, including graphic design offices, advertising agencies, communication businesses, as well as corporations, institutions, or governmental agencies as part of internal communications departments.

For more information about Graphic Design, including contact information, visit the department (http://design.ncsu.edu/academics/graphic-design/).

The Industrial Design program is a part of the Department of Graphic and Industrial Design. The Industrial Design program awards a Bachelor of Industrial Design degree. The pedagogical core of the department aims to reinforce the foundational principles of design theory as applied to traditional and advanced technologies, i.e. new media, materials, and production techniques. Our curriculum addresses broad cultural, technological, and societal considerations and promotes in our graduates the ability to meet the challenges of technological complexity through collaborative design. We emphasize the application of creative thinking and problem solving to design projects ranging from single to mass-produced artifacts. The areas of application span the range from industrial design to interactive multimedia and service design. The program is recognized by the Industrial Designers Society of America (IDSA) and accredited by the National Association of Schools of Art and Design (NASAD).

For more information about Industrial Design, including contact information, visit the department (http://design.ncsu.edu/academics/industrial-design-programs/).

Graphic Design (Bachelor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Graphic Design program is a part of the Department of Graphic and Industrial Design. The Graphic Design program awards a Bachelor of Graphic Design, a professional degree, recognized by the American Institute of Graphic Arts (AIGA) and is accredited by the National Association of Schools of Art and Design (NASAD). The program includes the study of visual, theoretical, historical, and technical aspects of the discipline. The curriculum provides comprehensive experiences in the analysis of communication problems, the development of creative solutions to those problems, and the implementation and evaluation of those solutions. Required courses in typography explore the role of words and language in graphic communication, while courses in imaging provide students with experiences in a range of photographic, videographic, and computer media. Instruction in computer software programs is fully integrated in design courses, and is not taught as a separate activity. In their studio coursework, graphic design majors prepare for careers in the field through the execution of demonstration projects of varying complexity and scale.

Plan Requirements

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<tr>
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<td>ENG 101</td>
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<td>GD 217</td>
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<td>GD 317</td>
<td>Typographic Language, Writing, and Reading ¹</td>
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<td>GD 203</td>
<td>History of Graphic Design ¹</td>
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<td>GD 417</td>
<td>Information and Publishing Design Systems ¹</td>
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<tr>
<td></td>
<td>Design History Elective (p. 406)</td>
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<tr>
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<td>Design, Context, and Experience ¹</td>
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<td>Designing for Settings, People, and Use ¹</td>
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<td>GD 210</td>
<td>Image and Tech Tinkering ¹</td>
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<td>GD 301</td>
<td>Branding, Interaction, and Service Design ¹</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.
### Design History Electives

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<td>ARC 241</td>
<td>History of World Architecture</td>
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<td>ARC 242</td>
<td>History of Western Architecture</td>
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<td>HA 201</td>
<td>History of Art from Caves to the Renaissance</td>
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<td>HA 202</td>
<td>History of Art From the Renaissance Through the 20th Century</td>
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<td>History of American Art</td>
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### Design Electives

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<th>Hours</th>
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<tr>
<td>ADN 212</td>
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<tr>
<td>ADN 219</td>
<td>Digital Imaging I</td>
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</tr>
<tr>
<td>ADN 272</td>
<td>Introduction to Printing and Surface Design</td>
<td>3</td>
</tr>
<tr>
<td>ADN 273</td>
<td>Fibers Materials and Processes</td>
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<td>ADN 281</td>
<td>Drawing I</td>
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<td>ADN 312</td>
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<td>ADN 319</td>
<td>Animation I</td>
<td>3</td>
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<tr>
<td>ADN 384</td>
<td>Painting I</td>
<td>3</td>
</tr>
<tr>
<td>ADN 386</td>
<td>Sculpture I</td>
<td>3</td>
</tr>
<tr>
<td>ADN 414</td>
<td>Color and Light</td>
<td>3</td>
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<td>ADN 419</td>
<td>Creative Technology Studio I</td>
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<td>ADN 472</td>
<td>Advanced Surface Design</td>
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<tr>
<td>ADN 481</td>
<td>Drawing II</td>
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<td>ADN 486</td>
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<tr>
<td>ARC 162</td>
<td>An Introduction to Architecture</td>
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<td>GD 492</td>
<td>Special Topics in Graphic Design</td>
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<td>Internship in Graphic Design</td>
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<td>Independent Study in Graphic Design</td>
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<td>ID 292</td>
<td>Special Topics in Industrial Design</td>
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<td>LAR 292</td>
<td>Special Topics in Landscape Architecture</td>
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<td>Special Topics in Landscape Architecture</td>
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### Advanced Studio Electives

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<td>ADN 204</td>
<td>Art + Design Sophomore Studio Spring</td>
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<td>ADN 460</td>
<td>Creative Technology Studio II</td>
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<td>ADN 470</td>
<td>Fibers and Surface Design Studio</td>
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<td>ADN 480</td>
<td>Intermediate Studio</td>
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<tr>
<td>ARC 401</td>
<td>Architectural Design: Urban</td>
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<td>GD 400</td>
<td>Advanced Graphic Design Studio</td>
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<tr>
<td>GD 490</td>
<td>Graphic Design International Studio</td>
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<tr>
<td>ID 401</td>
<td>Advanced Industrial Design Studio I</td>
<td>6</td>
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<tr>
<td>ID 490</td>
<td>Industrial Design International Studio</td>
<td>6</td>
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<tr>
<td>LAR 200</td>
<td>Landscape Architecture Introductory Studio</td>
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<td>LAR 400</td>
<td>Landscape Architecture Studio</td>
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### Mathematical Sciences Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
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<td>GC 320</td>
<td>3D Spatial Relations</td>
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<tr>
<td>HON 291</td>
<td>Honors Special Topics-Mathematics</td>
<td>3</td>
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<td>LOG 201</td>
<td>Logic</td>
<td>3</td>
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<td>LOG 335</td>
<td>Symbolic Logic</td>
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<tr>
<td>MA 335</td>
<td>Symbolic Logic</td>
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<tr>
<td>PHI 250</td>
<td>Thinking Logically</td>
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### Semester Sequence

This is a sample.

#### First Year

**Fall Semester**
- D 100  Design Inquiry I: Methods and Processes  3
- D 104  First Year Studio I  6
- ENG 101  Academic Writing and Research  4
- Mathematical Sciences Elective  3
- Semester Hours  16

**Spring Semester**
- GD 203  History of Graphic Design  3
- GD 210  Image and Tech Tinkering  6
- Mathematical Sciences Elective  3
- GEP Humanities (p. 1423)  3

**Total Hours**  16

#### Second Year

**Fall Semester**
- GD 201  Design, Context, and Experience  6
- GD 217  Typography and Technology  3
- GD 303  Graphic Design Theory and Practice  3
- GEP Social Sciences (p. 1430)  3
- Semester Hours  15

**Spring Semester**
- GD 202  Designing for Settings, People, and Use  6
- GEP Social Sciences (p. 1430)  3
- GD 317  Typographic Language, Writing, and Reading  3

**Total Hours**  15

#### Third Year

**Fall Semester**
- GD 301  Branding, Interaction, and Service Design  6
- GEP Health and Exercise Studies (p. 1422)  1
- GD 417  Information and Publishing Design Systems  3
- GEP Natural Sciences (p. 1429)  4
- Semester Hours  14

**Spring Semester**
- GD 400  Advanced Graphic Design Studio  6
- Design History Elective  3

**Total Hours**  14
Design Elective 3
GEP Natural Sciences (p. 1429) 3

**Fourth Year**

**Fall Semester**

Advanced Studio Electives 6
GD 401 Graphic Design Practicum 3
Design Elective 3
GEP Additional Breadth (p. 1417) 3

Hours 15

**Spring Semester**

Advanced Studio Electives 6
Free Electives 8

Hours 14

Total Hours 120

- Spring Semester of Junior Year or Fall Semester of Senior Year coursework may be taken at the Prague Institute or other approved international program to fulfill the department’s International Experience Requirement (observing a six credit minimum workload). Summer coursework in industrial design or other College of Design major (observing a rising Junior or above standing in home major) may also fulfill the International Experience Requirement (also observing a six credit minimum workload).

**Industrial Design (Bachelor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The Department of Graphic and Industrial Design offers a four-year bachelor degree and two-year or more master’s degrees. Industrial Design is concerned with all human aspects of products/systems and their relationship to people. The industrial designer is responsible for product safety, aesthetics, maintenance, and cost. Industrial designers deal with consumer and industrial products. In order to achieve these ends, designers must be involved in four major design and research areas: human behavior, human-machine relationships, the environment, and the product itself. In addition, the designer’s responsibility extends into sustainability product liability and cross-cultural issues.

Areas of study in the Bachelor of Industrial Design include:

- furniture
- textiles, house wares
- appliances
- transportation
- tools
- farm equipment
- medical instruments
- electronics
- human-computer interfaces
- recreational support equipment

The goal of the Industrial Design curriculum is to teach the design and development of products or product systems and their relationship to human beings and the environment.

Graduates of the Bachelor of Industrial Design program have career opportunities in three general types of practice: corporate design offices in manufacturing companies, independent consulting offices, and governmental agencies.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php).

**Plan Requirements**

**Industrial Design (Bachelor): 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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</table>

**Core Requirements**

| ID 110  | Introduction to Digital Techniques (p. 1) | 3     |
| ID 210  | Intermediate Digital Techniques (p. 1)    | 3     |
| ID 310  | Advanced Digital Techniques (p. 1)        | 3     |
| ID 216  | Visualization I (p. 1)                    | 3     |
| ID 316  | Visualization II (p. 1)                   | 3     |
| ID 255  | Contemporary Manufacturing Processes (p. 1)| 3     |
| ID 244  | History of Industrial Design (p. 1)       | 3     |
| ID 240  | Human-Centered Design (p. 1)              | 3     |
| ID 340  | Research Methods in Industrial Design (p. 1)| 3     |
| ID 440  | Experience Design for ID (p. 1)           | 3     |
| Design Electives (p. 408) (p. 1) | 3 |

**Studies**

| ID 104  | First Year Studio I                        | 6     |
| ID 102  | Basic Industrial Design Studio (p. 1)      | 6     |
| ID 201  | Industrial Design Studio I (p. 1)          | 6     |
| ID 202  | Industrial Design Studio II (p. 1)         | 6     |
| ID 301  | Industrial Design Studio III (p. 1)        | 6     |
| ID 302  | Industrial Design Studio IV (p. 1)         | 6     |
| ID 401  | Advanced Industrial Design Studio I (p. 1)| 6     |
| ID 402  | Advanced Industrial Design Studio II (p. 1)| 6     |

**International Experience**

International Experience (S Allowed, Verify requirement) 2

0

**General Education Program (GEP) Courses**

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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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</tr>
<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

Free Electives (12 Hr S/U Lmt) 5

Total Hours 120
A grade of C- or higher is required.

Students should consult their academic advisors to determine how to complete this requirement.

Students should consult their academic advisors to determine which courses fill this requirement.

### Design Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
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<td>Digital Imaging I</td>
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<td>ADN 272</td>
<td>Introduction to Printing and Surface Design</td>
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<td>ADN 273</td>
<td>Fibers Materials and Processes</td>
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<td>An Introduction to Architecture</td>
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<td>Special Topics in Graphic Design</td>
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<td>Imaging for Graphic Design IV</td>
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<td>Type IV</td>
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<td>ID 256</td>
<td>Contemporary Manufacturing Processes II</td>
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<td>ID 262</td>
<td>Professional Practice in Industrial Design</td>
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<tr>
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<td>Independent Study in Industrial Design</td>
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### Notes

1. Students who major in Industrial Design may elect one (1) six-credit-hour studio outside the major to fulfill one (1) 200 or 300 level studio requirement.
2. Declaration of intent to enroll in studios other than Industrial Design during any semester must be made during the pre-registration period prior to enrollment. No more than one (1) six credit studio may be taken in any given semester.

### Semester Sequence

This is a sample.

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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<td>ID 244</td>
<td>History of Industrial Design</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
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<td>13</td>
</tr>
</tbody>
</table>

### Spring Semester

| ID 102                | Basic Industrial Design Studio             | 6     |
| ID 210                | Intermediate Digital Techniques            | 3     |
| ID 216                | Visualization I                            | 3     |
| ENG 101               | Academic Writing and Research              | 4     |
| **Total Hours**       |                                            | 16    |

### Second Year

| **Fall Semester**     |                                            |       |
| ID 201                | Industrial Design Studio I                 | 6     |
| ID 310                | Advanced Digital Techniques                | 3     |
| ID 316                | Visualization II                           | 3     |
| GEP Social Sciences (p. 1430) |                                 | 3     |
| **Total Hours**       |                                            | 15    |

| **Spring Semester**   |                                            |       |
| ID 202                | Industrial Design Studio II                | 6     |
| ID 240                | Human-Centered Design                      | 3     |
| GEP Mathematical Sciences (p. 1428) |                                | 3     |
| ID 255                | Contemporary Manufacturing Processes I      | 3     |
| **Total Hours**       |                                            | 15    |

### Third Year

| **Fall Semester**     |                                            |       |
| ID 301                | Industrial Design Studio III               | 6     |
| ID 340                | Research Methods in Industrial Design      | 3     |
| ID 256                | Contemporary Manufacturing Processes II     | 3     |
| GEP Humanities (p. 1423) |                                       | 3     |
| **Total Hours**       |                                            | 15    |

| **Spring Semester**   |                                            |       |
| ID 302                | Industrial Design Studio IV                | 6     |
| ID 440                | Experience Design for ID                   | 3     |
| GEP Natural Sciences (p. 1429) |                                        | 3     |
| GEP Mathematical Sciences (p. 1428) |                                | 3     |
| **Total Hours**       |                                            | 15    |

### Fourth Year

| **Fall Semester**     |                                            |       |
| ID 401                | Advanced Industrial Design Studio I        | 6     |
| Design Elective       |                                            | 2     |
| Free Elective         |                                            | 3     |
| GEP Natural Sciences (p. 1429) |                                        | 4     |
| **Total Hours**       |                                            | 15    |

| **Spring Semester**   |                                            |       |
| ID 402                | Advanced Industrial Design Studio II       | 6     |
| Free Elective         |                                            | 3     |
| GEP Social Sciences (p. 1430) |                                        | 3     |
| GEP Additional Breadth (p. 1417) |                                | 3     |
| GEP Health and Exercise Studies (p. 1422) |                    | 1     |
| **Total Hours**       |                                            | 16    |

### Career Opportunities

Career opportunities for graduates of the Department of Graphic and Industrial Design span the range from industrial design to virtual design. Graduates of this department are currently working in fields such as
product development, furniture design, recreational product design, toy
design, exhibition design, textile design, fashion design, photography, film
making, special effects, set design, ergonomics and human factors.

Department of Landscape Architecture

Landscape architecture is a multi-faceted profession dedicated to the
welfare of the physical environment and the living communities of the
earth. It is a diverse and growing design profession that combines
art, science, engineering, and technology. Landscape Architecture at
the College of Design is especially concerned with the stewardship,
restoration, and regeneration of the natural and cultural environments in
urban, rural, and wilderness settings.

For more information about this department, including contact
information, visit the department (http://design.ncsu.edu/academics/
landscape-architecture/).

Faculty

Head
Meg Calkins

Director of Graduate Program
Carla Delcambre

Professors
K. Boone
G. Bressler
M. Calkins
M.E. Deming
A. Fox
M. Hoversten
R. Moore
A. Rice
G. Smith

Associate Professor
N. Cosco
C. Delcambre
F. Magallanes
J. Sherk

Assistant Professor
C. Pasalar

Teaching Assistant Professor
R. Layton
R. Swink

Assistant Professor of the Practice
D.A. Howe
T. Klondike
E. McCoy
B. Monette
J. Turner

Plans
- Landscape Architecture (Minor) (p. 409)

Landscape Architecture (Minor)

To see more about what you will learn in this program, visit the Learning
Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!

The Minor in Landscape Architecture will provide a basic understanding
of the nature of the profession of Landscape Architecture. Knowledge of
Landscape Architecture history and theory provides a useful addition to a
major in any of the University disciplines.

The Minor in Landscape Architecture is designed to:
- Provide a general background in the discipline with regard to
  landscape architecture research, development and design for
  students, whose primary professional practice will be in another
discipline.
- Clarify the role of the profession of Landscape Architecture.
- Define how the profession of Landscape Architecture and all related
  professional disciplines contribute to the successful practice of
design.

Admissions

Entrance to the minor is by application, grade review and permission of
the Department Chair. A GPA of 2.75 is required. Contact the Chair of
the Department of Landscape Architecture (listed below) or the College
of Design Scheduling Officer, Pam Christie-Tabron (200 Brooks Hall,
919.515.8308) for the application.

Certification

The minor must be completed no later than the semester in which the
student expects to graduate from his or her degree program. Paperwork
for certification can be found in 223 Brooks Hall and should be completed
during the registration period of the student’s final semester at NC State.

Contact Person

Meg Calkins, FASLA, Department Head
Department of Landscape Architecture
215D Brooks Hall
919.515.8342
Plan Requirements

- Completion of 15 credit hours are required.
- A letter grade of 'C-' or better will be required for credit in all courses in the minor program.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>LAR 444</td>
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<td>LAR 520</td>
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<td>LAR 528</td>
<td>Landscape Architecture Construction Materials and Methods</td>
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<td>LAR 534</td>
<td>Landscape Architecture Theory and Criticism</td>
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<td>LAR 582</td>
<td>Special Topics In Landscape Architecture 3</td>
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<td>LAR 517</td>
<td>GIS Applications in Landscape Architecture and Environmental Planning</td>
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<td>LAR 514</td>
<td>Landscape Architecture Digital Design Media 2</td>
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<td>Landscape Architecture Introduction Design Studio</td>
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<td>LAR 543</td>
<td>Landscape Performance and Metrics</td>
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<tr>
<td>LAR 545</td>
<td>City Planning and Design - Building Great Communities</td>
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<td>LAR 546</td>
<td>The Landscape Imperative</td>
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<td>LAR 550</td>
<td>Landscape Architecture Professional Practice</td>
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<td>Special Topics In Landscape Architecture 4</td>
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<td>LAR 502</td>
<td>Site Design and Environmental Planning Studio</td>
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<td>Summer Semester LAR courses</td>
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<td>LAR 523</td>
<td>Landscape Architecture Plant Identification</td>
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<td>LAR 524</td>
<td>Planting Design Applications in Landscape Architecture</td>
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<td>LAR 582</td>
<td>Special Topics In Landscape Architecture 5</td>
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<td>For students in the School of Architecture only:</td>
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<tr>
<td>LAR 502</td>
<td>Site Design and Environmental Planning Studio 2</td>
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<tr>
<td>LAR 506</td>
<td>Landscape Architecture Design + Build Studio 2</td>
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<tr>
<td>LAR 507</td>
<td>Advanced Topics Studio in Landscape Architecture and Environmental Planning 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Hours</td>
<td>15</td>
</tr>
</tbody>
</table>

1 The courses listed are some of the courses that can contribute to achievement of the Landscape Architecture Minor. Courses offered each semester are subject to change. A listing of courses for each semester will be sent to students registered for the minor prior to open enrollment.

2 Select one (1) course in addition to 3 courses (9 credit hours) from the previously listed courses (For students in the School of Architecture only).

3 LAR 582 008 Survey of Natural Hazards and Disasters

4 Possible choices: LAR 582 001 History of Landscape Architecture, LAR 582 002 Disaster Resilient Policy, Engineering and Design, LAR 582 003 Environmental and Social Equity in Design

5 LAR 582 006 Environment and Behavior for Designers (online course)

School of Architecture

In a world of changing conditions- social, cultural, economic and technological- the central task of the architect remains to give meaningful form to the physical environment. These rapid changes, however, force today's architects to not only concern themselves with traditional design issues like shelter, appropriateness, comfort, and beauty, but also to address emerging concerns like sustainability, resilience, environmental conservation, rapidly expanding cities, adaptive uses and preservation of older buildings, providing built environments in a global market, and new means of producing architecture. The aesthetic revolution of the past few decades has also freed architects from the rigidity of earlier theory allowing for greater diversity and expressiveness in architectural design.

The School of Architecture has addressed the diversity of roles and responsibilities through its faculty and its curricula. Its distinguished faculty embrace a broad definition of the practice of architecture and is, therefore, free of a singular, dogmatic, or stylistic bias. This diversity is evident in the experience, areas of interest, national origins, and educational backgrounds of the faculty. The architecture curriculum balances mathematics, English, natural sciences, and humanities and integrates with architectural design studios and a rich selection of design support courses. The design studio- a working laboratory in which the student learns how to design buildings under the guidance of a professor- is central to the curriculum.

The undergraduate Bachelor of Environmental Design in Architecture is a pre-professional degree that stresses the education of the individual and serves as the foundation for advanced, professional study in the discipline. The first semester is spent on design fundamentals in a studio common to all students in the College of Design. Following this introductory experience students receive a broad introduction to architectural design, theory, history, technology, and design processes, while exploring educational opportunities within the university.

- Following the pre-professional program students may continue their studies in either of two professional programs: the one-year, post-graduate Bachelor of Architecture or two-year Master of Architecture program (see the Graduate Catalog for information on the latter program). Entry into both of these programs is competitive.
- Many students spend one or more years gaining professional experience in architecture firms or related fields before pursuing the advanced degrees. Educational enrichment is an important characteristic of the architectural program.
- The College of Design regularly presents public lectures by leading professionals and exhibitions of design and artwork.
- Electives are available in related disciplines- painting, sculpture, photography, landscape architecture, industrial design, and graphic design.
- Also available are field trips to buildings in urban centers of architectural interest, urban design studios, and a variety of foreign study programs including the NC State European Center in Prague.
Accreditation

In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards. Doctor of Architecture and Master of Architecture degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree that, when earned sequentially, constitute an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree. The NAAB Conditions for Accreditation, including the required Student performance Criteria, can be viewed on the NAAB website (http://www.naab.org).

The North Carolina State University School of Architecture offers the following NAAB accredited degree programs:

- B. Arch. (pre-professional degree + 30 in professional program)
- M. Arch. (pre-professional degree + 48 graduate hours)
- M. Arch (non pre-professional degree + 96 hours)

Next accreditation visit for all programs: 2026

For more information about this School, including contact information, visit our website (https://academics.design.ncsu.edu/departments/academics/architecture/#overview).

David Hill, FAIA
Department Head and Professor of Architecture
Phone: 919-515-8357
Email: david_hill@ncsu.edu

Faculty

Head
David Hill

Director of Graduate Programs
Dana Gulling

Professors
R. Abrams
T. Barrie
D. Hill
W. Place
P. Rand

Associate Professor
B. Cho
G. Elvin
D. Gulling
J. Hu
P. Morgado
S. Queen
K. Schaffer

Assistant Professor
B. Erdim
T. Rider

Professor of Practice
S. Cannon
M. Purnell
D. Stallings
E. Weinstein

Associate Professor of Practice
M. Griffith
V. Petrarca

Assistant Professor of Practice
J. Glueck
D. Kranbuehl

Lecturers
B. Askey
J. Burkett
V. Calabro
R. Harkey
J. Heffington
E. Unger
K. Wakeford
M. Weiser-Ward

Professors emeriti
G. Bizios
Architecture (Bachelor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

To become an architect, students must earn an accredited, professional degree in Architecture. The Bachelor of Architecture is a one-year professional degree program only for students who have earned a four-year undergraduate degree in Architecture (from NC State or another program within a NAAB accredited institution). Admission requirements include prerequisite courses which must be included in the applicant’s undergraduate program. A transcript review will identify any prerequisite deficiencies. If accepted to the program, the applicant will be advised regarding how to comply with the prerequisite requirements.

The B.Arch is an advanced degree program that emphasizes comprehensive and integrative design processes. The program prepares students for professional practice through two design studios and a series of required and elective courses in history, theory, architectural technologies, urbanism, energy studies and environmental systems. In this program, students develop a directed thesis project with faculty members, and this project allows students to focus on topics that are critical to current issues in professional architectural practice.

View more information about the program and admissions requirements on our website (https://design.ncsu.edu/admissions/first-year/b-arch/).

Plan Requirements

Architecture (Bachelor): 30 Total Units

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<tr>
<th>Code</th>
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<tr>
<td>ARC 501</td>
<td>Professional Architecture Studio I</td>
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<tr>
<td>ARC 502</td>
<td>Professional Architecture Studio II</td>
<td>6</td>
</tr>
<tr>
<td>ARC 561</td>
<td>The Practice of Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 581</td>
<td>Project Preparation Seminar</td>
<td>3</td>
</tr>
<tr>
<td>ARC 561</td>
<td>The Practice of Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 570</td>
<td>Anatomy of the City</td>
<td>3</td>
</tr>
<tr>
<td>ARC 571</td>
<td>Urban House</td>
<td>3</td>
</tr>
<tr>
<td>ARC 574</td>
<td>Place and Place Making</td>
<td>3</td>
</tr>
<tr>
<td>ARC 581</td>
<td>Project Preparation Seminar</td>
<td>3</td>
</tr>
</tbody>
</table>

Environmental Design in Architecture (Bachelor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Environmental Design in Architecture (BEDA) is a four-year, pre-professional degree program that immerses students in architectural design fundamentals through studio- and project-based courses. Students take an array of classes that focus on history, theory, technology, structures, materials, construction, and general education subjects. The BEDA program prepares students for further study in a professional degree program such as the one-year Bachelor of Architecture (B.Arch) or a two-year Master of Architecture (M.Arch). The BEDA also prepares students for advanced study in related fields such as Landscape Architecture and City Design.

The four years of the BEDA curriculum are divided into:

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<tbody>
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<td>ARC 492</td>
<td>Special Topics in Architecture</td>
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<tr>
<td>ARC 495</td>
<td>Independent Study in Architecture</td>
<td>1-3</td>
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<td>ARC 543</td>
<td>Analysis of Precedent</td>
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<tr>
<td>ARC 544</td>
<td>American City Planning History</td>
<td>3</td>
</tr>
<tr>
<td>ARC 546</td>
<td>Theory of Building Types</td>
<td>3</td>
</tr>
<tr>
<td>ARC 561</td>
<td>The Practice of Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 570</td>
<td>Anatomy of the City</td>
<td>3</td>
</tr>
<tr>
<td>ARC 571</td>
<td>Urban House</td>
<td>3</td>
</tr>
<tr>
<td>ARC 574</td>
<td>Place and Place Making</td>
<td>3</td>
</tr>
<tr>
<td>ARC 581</td>
<td>Project Preparation Seminar</td>
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Semester Sequence

Fall Semester

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<th>Course</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ARC 501</td>
<td>Professional Architecture Studio I</td>
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</tr>
<tr>
<td>ARC 581</td>
<td>Project Preparation Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Architecture Elective</td>
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<td>3</td>
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<tr>
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Spring Semester

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<td>Architecture Elective</td>
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</tr>
<tr>
<td>Hours</td>
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</table>

Total Hours 30
The First Year Experience (a common first year curriculum shared by all majors in the College of Design)

The Second Year Concentrated Architectural Studies

The Third Year Concentrated Architectural Studies

The Fourth Year (study abroad, “swing” studios in other majors; design/build studio; and elective seminars).

Learn more about the BEDA program about the School of Architecture on our website (https://academics.design.ncsu.edu/departments/academics/architecture/#undergraduate).

### Plan Requirements

**Environmental Design in Architecture (Bachelor): 126 Total Units**

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<thead>
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<tr>
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<tr>
<td>ARC 211</td>
<td>Natural Systems and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 241</td>
<td>History of World Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 232</td>
<td>Structures and Materials</td>
<td>3</td>
</tr>
<tr>
<td>ARC 242</td>
<td>History of Western Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 251</td>
<td>Digital Representation</td>
<td>3</td>
</tr>
<tr>
<td>ARC 331</td>
<td>Architectural Structures I</td>
<td>3</td>
</tr>
<tr>
<td>ARC 332</td>
<td>Architectural Structures II</td>
<td>3</td>
</tr>
<tr>
<td>ARC 414</td>
<td>Environmental Control Systems</td>
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</tr>
<tr>
<td>ARC 432</td>
<td>Architectural Construction Systems</td>
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<tr>
<td>ARC 441</td>
<td>History of Contemporary Architecture</td>
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**Architecture Core Requirements**

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</tr>
<tr>
<td>ARC 211</td>
<td>Natural Systems and Architecture</td>
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<td>ARC 232</td>
<td>Structures and Materials</td>
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<td>ARC 242</td>
<td>History of Western Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 251</td>
<td>Digital Representation</td>
<td>3</td>
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<tr>
<td>ARC 331</td>
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<td>3</td>
</tr>
<tr>
<td>ARC 332</td>
<td>Architectural Structures II</td>
<td>3</td>
</tr>
<tr>
<td>ARC 414</td>
<td>Environmental Control Systems</td>
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<tr>
<td>ARC 432</td>
<td>Architectural Construction Systems</td>
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**Architecture Studio Requirement**

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<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
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<td>D 101</td>
<td>Design Inquiry II: Methods and Processes</td>
<td>3</td>
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<tr>
<td>D 104</td>
<td>First Year Studio I</td>
<td>6</td>
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<tr>
<td>D 105</td>
<td>First Year Studio II</td>
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<tr>
<td>ARC 201</td>
<td>Architectural Design: Environment</td>
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<tr>
<td>ARC 202</td>
<td>Architectural Design: Form</td>
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<td>ARC 301</td>
<td>Architectural Design: Tectonics</td>
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<td>ARC 302</td>
<td>Architectural Design: Technology</td>
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<td>ARC 401</td>
<td>Architectural Design: Urban</td>
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<td>ARC 402</td>
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**Mathematics & Natural Sciences**

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<td>MA 108</td>
<td>Precalculus II</td>
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<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<td>Elements of Calculus</td>
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</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>

**International Experience**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>3</td>
</tr>
<tr>
<td>PY 211</td>
<td>College Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

**General Education Program (GEP) Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431)</td>
<td>(verify requirement)</td>
<td></td>
</tr>
<tr>
<td>GEP Global Knowledge (p. 1419)</td>
<td>(verify requirement)</td>
<td></td>
</tr>
</tbody>
</table>

**Foreign Language Proficiency (p. 1417) (verify requirement)**

**Free Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Free Electives (12 Hr S/U Lmt)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Hours**

126

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine how to complete this requirement.
3. Students should consult their academic advisors to determine which courses fill this requirement.

### Mathematics Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
</tr>
<tr>
<td>MA 108</td>
<td>Precalculus II</td>
<td>3</td>
</tr>
<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
<td>3</td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>

**Semester Sequence**

This is a sample.

#### First Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
<td>3</td>
</tr>
<tr>
<td>D 104</td>
<td>First Year Studio I</td>
<td>6</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
</tbody>
</table>

**Spring Semester**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 101</td>
<td>Design Inquiry II: Methods and Processes</td>
<td>3</td>
</tr>
<tr>
<td>D 105</td>
<td>First Year Studio II</td>
<td>6</td>
</tr>
<tr>
<td>ARC 162</td>
<td>An Introduction to Architecture</td>
<td>3</td>
</tr>
<tr>
<td>PY 211</td>
<td>College Physics I</td>
<td>4</td>
</tr>
</tbody>
</table>

#### Second Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 201</td>
<td>Architectural Design: Environment</td>
<td>6</td>
</tr>
<tr>
<td>ARC 211</td>
<td>Natural Systems and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 241</td>
<td>History of World Architecture</td>
<td>3</td>
</tr>
<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

**Spring Semester**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARC 202</td>
<td>Architectural Design: Form</td>
<td>6</td>
</tr>
<tr>
<td>ARC 232</td>
<td>Structures and Materials</td>
<td>3</td>
</tr>
<tr>
<td>ARC 242</td>
<td>History of Western Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ARC 251</td>
<td>Digital Representation</td>
<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
The First Year Experience

First Year Experience (FYE) is the foundational, interdisciplinary curriculum that prepares all incoming studio majors at the College of Design for their future disciplinary studies. FYE is comprised of immersive, hands-on design studios and method courses focused on the processes of design thinking. These courses serve as the introduction to fundamental design concepts and methods representative of creative activity across design and artistic disciplines. They encourage entering freshman to think critically and act creatively about and upon design, art, and the world around them as they secure a skillful level of craftsmanship in the conception, development, and making of all studio-based work. The project-based curriculum focuses on key design issues such as process, method, technique, technology, and the production of visual and physical items necessary for question seeking and the envisioning and development of design ideas.

For the fall semester, all freshman begin in an interdisciplinary studio and design inquiry lecture course with students across all College of Design majors. In the spring semester, students are immersed in a discipline-specific fundamentals studio and methods course to prepare them for their sophomore year in their chosen major.

College of Education

Mission

The College of Education is a voice of innovation for learning across the lifespan. We prepare professionals who educate and lead. Our inquiry and practice reflect integrity, a commitment to social justice, and the value of diversity in a global community.

Vision

The College of Education will lead the way in North Carolina in increasing opportunities for success in education and reducing achievement gaps.

What sets our College apart:

- The Student Success and Advising Center provides professional advising for all freshman, sophomores and transfer students in programs within the College of Education. The SSAC also serves as a resource for all College of Education students by offering services and programing such as student success workshops, student engagement opportunities and leadership development opportunities. Advisors are trained professionals who can supply valuable information about majors, courses, careers, requirements, policies, social life, academic support and transition issues.

- Through the generous support of corporations and friends, the College of Education is able to offer over 45 scholarships to our undergraduate and graduate students (https://ced.ncsu.edu/undergraduate/undergraduate-scholarships-and-financial-aid/) each year based on merit and/or need. Scholarship amounts range from $1,200 to $5,000. High school counselors receive information for all College of Education scholarships.

- The College of Education maintains the Omicron Rho chapter of Kappa Delta Pi (http://www.kdp.org), an international honor society in education. It elects those to membership who exemplify high academic achievement and exhibit the ideals of scholarship, high personal standards, and promise in teaching and allied professions.

- The Department of Science, Technology, Engineering, and Mathematics Education hosts the local chapter of Epsilon Pi Tau (http://ced.ncsu.edu/student-life/organizations/) International Honor Society for Professions in Technology. Epsilon Pi Tau recognizes student excellence in the study of technology and technology education and prepares practitioners for the technology professions.

- The college and University Housing have partnered to provide a living and learning residential experience for first year students called Students Advocating for Youth (SAY Village). Housed in Syme Hall, this experience targets students interested in working with elementary-aged youth.

- Students have the opportunity to participate in a number of the College of Education's Study Abroad opportunities (http://ced.ncsu.edu/study-abroad/)

Accreditation

All of the bachelor’s level and graduate level licensure programs are approved by the North Carolina State Board of Education. The college
is accredited by the Council for the Accreditation of Counseling and Related Programs (CACREP) and the Council for the Accreditation of Educator Preparation (CAEP). Please visit the College of Education’s website (http://ced.ncsu.edu/academics/licensureaccreditation/). (https://ced.ncsu.edu/academics/professional-education/).

For more information about our college, visit our website (http://ced.ncsu.edu).

College of Education
208 Poe Hall
2310 Stinson Drive
Raleigh, NC 27695
Phone: 919-515-5514
Email: ced_info@ncsu.edu

Faculty
Dean
Mary Ann Danowitz

Associate Dean, Faculty and Academic Affairs
Lee V. Stiff

Associate Dean, Research and Innovation
Paola Sztajn

Associate Dean, Student Success and Strategic Community Engagement
Anona Smith Williams

Associate Dean and Executive Director, Friday Institute
Hiller A. Spires

Assistant Dean, Finance
Lilia Collazo

Assistant Dean, Professional Education and Assessment
Vacant

Administration
Tish Attayek, Director of Research Development
Mandy Blackmon, Director of Human Resources
Tremaine Brittain, Director of Advising
Cherry Crayton, Director of Marketing & Communication

Matt Friedrick, Executive Director of Development
Stephanie Jackson, Director of Research Management
Ajaya Jones, Coordinator, Global Programs
Kerri Brown Parker, Director of METRC
Mark Williams, Director of Education IT

Departments
- Agricultural Teacher Education (p. 416)
- Department of Science, Technology, Engineering and Mathematics Education (STEM) (p. 416)
- Department of Teacher Education and Learning Sciences (TELS) (p. 459)
- English Teacher Education (p. 469)
- French Teacher Education (p. 469)
- Spanish Teacher Education (p. 469)
- Technology, Engineering and Design Education (p. 469)

Majors
- Education, General Studies (BS) (p. 460)
- Elementary Education (BS): Science, Technology, Engineering, and Mathematics Concentration (p. 462)
- Mathematics Education (BS) and Mathematics (BS) (Double Major) (p. 418)
- Mathematics Education (BS) and Statistics (BS) (Double Major) (p. 421)
- Mathematics Education (BS): Computer Specialization (p. 424)
- Mathematics Education (BS): Mathematics Specialization (p. 426)
- Mathematics Education (BS): Middle Grades Mathematics Concentration (p. 428)
- Mathematics Education (BS): Statistics Specialization (p. 431)
- Middle Grades Education (BS), Mathematics and Sciences Concentration (p. 433)
- Middle Grades Education (BS): Language Arts and Social Studies Concentration (p. 466)
- Science Education (BS): Biology Concentration (p. 436)
- Science Education (BS): Chemistry Concentration (p. 440)
- Science Education (BS): Earth Science Concentration (p. 443)
- Science Education (BS): Middle Grades Science Concentration (p. 446)
- Science Education (BS): Physics Concentration (p. 449)
- Technology, Engineering and Design Education (BS), Graphic Communication Concentration (p. 453)
- Technology, Engineering and Design Education (BS): Licensure Concentration (p. 456)

Minors
- Graphic Communications (Minor) (p. 418)
- Technology, Engineering and Design Education (Minor) (p. 459)
Certificates

- U.S. Culture and Cooperative Education (Certificate) (GTC) (p. 469)
- U.S. Culture and Education (Certificate) (GTE) (p. 470)

Agricultural Teacher Education

Our Agricultural Education students graduate prepared to teach agriculture and be FFA advisors in public and private schools. Many of our alumni pursue careers in middle and high schools, universities and community colleges, county extension offices, and in the agricultural industry. Learn more about the many agricultural and human science career opportunities (https://cals.ncsu.edu/agricultural-and-human-sciences/careers/) available.

Teacher Licensure

Completion of the B.S. program in Agricultural Education leads to teacher licensure in North Carolina for grades 6-12. Because of North Carolina’s reciprocity agreements, graduates also can pursue certification in about 35 states. Download the Teacher Licensure Checklist (https://cals.ncsu.edu/agricultural-and-human-sciences/wp-content/uploads/sites/13/2017/06/Teacher-Licensure-Checklist.pdf) to review the requirements for admissions to teacher education candidacy and help you stay on course.

Curriculum

The agricultural education curriculum has three components:

1. General education courses (https://oucc.dasa.ncsu.edu/general-education-program-gep/gep-category-requirements/) required for all NC State University students.

2. A broad understanding of agriculture. Students complete introductory courses in animal or poultry science, plant science, soil science, agricultural economics, agricultural engineering, and forestry to develop the necessary agricultural background to provide information to a variety of clients.


Faculty

Department Head
Carolyn Dunn

Undergraduate Coordinator
Travis Park

Department of Science, Technology, Engineering and Mathematics Education (STEM)

Our graduates are recognized as top in their fields throughout the state and nation as they begin their professional careers as teachers of Science, Technology, Engineering and Mathematics (STEM). NC State STEM Education produces competent professionals who have strong subject matter backgrounds and pedagogical skills throughout their fully accredited programs. Departmental majors may seek licensure for teaching high school grades 9-12 or middle grades 6-9. Students in the high school curriculum in education take approximately 45 percent of their program in the College of Sciences and may complete a double major, receiving a second degree in mathematics, statistics, or one of the sciences. Students in Technology, Engineering and Design Education may be licensed as teachers of technology and engineering education programs in middle grades and high schools. All pre-service teaching programs provide a broad background; an in-depth study in mathematics, technology or an area of science; and the development of professional competencies.

In addition, the Technology, Engineering and Design education curriculum provides a non-teaching graphic communications option with a general background for a variety of employment opportunities in business and industry.

The department also offers minors in:

- Graphic Communications (13GCM) (https://ced.ncsu.edu/program-descriptions/graphic-communications-technology-engineering-and-design-education/)
- Technology, Engineering and Design Education (13TEM) (https://ced.ncsu.edu/program-descriptions/minor-in-technology-engineering-design-education/)

Minors give opportunities for students to develop proficiency in applying graphic techniques in both career and leisure activities or technology based laboratory skills.

The department offers student engagement activities through their active professional organizations that include: Technology and Engineering Education Collegiate Association (TEECA), Epsilon Pi Tau International Honor Society for Professions in Technology, North Carolina Council of Teachers of Mathematics (NCCTM)-Kappa Student Chapter, and the National Science Teachers Association (NSTA Student Chapter)

The Department of STEM Education is located in Poe Hall, Suite 510.
For more information about this department, including contact information, visit our website (https://ced.ncsu.edu/stem-ed/undergraduate/).

Contact
Christy Buck
Student Services Coordinator
cjbuck@ncsu.edu
https://ced.ncsu.edu/stem-ed/undergraduate/

Faculty
Department Head
A. C. Clark, Department Head

Program Coordinator, Undergraduate Programs for Science Education
Vacant

Program Coordinator, Undergraduate Programs for Technology, Engineering & Design Education
N.E. Fahrer, Teaching Asst Professor

Program Coordinator, Undergraduate Programs for Mathematics Education
C. Edgington, Teaching Asst Professor

Professors
M.R. Blanchard, Science Education
A. C. Clark, Technology, Design and Engineering Education
K.F. Hollebrands, Outstanding Teacher for College of Education, Mathematics Education
C. Johnson, Science Education
M.G. Jones, Alumni Distinguished Graduate Professor, Science Education
H.S. Lee, Mathematics Education
S. Park, Science Education
E. Wiebe, Science Education

Associate Professors
C. Delgado, Science Education
C. Denson, Technology, Engineering & Design Education

Assistant Professors
R. K. Anderson, Mathematics Education
K.C. Busch, Science Education
T. Jones, Technology, Engineering & Design Education
E. E. Krupa, Mathematics Education

Teaching Assistant Professors
C.P. Edgington, Mathematics Education
N.E. Fahrer, Technology, Engineering & Design Education
M. Franzen, Technology, Education and Design Education
B. Matthews, Technology, Engineering and Design Education
S. L. Miller, Technology, Engineering and Design Education
K. G. Sutton, Technology, Engineering and Design Education

Lecturer
J. P. Newby, Technology, Engineering and Design Education

Alumni Distinguished Undergraduate Professor
J. L. Crow

Professors emeriti
N. D. Anderson, Mathematics Education
J. Confrey, Joseph D. Moore Distinguished Professor of Mathematics Education
W. J. Haynie, Technology, Engineering & Design Education
J. R. Kolb, Outstanding Teacher for College of Education, Science Education
J. E. Penick, Science Education
L. V. Stiff, Mathematics Education

Associate professors emeriti
T. J. Branoff, Technology, Engineering and Design Education
G. S. Carter, Science Education
V. W. DeLuca, Technology, Engineering & Design Education
K. A. Keene, Mathematics Education
L. W. Watson, Mathematics Education
J. H. Wheatley, Science Education
Assistant Professor Emeritus
W. J. Vanderwall, Graphic Communications

Teaching Assistant Emeritus
A. Y. Scales, Graphic Communications

Lecturer Emeritus
J. F. Freeman, Graphic Communications

Plans
- Graphic Communications (Minor) (p. 418)
- Mathematics Education (BS) and Mathematics (BS) (Double Major) (p. 418)
- Mathematics Education (BS) and Statistics (BS) (Double Major) (p. 421)
- Mathematics Education (BS): Computer Specialization (p. 424)
- Mathematics Education (BS): Mathematics Specialization (p. 426)
- Mathematics Education (BS): Middle Grades Mathematics Concentration (p. 428)
- Mathematics Education (BS): Statistics Specialization (p. 431)
- Mathematics Education, Secondary (p. 433)
- Middle Grades Education (BS), Mathematics and Sciences Concentration (p. 433)
- Science Education (BS): Biology Concentration (p. 436)
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- Science Education (BS): Middle Grades Science Concentration (p. 446)
- Science Education (BS): Physics Concentration (p. 449)
- Science Education, Secondary (p. 453)
- Technology, Engineering and Design Education (BS), Graphic Communication Concentration (p. 453)
- Technology, Engineering and Design Education (BS): Licensure Concentration (p. 456)
- Technology, Engineering and Design Education (Minor) (p. 459)

Graphic Communications (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

This fifteen-credit hour minor develops competencies in selecting and applying graphic techniques in both professional and avocational areas, provides in-depth study and authentic activities in visual science, and enriches visual perception and critical thought in graphic areas. Minor programs are individually designed to meet the needs of the student and to complement their major.

Admissions

Students may declare their intention to complete the Graphic Communication minor by consulting with the contact person listed below.

Certification

The person listed below will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

John Parks Newby
510-C Poe Hall
919.515.1065
jpnewby@ncsu.edu

SIS Code: 13GCM

Plan Requirements

- Complete 15 hours of course work in Graphic Communications.
- A minimum grade of ‘C’ (2.0) or better must be achieved in each course counting towards the minor.
- Students who have transfer credit from another institution that they believe is equivalent to GC 120 Foundations of Graphics should consult the contact person listed below for approval and inclusion in the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC 120</td>
<td>Foundations of Graphics</td>
<td>3</td>
</tr>
<tr>
<td>or TDE 220</td>
<td>Civil Engineering Graphics</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses

Select four of the following: 12

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>GC 250</td>
<td>Architectural Graphic Communications</td>
</tr>
<tr>
<td>GC 320</td>
<td>3D Spatial Relations</td>
</tr>
<tr>
<td>GC 330</td>
<td>Basic Technical Animation</td>
</tr>
<tr>
<td>GC 340</td>
<td>Concepts of Website Development</td>
</tr>
<tr>
<td>GC 350</td>
<td>Applied CAD/D and Geometric Controls</td>
</tr>
<tr>
<td>GC 420</td>
<td>Visual Thinking</td>
</tr>
<tr>
<td>GC 450</td>
<td>Advanced Graphics Usage with CAD</td>
</tr>
<tr>
<td>GC 498</td>
<td>Independent Study in Graphic Communications</td>
</tr>
<tr>
<td>TDE 205</td>
<td>Desktop Publishing and Imaging Technology</td>
</tr>
<tr>
<td>TDE 230</td>
<td>Scientific and Technical Visualization</td>
</tr>
<tr>
<td>TDE 261</td>
<td>Digital Media Education</td>
</tr>
</tbody>
</table>

Total Hours 15

Mathematics Education (BS) and Mathematics (BS) (Double Major)

The double degree in Mathematics Education (BS) and Mathematics (BS) is one of two double degree options in the Mathematics Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the mathematics they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching
mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

In addition, students earn a degree in Mathematics. Upper level mathematics electives help prepare students for a variety of math-related fields in addition to teaching at the secondary level and graduate study in mathematics or related fields.

Students in this program also have the opportunity to participate in:

- Undergraduate research
- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Tutoring in local schools
- For more information about this program, visit our website (https://ced.ncsu.edu/programs/mathematics-education-middle-school-or-secondary-bachelor/).

Program Coordinator:
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

Plan Requirements
Mathematics Education (BS) and Mathematics (BS) (Dual Degree):
129 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>E 115</td>
<td>Introduction to Computing</td>
<td>1</td>
</tr>
<tr>
<td>or COS 100</td>
<td>Science of Change</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CSC 112</td>
<td>Introduction to Computing-FORTRAN</td>
<td></td>
</tr>
<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
<td></td>
</tr>
<tr>
<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
<td></td>
</tr>
</tbody>
</table>

English and Communication

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>2</td>
</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
</tbody>
</table>

Natural Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>2</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PY 201</td>
<td>University Physics I</td>
<td></td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td></td>
</tr>
<tr>
<td>&amp; PY 206</td>
<td>and Physics for Engineers and Scientists I Laboratory</td>
<td></td>
</tr>
<tr>
<td>Basic Science Elective (p. 419)</td>
<td></td>
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</tr>
</tbody>
</table>

Mathematical Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>1</td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>1</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
<td>1</td>
</tr>
<tr>
<td>MA 225</td>
<td>Foundations of Advanced Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>MA 341</td>
<td>Applied Differential Equations</td>
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<tr>
<td>or MA 351</td>
<td>or Introduction to Discrete Mathematical Models</td>
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<td>MA 405</td>
<td>Introduction to Linear Algebra</td>
<td>1</td>
</tr>
<tr>
<td>MA 421</td>
<td>Introduction to Probability</td>
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</tr>
<tr>
<td>MA 407</td>
<td>Introduction to Modern Algebra for Mathematics Majors</td>
<td>1</td>
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<tr>
<td>MA 408</td>
<td>Foundations of Euclidean Geometry</td>
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<tr>
<td>MA 425</td>
<td>Mathematical Analysis</td>
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<td>Math Electives (p. 420)</td>
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<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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Professional Education

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<td>EDP 304</td>
<td>Educational Psychology</td>
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<td>ELP 344</td>
<td>School and Society</td>
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<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
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<td>Introduction to Mathematics Education</td>
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<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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<td>ED 312</td>
<td>Classroom Assessment Principles and Practices</td>
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<td>EMS 480</td>
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<td>EMS 470</td>
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<td>EMS 471</td>
<td>Student Teaching in Mathematics</td>
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<td>EMS 472</td>
<td>Teaching Mathematics Topics in Senior High School</td>
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<td>School Mathematics from an Advanced Perspective</td>
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General Education Program (GEP) Courses

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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Total Hours 129

1 A grade of C or higher is required.
2 A grade of C- or higher is required.
3 A grade of B- or higher is required.

Basic Science Electives

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<tr>
<td>&amp; CH 202</td>
<td>and Quantitative Chemistry Laboratory</td>
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<td>PY 202</td>
<td>University Physics II</td>
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Math Electives

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<td>Symbolic Logic</td>
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<tr>
<td>MA 325</td>
<td>Introduction to Applied Mathematics</td>
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<tr>
<td>MA 335</td>
<td>Symbolic Logic</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models</td>
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<td>BMA 573</td>
<td>Mathematical Modeling of Physical and Biological Processes I</td>
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<td>BMA 574</td>
<td>Mathematical Modeling of Physical and Biological Processes II</td>
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<td>CSC 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>CSC 428</td>
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<td>E 531</td>
<td>Dynamic Systems and Multivariable Control I</td>
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<td>ECG 528</td>
<td>Options and Derivatives Pricing</td>
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<td>FIM 528</td>
<td>Options and Derivatives Pricing</td>
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<td>FIM 548</td>
<td>Monte Carlo Methods for Financial Math</td>
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<td>FIM 549</td>
<td>Financial Risk Analysis</td>
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<tr>
<td>ISE 505</td>
<td>Linear Programming</td>
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<tr>
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<td>Applied Differential Equations II</td>
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<tr>
<td>MA 402</td>
<td>Mathematics of Scientific Computing</td>
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<td>MA 405</td>
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<td>Introduction to Modern Algebra for Mathematics Majors</td>
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<td>MA 408</td>
<td>Foundations of Euclidean Geometry</td>
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<td>MA 410</td>
<td>Theory of Numbers</td>
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<td>MA 412</td>
<td>Long-Term Actuarial Models</td>
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<td>MA 426</td>
<td>Mathematical Analysis II</td>
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<td>Introduction to Numerical Analysis II</td>
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<tr>
<td>MA 430</td>
<td>Mathematical Models in the Physical Sciences</td>
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<td>MA 432</td>
<td>Mathematical Models in Life and Social Sciences</td>
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<tr>
<td>MA 437</td>
<td>Applications of Algebra</td>
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<td>MA 440</td>
<td>Game Theory</td>
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<td>MA 444</td>
<td>Problem Solving Strategies for Competitions</td>
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<td>Methods of Applied Mathematics I</td>
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<td>MA 451</td>
<td>Methods of Applied Mathematics II</td>
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<td>Reading in Honors Mathematics</td>
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<tr>
<td>MA 493</td>
<td>Special Topics in Mathematics</td>
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### Semester Sequence

This is a sample.

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<td>CH 101</td>
<td>Chemistry - A Molecular Science (^2)</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory (^2)</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Introduction to Computing Environments or Science of Change</td>
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<td>Calculus II (^1)</td>
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<td>PY 205 or PY 201</td>
<td>Physics for Engineers and Scientists II (^2) or University Physics I</td>
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<tr>
<td>Introduction to Programming (^3)</td>
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<td>PY 208 or PY 202</td>
<td>Physics for Engineers and Scientists II (^2) or University Physics II</td>
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<td><strong>Hours</strong></td>
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<td>Applied Differential Equations I (^1) or Introduction to Discrete Mathematical Models</td>
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<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools (^1)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Introduction to Modern Algebra for Mathematics Majors (^3)</td>
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<td>Foundations of Euclidean Geometry (^3)</td>
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<td>School and Society (^1)</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices (^1)</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>Teaching Mathematics with Technology (^1)</td>
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<td>School Mathematics from an Advanced Perspective</td>
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<td>Teaching Mathematics Topics in Senior High School (^1)</td>
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<td>EMS 470</td>
<td>Methods and Materials for Teaching Mathematics (^1)</td>
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<td><strong>Total Hours</strong></td>
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</table>

1. A grade of C or higher is required.
2. At most one grade below a C- is permitted in courses satisfying the science requirement.
3. At most one grade below a C is permitted in required mathematics courses >400, elective math courses, statistics, and computer science courses.
4. A grade of B- or higher is required.

### Mathematics Education (BS) and Statistics (BS) (Double Major)

The double degree in Mathematics Education (BS) and Statistics (BS) is one of two double degree options in the Mathematics Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the mathematics and statistics they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 9-12. They
will be able to seek employment opportunities in education and make a positive difference in their communities.

In addition, students earn a degree in Statistics. Upper level statistics electives help prepare students for a variety of statistics-related fields in addition to teaching at the secondary level and graduate study in statistics or related fields.

Students in this program also have the opportunity to participate in:

- Undergraduate research
- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Tutoring in local schools

For more information about this program, visit our website (https://ced.ncsu.edu/programs/mathematics-education-middle-school-or-secondary-bachelor/).

**Program Coordinator:**
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

**Plan Requirements**

Mathematics Education (BS) and Statistics (BS) (Dual Degree): 129 Total Units

<table>
<thead>
<tr>
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<tr>
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<td>Academic Writing and Research</td>
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<td><strong>Natural Sciences</strong></td>
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To satisfy the science requirement, a sequence of two lab-based courses (BIO 181 and BIO 183, or CH 101/CH 102 and CH 201/CH 202, or PY 205 and PY 208, or PY 201 and PY 202, or PY 211 and PY 212) must be taken. The third science may be selected from the GEP list of approved science courses.

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<td>MA 408</td>
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<td>Introduction to Regression Analysis</td>
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<td>ST 431</td>
<td>Introduction to Experimental Design</td>
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<td>ST 432</td>
<td>Introduction to Survey Sampling</td>
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<td>Introduction to Statistical Computing and Data Management</td>
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**Professional Education**

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<td>School and Society</td>
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<td>Teaching Mathematics with Technology</td>
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<td>Methods and Materials for Teaching Mathematics</td>
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**GEP Courses**

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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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1 A grade of C- or higher is required.
2 A grade of C or higher is required.
3 A grade of B- or higher is required.

**Natural Sciences I & II**

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<td>Applied Econometrics I</td>
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<td>EMS 519</td>
<td>Teaching and Learning of Statistical Thinking</td>
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<td>GPH 404</td>
<td>Epidemiology and Statistics in Global Public Health</td>
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<td>MA 412</td>
<td>Long-Term Actuarial Models</td>
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<td>Probability and Stochastic Processes I</td>
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<td>Experiences in Data Analysis</td>
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<td>ST 404</td>
<td>Epidemiology and Statistics in Global Public Health</td>
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<td>Applied Nonparametric Statistics</td>
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<td>ST 412</td>
<td>Long-Term Actuarial Models</td>
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<td>Applied Time Series</td>
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<td>Statistical Methods for Quality and Productivity Improvement</td>
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<td>Applied Multivariate and Longitudinal Data Analysis</td>
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<td>Introduction to Data Science</td>
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<td>ST 491</td>
<td>Statistics in Practice</td>
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<td>Fundamentals of Statistical Inference I</td>
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<td>ST 502</td>
<td>Fundamentals of Statistical Inference II</td>
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<td>Fundamentals of Linear Models and Regression</td>
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<td>Statistical Methods For Researchers I</td>
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<td>Statistics for Management I</td>
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<td>Applied Statistical Methods I</td>
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<td>Teaching and Learning of Statistical Thinking</td>
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<td>Statistical Principles of Clinical Trials</td>
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### Semester Sequence

This is a sample.

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<td>COM 112</td>
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<td>Foundations of Advanced Mathematics ¹</td>
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<td>ED 204</td>
<td>Introduction to Teaching in Today’s Schools</td>
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<td>ST 308</td>
<td>Introduction to Statistical Programming - R ¹</td>
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<td>GEP Humanities (p. 1423)</td>
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1. Required course
Mathematics Education (BS): Computer Specialization

The Mathematics Education: Computer Specialization (BS) degree is one of four undergraduate degree options in the Mathematics Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the mathematics and computer science they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year and take five computer science courses in lieu of math electives. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 9-12 and are also poised to teach computer science courses at the secondary level. They will be able to seek employment opportunities in education and make a positive difference in their communities.

Students in this program also have the opportunity to participate in:

- Undergraduate research
- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Tutoring in local schools

For more information about this program, visit our website (https://ced.ncsu.edu/programs/mathematics-education-middle-school-or-secondary-bachelor/).

Program Coordinator:
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

Plan Requirements

Mathematics Education (BS): Computer Specialization: 120 Total Units

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<thead>
<tr>
<th>Code</th>
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<td>ENG 101</td>
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<td>COM 112</td>
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<td>MA 141</td>
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<td>MA 241</td>
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<td>MA 242</td>
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<td>MA 403</td>
<td>Introduction to Modern Algebra ²</td>
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<td>MA 408</td>
<td>Foundations of Euclidean Geometry ²</td>
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<td>Introduction to Statistics ²</td>
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Computer Science Specialization

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1 At most one grade below a C- is permitted in the courses satisfying the science requirement.

2 At most one grade below a C is permitted in mathematics, statistics, and computer science courses. A C- or better is required in ST 421 Introduction to Mathematical Statistics I.

3 A grade below a B is not permitted in EMS 204 Introduction to Mathematics Education. A grade below a C is not permitted in all other EMS, EDP, ECI, ELP, and ED courses.
Natural Sciences Lab Course Electives

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<td>CSC 216</td>
<td>Software Development Fundamentals</td>
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<td>CSC 316</td>
<td>Data Structures and Algorithms</td>
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Natural Sciences

Natural Science Lab Course Elective (p. 425)

GEP Natural Sciences (p. 1429)

Professional Education

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<td>EDP 304</td>
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<td>ELP 344</td>
<td>School and Society</td>
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<td>Introduction to Teaching in Today's Schools</td>
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<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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GEP Courses

GEP Humanities (p. 1423)

GEP Health and Exercise Studies (p. 1422)

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)

GEP Interdisciplinary Perspectives (p. 1426)

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

Free Electives

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Total Hours

120

A grade of C- or higher is required.

A grade of C or higher is required.

A grade of B- or better is required.

Students should consult their academic advisors to determine which courses fill this requirement.

Natural Sciences Lab Course Electives

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Biological Sciences

BIO 181  Introductory Biology: Ecology, Evolution, and Biodiversity

BIO 183  Introductory Biology: Cellular and Molecular Biology

Physics Sequence A

PY 205  Physics for Engineers and Scientists I

PY 206  Physics for Engineers and Scientists I Laboratory

PY 208  Physics for Engineers and Scientists II

PY 209  Physics for Engineers and Scientists II Laboratory

Physics Sequence B

PY 201  University Physics I

PY 202  University Physics II

Physics Sequence C

PY 211  College Physics I

PY 212  College Physics II

Semester Sequence

This is a sample.

Course

First Year

Fall Semester

MA 141  Calculus I

CSC 110  Computer Science Principles - The Beauty and Joy of Computing

ENG 101  Academic Writing and Research

E 115  Introduction to Computing Environments

ED 100  Intro to Education

GEP Health and Exercise Studies (p. 1422)

Hours

15

Spring Semester

MA 241  Calculus II

Science

CSC 116  Introduction to Computing - Java

GEP Health and Exercise Studies (p. 1422)

COM 112  Interpersonal Communication

Hours

15

Second Year

Fall Semester

MA 242  Calculus III

EMS 204  Introduction to Mathematics Education

ED 204  Introduction to Teaching in Today's Schools

Science

ST 311  Introduction to Statistics

GEP Interdisciplinary Perspectives (p. 1426)

Hours

17

Spring Semester

CSC 216  Software Development Fundamentals

CH 201  Chemistry - A Quantitative Science

CH 202  Quantitative Chemistry Laboratory

CH 102  General Chemistry Laboratory

CH 201  Chemistry - A Quantitative Science

CH 202  Quantitative Chemistry Laboratory

Biology Sequence

BIO 181  Introductory Biology: Ecology, Evolution, and Biodiversity

BIO 183  Introductory Biology: Cellular and Molecular Biology

Physics Sequence A

PY 205  Physics for Engineers and Scientists I

PY 206  Physics for Engineers and Scientists I Laboratory

PY 208  Physics for Engineers and Scientists II

PY 209  Physics for Engineers and Scientists II Laboratory

Physics Sequence B

PY 201  University Physics I

PY 202  University Physics II

Physics Sequence C

PY 211  College Physics I

PY 212  College Physics II
Mathematics Education (BS): Mathematics Specialization

The Mathematics Education: Mathematics Specialization (BS) degree is one of four undergraduate degree options in the Mathematics Education program in the Department of STEM Education. This degree program prepares teacher-leaders to have a deep understanding of the mathematics they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year and choose from a range of mathematics electives. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

Students in this program also have the opportunity to participate in:

- Undergraduate research
- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Tutoring in local schools

For more information about this program, visit our website (https://ced.ncsu.edu/programs/mathematics-education-middle-school-or-secondary-bachelor/).

Program Coordinator:
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

Plan Requirements

Mathematics Education (BS): Mathematics Specialization: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
</tr>
<tr>
<td>or COS 100</td>
<td>Science of Change</td>
<td>3</td>
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<tr>
<td>Select one of the following:</td>
<td></td>
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<tr>
<td>CSC 112</td>
<td>Introduction to Computing-FORTRAN</td>
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<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
<td>2</td>
</tr>
<tr>
<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
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English and Communication

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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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Mathematical Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MA 141</td>
<td>Calculus I 1</td>
<td>4</td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II 1</td>
<td>4</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III 1</td>
<td>4</td>
</tr>
</tbody>
</table>

1. At most one grade below a C is permitted in the mathematics, statistics, and computer science courses.
2. A grade below a B- is not permitted in EMS 204. A grade below a C is not permitted in all other EMS, EDP, ECI, ELP, and ED courses.
3. At most one grade below a C- is permitted in the courses satisfying the science requirement.
MA 351 Introduction to Discrete Mathematical Models \(^1\) 3
MA 225 Foundations of Advanced Mathematics \(^1\) 3
MA 405 Introduction to Linear Algebra \(^1\) 3
MA 403 Introduction to Modern Algebra \(^1\) 3
MA 408 Foundations of Euclidean Geometry \(^1\) 3
MA 105 Mathematics of Finance 6
& MA 114 and Introduction to Finite Mathematics with Applications \(^1\)

ST 311 Introduction to Statistics \(^1\) 3
ST 312 Introduction to Statistics II \(^1\) 3
ST 307 Introduction to Statistical Programming- SAS \(^1\) 1

**Natural Sciences Lab Course Electives**

**Chemistry Sequence**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>

**Biology Sequence**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
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**Physics Sequence A**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>3</td>
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<tr>
<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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</tr>
<tr>
<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
<td>1</td>
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**Physics Sequence B**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PY 201</td>
<td>University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PY 202</td>
<td>University Physics II</td>
<td>4</td>
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**Physics Sequence C**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PY 211</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PY 212</td>
<td>College Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

### Semester Sequence

This is a sample.

#### First Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MA 141</td>
<td>Calculus I (^1)</td>
<td>4</td>
</tr>
<tr>
<td>Science (^2)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>or COS 100</td>
<td>Introduction to Computing Environments or Science of Change</td>
<td>1</td>
</tr>
<tr>
<td>ED 100</td>
<td>Intro to Education (^3)</td>
<td>2</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
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</tr>
</tbody>
</table>

**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MA 241</td>
<td>Calculus II (^1)</td>
<td>4</td>
</tr>
<tr>
<td>Science (^2)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics (^1)</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>1</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
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</table>

#### Second Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MA 242</td>
<td>Calculus III (^1)</td>
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<tr>
<td>Select one of the following: (^1)</td>
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</tr>
<tr>
<td>CSC 112</td>
<td>Introduction to Computing-FORTRAN</td>
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</tr>
<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
<td></td>
</tr>
<tr>
<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
<td></td>
</tr>
<tr>
<td>MA 351 or MA 341</td>
<td>Introduction to Discrete Mathematical Models (^1) or Applied Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>EMS 204</td>
<td>Introduction to Mathematics Education (^3)</td>
<td>2</td>
</tr>
</tbody>
</table>
Mathematics Education (BS): Middle Grades Mathematics Concentration

The Mathematics Education: Middle Grades Concentration (BS) degree is one of four undergraduate degree options in the Mathematics Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the mathematics and statistics they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year. In addition, students take courses specific to teaching content in the middle grades. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 6-9. Students in this program have the option to pursue a dual teaching license. This means they will receive a BS in Mathematics Education but they may be recommended for licensure in both middle grades mathematics and middle grades science. They will be able to seek employment opportunities in education and make a positive difference in their communities.

Students in this program also have the opportunity to participate in:

- Undergraduate research
- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
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**Program Coordinator:**
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

**Plan Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools</td>
<td>2</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>2-3</td>
<td></td>
</tr>
</tbody>
</table>

**Spring Semester**

MA 225 Foundations of Advanced Mathematics 1 3
ST 312 Introduction to Statistics II 1 3
ST 307 Introduction to Statistical Programming-SAS 1 1
GEP Humanities (p. 1423) 3
COM 112 Interpersonal Communication 3
Science 2 3

Hours 16-17

**Third Year**

**Fall Semester**

MA 405 Introduction to Linear Algebra 1 3
MA 403 Introduction to Modern Algebra 1 3
ELP 344 School and Society 3 3
EDP 304 Educational Psychology 3 3
ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom 3 3
GEP Health and Exercise Studies (p. 1422) 1 1

Hours 16

**Spring Semester**

MA 408 Foundations of Euclidean Geometry 1 3
EMS 480 Teaching Mathematics with Technology 3 3
MA 105 Mathematics of Finance 1 or Introduction to Finite Mathematics with Applications 3 3
ED 311 Classroom Assessment Principles and Practices 3 2
ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 3 1
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3 3

Hours 15

**Fourth Year**

**Fall Semester**

Mathematics Elective 1 3
EMS 472 Teaching Mathematics Topics in Senior High School 3 3
EMS 490 School Mathematics from an Advanced Perspective 3 3
EMS 470 Methods and Materials for Teaching Mathematics 3 3
GEP Interdisciplinary Perspectives (p. 1426) 3 3

Hours 15

**Spring Semester**

EMS 471 Senior Seminar in Mathematics and Science Education 3 10
EMS 495 Senior Seminar in Mathematics and Science Education 3 2

Hours 12

Total Hours 120-121

1 At most one grade below a C is permitted in the mathematics, statistics, and computer science courses.
2 At most one grade below a C- is permitted in the courses satisfying the science requirement.
3 A grade below a B- is not permitted in EMS 204. A grade below a C is not permitted in all other EMS, EDP, ECI, ELP, and ED courses.
Mathematical Sciences
MA 141 Calculus I $^2$ 4
MA 241 Calculus II $^2$ 4
MA 225 Foundations of Advanced Mathematics $^2$ 3
MA 403 Introduction to Modern Algebra $^2$ 3
MA 408 Foundations of Euclidean Geometry $^2$ 3
Select one of the following: $^2$ 3
   MA 205 Elements of Matrix Computations
   MA 305 Introductory Linear Algebra and Matrices
   MA 405 Introduction to Linear Algebra
Discrete Mathematics or Science Elective (p. 429) 3
ST 311 Introduction to Statistics $^2$ 3

Natural Sciences
Select one of the following: $^2$ 4
   CH 100 Chemistry and Society
   CH 101 Chemistry - A Molecular Science & CH 102 General Chemistry Laboratory
   BIO 105 Biology in the Modern World $^2$ 3
   BIO 106 Biology in the Modern World Laboratory $^2$ 1
   PY 131 Conceptual Physics $^2$ 4
Mathematics/Science Elective (p. 429) $^2$ 6

Professional Education
ED 100 Intro to Education $^2$ 2
EMS 204 Introduction to Mathematics Education $^3$ 2
ED 204 Introduction to Teaching in Today's Schools $^2$ 2
EDP 304 Educational Psychology $^2$ 3
ECI 309 Teaching in the Middle Years $^2$ 3
ECI 306 Middle Years Reading $^2$ 3
ELP 344 School and Society $^2$ 3
EMS 480 Teaching Mathematics with Technology $^2$ 3
ED 311 Classroom Assessment Principles and Practices $^2$ 2
ED 312 Classroom Assessment Principles and Practices Professional Learning Lab $^2$ 1
EMS 375 Methods of Teaching Science I $^2$ 3
EMS 474 Teaching Mathematics Topics in the Middle Grades $^2$ 3
EMS 470 Methods and Materials for Teaching Mathematics $^2$ 3
EMS 471 Student Teaching in Mathematics $^2$ 10
EMS 490 School Mathematics from an Advanced Perspective $^2$ 3
ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom $^2$ 3
EMS 495 Senior Seminar in Mathematics and Science Education $^2$ 2

GEP Courses
GEP Humanities (p. 1423) 6
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

Foreign Language Proficiency (p. 1417) (verify requirement)
Free Electives
Free Electives $^4$ 2
Total Hours 120

$^1$ A grade of C- or higher is required.
$^2$ A grade of C or higher is required.
$^3$ A grade of B- or higher is required.
$^4$ Students should consult their academic advisors to determine which courses fulfill this requirement.

Discrete Mathematics or Science Electives

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<tr>
<td>MA 103A</td>
<td>Topics in Contemporary Mathematics</td>
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</tr>
<tr>
<td>MA 105</td>
<td>Mathematics of Finance</td>
<td>3</td>
</tr>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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Science Electives

<table>
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<tbody>
<tr>
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<td>Geology I: Physical</td>
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<tr>
<td>EMS 375</td>
<td>Methods of Teaching Science I</td>
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<tr>
<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
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<tr>
<td>PY 124</td>
<td>Solar System Astronomy</td>
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Mathematics/Science Electives

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<tbody>
<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
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<tr>
<td>ES 200</td>
<td>Climate Change and Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>ES 300</td>
<td>Energy and Environment</td>
<td>3</td>
</tr>
<tr>
<td>MEA 101</td>
<td>Geology I: Physical</td>
<td>3</td>
</tr>
<tr>
<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>PY 123</td>
<td>Stellar and Galactic Astronomy</td>
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Mathematics Electives

<table>
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<tr>
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<td>CSC 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>EMS 375</td>
<td>Methods of Teaching Science I</td>
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<td>LOG 335</td>
<td>Symbolic Logic</td>
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<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>MA 325</td>
<td>Introduction to Applied Mathematics</td>
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<td>MA 335</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models</td>
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<td>MA 402</td>
<td>Mathematics of Scientific Computing</td>
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<td>MA 410</td>
<td>Theory of Numbers</td>
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<tr>
<td>MA 416</td>
<td>Introduction to Combinatorics</td>
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<td>MA 421</td>
<td>Introduction to Probability</td>
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<td>MA 425</td>
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<td>MA 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>MA 430</td>
<td>Mathematical Models in the Physical Sciences</td>
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<tr>
<td>MA 432</td>
<td>Mathematical Models in Life and Social Sciences</td>
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</table>
### Mathematics Education (BS): Middle Grades Mathematics Concentration

**MA 437** Applications of Algebra 3  
**ST 312** Introduction to Statistics II 3

## Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
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<tr>
<td>MA 141</td>
<td>Calculus I 1</td>
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<tr>
<td>Select one of the following:</td>
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<td>4</td>
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<tr>
<td>CH 100</td>
<td>Chemistry and Society</td>
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</tr>
<tr>
<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>1</td>
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<td>ED 100</td>
<td>Intro to Education 3</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>MA 241</td>
<td>Calculus II 1</td>
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<tr>
<td>BIO 105</td>
<td>Biology in the Modern World 2</td>
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<td>BIO 106</td>
<td>Biology in the Modern World Laboratory 2</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td></td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
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<td>EMS 204</td>
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<td>Introductory Linear Algebra and Matrices</td>
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<tr>
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<td>ELP 344</td>
<td>School and Society 3</td>
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<td>ED 311</td>
<td>Classroom Assessment Principles and Practices 3</td>
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<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab 3</td>
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<td>ST 311</td>
<td>Introduction to Statistics 1</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Foundations of Euclidean Geometry 1</td>
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<td>ECI 306</td>
<td>Middle Years Reading 3</td>
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<td>Teaching Mathematics Topics in the Middle Grades 3</td>
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<td>School Mathematics from an Advanced Perspective 3</td>
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<td>EMS 470</td>
<td>Methods and Materials for Teaching Mathematics 3</td>
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<td>Mathematics Elective 1</td>
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<td>Science Elective 2</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>EMS 495</td>
<td>Senior Seminar in Mathematics and Science Education 3</td>
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<td><strong>Total Hours</strong></td>
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1 At most one grade below a C is permitted in the mathematics, statistics, and computer science courses.  
2 At most one grade below a C- is permitted in the courses satisfying the science requirements for a student intending to license in mathematics. For a student intending to license in mathematics and science, no grades below a C are permitted in the courses satisfying the science requirements.  
3 A grade below a B- is not permitted in EMS 204. A grade below a C is not permitted in all other EMS, EDP, ECI, ELP, ED courses.
To be eligible for a teaching license in mathematics only, either mathematics or science courses may be selected. To be eligible for teaching licenses in both mathematics and science two science elective courses must be selected. One from EMS 375, PY 124, MEA 130 or MEA 101 AND one from PY 123, MEA 130, MEA 101, ES 100, ES 200, or ES 300. Grades below C are not permitted in these science courses.

Mathematics Education (BS): Statistics Specialization

The Mathematics Education: Statistics Specialization (BS) degree is one of four undergraduate degree options in the Mathematics Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the mathematics and statistics they will teach and knowledge about different pedagogical strategies they can apply in the classroom. Students take five courses focused on mathematics education, beginning in their sophomore year, and two statistics courses in lieu of math electives. Our professional courses in the junior and senior year offer relevant pedagogical experiences, emphasize teaching mathematics with technology, and provide rich field experiences in math classrooms. Graduates are recommended for an initial North Carolina teaching license in mathematics grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

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- Kappa student chapter of the NC Council of Teachers of Mathematics, and other high impact experiences such as Passport to Success, SAY Village, and study abroad
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Program Coordinator:
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

Plan Requirements

Mathematics Education (BS): Statistics Specialization: 120 Total Unit

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<td>or COS 100</td>
<td>Science of Change</td>
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<td>CSC 112</td>
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<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
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<tr>
<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
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English and Communication

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<td>ENG 101</td>
<td>Academic Writing and Research 2</td>
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<td>COM 112</td>
<td>Interpersonal Communication</td>
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Mathematical Sciences

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<tr>
<td>MA 141</td>
<td>Calculus I 1</td>
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<td>MA 241</td>
<td>Calculus II 1</td>
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<td>MA 242</td>
<td>Calculus III 1</td>
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<td>MA 225</td>
<td>Foundations of Advanced Mathematics 1</td>
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<td>MA 405</td>
<td>Introduction to Linear Algebra 1</td>
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<td>MA 408</td>
<td>Foundations of Euclidean Geometry 1</td>
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<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models 1</td>
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Statistics Specialization

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<td>ST 311</td>
<td>Introduction to Statistics 1</td>
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<td>ST 312</td>
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<td>ST 307</td>
<td>Introduction to Statistical Programming - SAS 1</td>
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<td>Introduction to Mathematical Statistics I 1</td>
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<td>Introduction to Mathematical Statistics II 1</td>
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Natural Sciences

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<th>Code</th>
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<td>Natural Science Lab Course Elective (p. 432) 2</td>
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<td>GEP Natural Sciences (p. 1429) 2</td>
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Professional Education Requirements

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<tr>
<td>ED 100</td>
<td>Intro to Education 1</td>
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<td>Educational Psychology 1</td>
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<td>ELP 344</td>
<td>School and Society 1</td>
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<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom 1</td>
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<td>EMS 204</td>
<td>Introduction to Mathematics Education 3</td>
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<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools 1</td>
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<td>ED 311</td>
<td>Classroom Assessment Principles and Practices 1</td>
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<td>ED 312</td>
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<td>EMS 480</td>
<td>Teaching Mathematics with Technology 1</td>
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<td>Methods and Materials for Teaching Mathematics 1</td>
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<td>EMS 471</td>
<td>Student Teaching in Mathematics 1</td>
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<td>EMS 472</td>
<td>Teaching Mathematics Topics in Senior High School 1</td>
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<td>EMS 490</td>
<td>School Mathematics from an Advanced Perspective 1</td>
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General Education Program (GEP) Courses

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Total Hours 120
1 A grade of C or higher is required.
2 A grade of C- or higher is required.
3 A grade of B- or higher is required.

Natural Science Lab Course Elective

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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<td>PY 201</td>
<td>University Physics I</td>
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Semester Sequence

This is a sample.

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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>E 115 or COS 100</td>
<td>Introduction to Computing Environments or Science of Change</td>
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<tr>
<td>ED 100</td>
<td>Intro to Education</td>
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<td>MA 241</td>
<td>Calculus II</td>
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<td>COM 112</td>
<td>Interpersonal Communication</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>EMS 472</td>
<td>Teaching Mathematics Topics in Senior High School</td>
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<td>EMS 490</td>
<td>School Mathematics from an Advanced Perspective</td>
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<td>EMS 470</td>
<td>Methods and Materials for Teaching Mathematics</td>
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<td>Classroom Assessment Principles and Practices</td>
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<td>Classroom Assessment Principles and Practices Professional Learning Lab</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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Spring Semester

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<tr>
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<td>Introduction to Mathematical Statistics I</td>
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<td>Introduction to Discrete Mathematical Models</td>
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<td>ELP 344</td>
<td>School and Society</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Science</td>
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Second Year

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<tr>
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<td>Foundations of Advanced Mathematics</td>
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<td>Introduction to Mathematics Education</td>
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Fourth Year

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<td>EMS 490</td>
<td>School Mathematics from an Advanced Perspective</td>
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<tr>
<td>EMS 470</td>
<td>Methods and Materials for Teaching Mathematics</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
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Spring Semester

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<tbody>
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Notes:
1. A grade of C or higher is required.
2. A grade of C- or higher is required.
3. A grade of B- or higher is required.
EMS 495 Senior Seminar in Mathematics and Science Education 2

Hours 12

Total Hours 120

1 At most one grade below a C is permitted in the mathematics, statistics, and computer science courses.
2 At most one grade below a C- is permitted in the courses satisfying the science requirement.
3 A grade below a B- is not permitted.

Mathematics Education, Secondary

The degree of Bachelor of Science in Mathematics Education may be obtained by selecting one of 4 concentrations offered by the Department of STEM Education in the College of Education: Middle Grades Mathematics, Mathematics Specialization, Statistics Specialization, or Computer Science Specialization. In addition, there are two dual major options: Mathematics and Math Education, and Statistics and Math Education.

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Program Coordinator:
Dr. Cyndi Edgington
Email: cpedging@ncsu.edu
502J Poe Hall
919-515-1754

Faculty

Coordinator of Advising
Cyndi Edgington, Assistant Teaching Professor

Middle Grades Education (BS), Mathematics and Sciences Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Plan Requirements

Middle Grades Education (BS): Mathematics and Sciences Concentration: 121 Total Units

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<tr>
<th>Code</th>
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<tr>
<td>COM 112</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>HI 321</td>
<td>Scientific Revolution and European Society, 1500-1800</td>
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<tr>
<td>HI 322</td>
<td>Rise of Modern Science</td>
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<td>Science and Civilization</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>ST 371</td>
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Mathematics Elective (p. 434) 3

Sciencs
### Mathematics Electives

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<td>ECG 528</td>
<td>Options and Derivatives Pricing</td>
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### MA 440
Game Theory 3

### MA 444
Problem Solving Strategies for Competitions 1

### MA 450
Methods of Applied Mathematics I 3

### MA 451
Methods of Applied Mathematics II 3

### MA 491
Reading in Honors Mathematics 1-6

### MA 493
Special Topics in Mathematics 1-6

### MA 494
Major Paper in Math 1

### MA 499
Independent Research in Mathematics 1-6

### MA 501
Advanced Mathematics for Engineers and Scientists I 3

### MA 502
Advanced Mathematics for Engineers and Scientists II 3

### MA 504
Introduction to Mathematical Programming 3

### MA 507
Survey of Real Analysis 3

### MA 508
Geometry For Secondary Teachers 3

### MA 509
Survey of Abstract Algebra 3

### MA 510
Selected Topics In Mathematics For Secondary Teachers 1-6

### MA 511
Advanced Calculus I 3

### MA 512
Advanced Calculus II 3

### MA 513
Introduction To Complex Variables 3

### MA 515
Analysis I 3

### MA 518
Geometry of Curves and Surfaces 3

### MA 520
Linear Algebra 3

### MA 521
Abstract Algebra I 3

### MA 522
Computer Algebra 3

### MA 523
Linear Transformations and Matrix Theory 3

### MA 524
Combinatorics I 3

### MA 526
Algebraic Geometry 3

### MA 528
Options and Derivatives Pricing 3

### MA 531
Dynamic Systems and Multivariable Control I 3

### MA 532
Ordinary Differential Equations I 3

### MA 534
Introduction To Partial Differential Equations 3

### MA 537
Nonlinear Dynamics and Chaos 3

### MA 540
Uncertainty Quantification for Physical and Biological Models 3

### MA 544
Computer Experiments In Mathematical Probability 3

### MA 546
Probability and Stochastic Processes I 3

### MA 547
Financial Mathematics 3

### MA 548
Monte Carlo Methods for Financial Math 3

### MA 549
Financial Risk Analysis 3

### MA 551
Introduction to Topology 3

### MA 555
Introduction to Manifold Theory 3

### MA 561
Set Theory and Foundations Of Mathematics 3

### MA 565
Graph Theory 3

### MA 573
Mathematical Modeling of Physical and Biological Processes I 3

### MA 574
Mathematical Modeling of Physical and Biological Processes II 3

### MA 580
Numerical Analysis I 3

### MA 583
Introduction to Parallel Computing 3

### MA 584
Numerical Solution of Partial Differential Equations--Finite Difference Methods 3

### MA 587
Numerical Solution of Partial Differential Equations--Finite Element Method 3

### MA 591
Special Topics 1-6

### MBA 528
Options and Derivatives Pricing 3

### MEA 315
Mathematics Methods in Atmospheric Sciences 4

### OR 504
Introduction to Mathematical Programming 3

### OR 505
Linear Programming 3

### OR 531
Dynamic Systems and Multivariable Control I 3

### OR 565
Graph Theory 3

### ST 412
Long-Term Actuarial Models 3

### ST 413
Short-Term Actuarial Models 3

### ST 546
Probability and Stochastic Processes I 3

---

### Middle Grades Education (BS): Mathematics and Sciences (13MIDEDBS-13MIDEDMSD)

#### Semester Sequence

This is a sample.

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<th>Course</th>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>MEA 110</td>
<td>Geology I Laboratory</td>
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<td>Chemistry - A Quantitative Science</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<td>MA 241</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td><strong>Total Hours</strong></td>
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<tr>
<td><strong>Second Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>Introduction to Computers and Their Uses</td>
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<td>Introduction to Weather and Climate</td>
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<td>Introduction to Weather and Climate Laboratory</td>
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<td>GEP Additional Breadth (p. 1417)</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>PY 131</td>
<td>Conceptual Physics</td>
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Science Education (BS): Biology Concentration

The Science Education: Biology concentration (BS) degree is one of five undergraduate degree options in the Science Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the pedagogical strategies to teach high school Biology. Students complete courses focused on Biology and Science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
- Context knowledge — understanding the culture of the school, community and society in which educational institutions exist and function

Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website.

Department of STEM Education
North Carolina State University
208 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Plan Requirements

Science Education (BS): Biology Concentration: 120 Total Units
Select one of the following:

1. A grade of C or higher is required.
2. A grade of C- or higher is required.
3. A grade of B- or higher is required.
4. Students should consult their academic advisors to determine which courses fill this requirement.

Social Sciences Electives

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<td>EDP 304</td>
<td>Educational Psychology</td>
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HI/PHI of Science & SS Electives

Select one of the following:

1. HI 321 Scientific Revolution and European Society, 1500-1800
2. HI 322 Rise of Modern Science
3. HI 341 Technology in History
4. PHI 340 Philosophy of Science
5. STS 301 Science and Civilization

Social Sciences Elective (p. 437)

GEP Courses

1. GEP Humanities (p. 1423)
2. GEP Health and Exercise Studies (p. 1422)
3. GEP Interdisciplinary Perspectives (p. 1426)
4. GEP U.S. Diversity (p. 1431) (verify requirement)
5. GEP Global Knowledge (p. 1419) (verify requirement)
6. Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) 4 1 1

Total Hours 120

Social Sciences Electives

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Social Sciences ANT

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<td>ANT 252</td>
<td>Cultural Anthropology</td>
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<td>ANT 253</td>
<td>Unearthing the Past: Introduction to World Archaeology</td>
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<td>ANT 254</td>
<td>Language and Culture</td>
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<td>ANT 261</td>
<td>Technology in Society and Culture</td>
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<td>ANT 310</td>
<td>Native Peoples and Cultures of North America</td>
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<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
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<td>ANT 325</td>
<td>Andean South America</td>
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<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
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<td>ANT 371</td>
<td>Human Variation</td>
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<td>ANT 389</td>
<td>Fundamentals of Archaeological Research</td>
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<td>SOC 261</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>ARE 311</td>
<td>Agricultural Markets</td>
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<td>ARE 433</td>
<td>U.S. Agricultural Policy</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
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<td>COM 292</td>
<td>Language, Communication, and Culture</td>
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<td>Renewable Natural Resource Management and Policy</td>
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<td>Principles of Geography</td>
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<td>SOC 220</td>
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<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
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<td>Psychology of Gender</td>
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### Semester Sequence

This is a sample.

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<td>HI 322</td>
<td>Rise of Modern Science</td>
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<td>HI 341</td>
<td>Technology in History</td>
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<td>PHI 340</td>
<td>Philosophy of Science</td>
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<td>STS 301</td>
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<td>Introduction to Whole Plant Physiology</td>
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1 A grade of C or higher is required.
2 A grade of B- or higher is required.
3 If you are a BLS double major, choose MB 351 General Microbiology and MB 352 General Microbiology Laboratory
4 A grade of C (2.0) or better is required for core content courses, up to two courses with a grade below a C is permitted.
Science Education (BS): Chemistry Concentration

The Science Education: Chemistry concentration (BS) degree is one of five undergraduate degree options in the Science Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the pedagogical strategies to teach high school Chemistry. Students complete courses focused on Chemistry and Science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
- Context knowledge — understanding the culture of the school, community and society in which educational institutions exist and function

Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website.

Department of STEM Education
North Carolina State University
208 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Plan Requirements

Science Education (BS), Chemistry Concentration (13SCIEDBS): 120 Total Units

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<td>MA 141</td>
<td>Calculus I</td>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>Chemistry - A Molecular Science</td>
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<td>CH 205</td>
<td>Physics for Engineers and Scientists Laboratory</td>
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<td>CH 208</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<td>CH 331</td>
<td>Introductory Physical Chemistry</td>
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<td>CH 401</td>
<td>Systematic Inorganic Chemistry I</td>
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<td>EMS 205</td>
<td>Introduction to Teaching Science</td>
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Science Education

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Education and Psychology

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<td>Classroom Assessment Principles and Practices</td>
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<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
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### Social Sciences Electives

**GEP Courses**
- GEP Humanities (p. 1423) 6
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) 3
- GEP U.S. Diversity (p. 1431) (verify requirement) 3
- GEP Global Knowledge (p. 1419) (verify requirement) 4
- Foreign Language Proficiency (p. 1417) (verify requirement)

**Hi/PHI of Science & SS Electives**

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**Social Sciences Electives**

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**Social Sciences COM**
- COM 112 | Interpersonal Communication | 3 |
- COM 289 | Science Communication and Public Engagement | 3 |
- COM 292 | Language, Communication, and Culture | 3 |
- COM 392 | International and Crosscultural Communication | 3 |
- HSS 392 | International and Crosscultural Communication | 3 |

**Social Sciences EC**
- EC 201 | Principles of Microeconomics | 3 |
- EC 202 | Principles of Macroeconomics | 3 |
- EC 205 | Fundamentals of Economics | 3 |

**Social Sciences ENG**
- ENG 210 | Introduction to Language and Linguistics | 3 |

**Social Sciences FOR**
- FOR 472 | Forest Soils | 4 |
- NR 460 | Renewable Natural Resource Management and Policy | 3 |
- NR 560 | Renewable Natural Resource Management and Policy | 3 |

**Social Sciences GEO**
- GEO 200 | Principles of Geography | 3 |
- GEO 220 | Cultural Geography | 3 |
- SOC 220 | Cultural Geography | 3 |

**Social Sciences Catch All**
- AEE 323 | Leadership Development in Agriculture and Life Sciences | 3 |
- AS 321 | Leading People and Effective Communication I | 3 |
- COM 392 | International and Crosscultural Communication | 3 |
- HON 295 | Honors Special Topics-Social Science | 3 |
- HSS 392 | International and Crosscultural Communication | 3 |
- MS 302 | Applied Leadership in Small Unit Operations | 3 |
- NR 219 | Natural Resource Markets | 3 |
- NS 210 | Leadership and Management | 3 |
- SSGE 295 | Social Sciences Special Topics | 3 |
- SSGE 295 | Social Sciences and Global Knowledge Special Topics | 3 |
- SSUS 295 | Social Sciences and U.S. Diversity Special Topics | 3 |

**Social Sciences PRT**
- PRT 152 | Introduction to Parks, Recreation and Tourism | 3 |
- PRT 200 | Health, Wellness and the Pursuit of Happiness | 3 |

**Social Sciences PS**
- LPS 315 | Public Leadership | 3 |
- PS 201 | American Politics and Government | 3 |
- PS 202 | State and Local Government | 3 |
- PS 203 | Introduction to Nonprofits | 3 |
- PS 231 | Introduction to International Relations | 3 |
- PS 236 | Issues in Global Politics | 3 |
- PS 241 | Introduction to Comparative Politics | 3 |
- PS 301 | The Presidency and Congress | 3 |
- PS 302 | Campaigns and Elections in the US Political System | 3 |
- PS 303 | Race in U.S. Politics | 3 |

**Notes:**
1. A grade of C or higher is required.
2. A grade of C- or higher is required.
3. A grade of B- or higher is required.
### Semester Sequence

This is a sample.

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<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>ED 100</td>
<td>Intro to Education</td>
<td>2</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
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<tr>
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<td>Philosophy of Science</td>
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<td>STS 301</td>
<td>Science and Civilization</td>
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### Social Sciences SOC

AFS 305 | Racial and Ethnic Relations | 3 |
ANT 261 | Technology in Society and Culture | 3 |
GEO 220 | Cultural Geography | 3 |
SOC 202 | Principles of Sociology | 3 |
SOC 203 | Current Social Problems | 3 |
SOC 203A | Current Social Problems | 3 |
SOC 204 | Sociology of Family | 3 |
SOC 205 | Jobs and Work | 3 |
SOC 206 | Social Deviance | 3 |
SOC 207 | Language and Society | 3 |
SOC 220 | Cultural Geography | 3 |
SOC 241 | Sociology of Agriculture and Rural Society | 3 |
SOC 241A | Sociology of Agriculture and Rural Society | 3 |
SOC 261 | Technology in Society and Culture | 3 |
SOC 300 | Social Research Methods | 4 |
SOC 301 | Human Behavior | 3 |
SOC 304 | Gender and Society | 3 |
SOC 305 | Racial and Ethnic Relations | 3 |
SOC 306 | Criminology | 3 |
SOC 311 | Community Relationships | 3 |
SOC 342 | International Development | 3 |
SOC 351 | Population and Planning | 3 |
WGS 204 | Sociology of Family | 3 |
WGS 304 | Gender and Society | 3 |

### Social Sciences WGS

ENG 308 | Contemporary Issues in Ecofeminism | 3 |
PS 306 | Gender and Politics in the United States | 3 |
PSY 406 | Psychology of Gender | 3 |
SOC 204 | Sociology of Family | 3 |
SOC 304 | Gender and Society | 3 |
WGS 204 | Sociology of Family | 3 |
WGS 304 | Gender and Society | 3 |
WGS 306 | Gender and Politics in the United States | 3 |
WGS 308 | Contemporary Issues in Ecofeminism | 3 |
WGS 406 | Psychology of Gender | 3 |
The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
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Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website.

Department of STEM Education
North Carolina State University
208 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Plan Requirements

Science Education (BS): Earth Science Concentration: 120 Total Units

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1 A grade of C or higher is required.
2 A grade of C (2.0) or better is required for core content courses. Up to two courses with a grade below a “C” is permitted
3 B- or better is required
CH 102  General Chemistry Laboratory 1  1
CH 201  Chemistry - A Quantitative Science 1  3
CH 202  Quantitative Chemistry Laboratory 1  1
MEA 101  Geology I: Physical 1  3
MEA 110  Geology I Laboratory 1  1
MEA 130  Introduction to Weather and Climate 1  3
MEA 202  Geology II: Historical 1  3
MEA 200  Introduction to Oceanography 1  3
MEA 410  Introduction to Mineralogy and Petrology 1  4
MEA 451  Structural Geology 1  4
PY 211  College Physics I 1  4
PY 212  College Physics II 1  4
PY 123  Stellar and Galactic Astronomy 1  3
or PY 124  Solar System Astronomy
ES 200  Climate Change and Sustainability 1  3

Science Education
EMS 205  Introduction to Teaching Science 3  2
EMS 373  Instructional Materials in Science 1  3
EMS 375  Methods of Teaching Science I 3  3
EMS 475  Methods of Teaching Science II 3  3
EMS 476  Student Teaching in Science 1  10
EMS 495  Senior Seminar in Mathematics and Science Education 1  2

Education and Psychology
ED 204  Introduction to Teaching in Today's Schools 1  2
ELP 344  School and Society 1  3
ED 311  Classroom Assessment Principles and Practices 1  2
ED 312  Classroom Assessment Principles and Practices Professional Learning Lab 1  1
ECI 416  Teaching Exceptional Students in the Mainstreamed Classroom 1  3
EDP 304  Educational Psychology 1  3

Hi/PHI of Science & SS Electives
Select one of the following:
 HI 321  Scientific Revolution and European Society, 1500-1800
 HI 322  Rise of Modern Science
 HI 341  Technology in History
 PHI 340  Philosophy of Science
 STS 301  Science and Civilization

Social Sciences Elective (p. 444)  3

GEP Courses
GEP Humanities (p. 1423)  6
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours  120

1  A grade of C or higher is required.
2  A grade of C- or higher is required.
3  A grade of B- or higher is required.

Social Sciences Electives

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Social Sciences ANT

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<td>ANT 253</td>
<td>Unearthing the Past: Introduction to World Archaeology</td>
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<td>Language and Culture</td>
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<td>Technology in Society and Culture</td>
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<td>ANT 310</td>
<td>Native Peoples and Cultures of North America</td>
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<td>ANT 315</td>
<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
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<td>ANT 325</td>
<td>Andean South America</td>
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<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<td>Peoples and Cultures of Southeast Asia</td>
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<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
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<td>ANT 371</td>
<td>Human Variation</td>
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<td>ANT 389</td>
<td>Fundamentals of Archaeological Research</td>
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<td>COM 292</td>
<td>Language, Communication, and Culture</td>
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Social Sciences GEO
SOC 200 Principles of Geography 3
SOC 200 Cultural Geography 3
SOC 220 Cultural Geography 3

Social Sciences Catch All
AEE 323 Leadership Development in Agriculture and Life Sciences 3
AS 321 Leading People and Effective Communication I 3
COM 392 International and Crosscultural Communication 3
HON 295 Honors Special Topics-Social Science 3
HSS 392 International and Crosscultural Communication 3
MS 302 Applied Leadership in Small Unit Operations 3
NR 219 Natural Resource Markets 3
NS 210 Leadership and Management 3
SSGE 295 Social Sciences Special Topics 3
SSGK 295 Social Sciences and Global Knowledge Special Topics 3
SSUS 295 Social Sciences and U.S. Diversity Special Topics 3

Social Sciences PS
LPS 315 Public Leadership 3
PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 203 Introduction to Nonprofits 3
PS 231 Introduction to International Relations 3
PS 236 Issues in Global Politics 3
PS 241 Introduction to Comparative Politics 3
PS 301 The Presidency and Congress 3
PS 302 Campaigns and Elections in the US Political System 3
PS 303 Race in U.S. Politics 3
PS 305 The Justice System in the American Political Process 3
PS 309 Equality and Justice in United States Law 3
PS 310 Public Policy 3
PS 312 Introduction to Public Administration 3
PS 314 Science, Technology and Public Policy 3
PS 320 U.S. Environmental Law and Politics 3
PS 331 U.S. Foreign Policy 3
PS 335 International Law 3
PS 336 Global Environmental Politics 3
PS 341 European Politics 3
PS 342 Politics of China and Japan 3
PS 345 Governments and Politics in the Middle East 3
PS 353 Issues in Latin American and Caribbean Politics 3

Social Sciences SOC
AFS 305 Racial and Ethnic Relations 3
ANT 261 Technology in Society and Culture 3
GEO 220 Cultural Geography 3
SOC 202 Principles of Sociology 3
SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 261 Technology in Society and Culture 3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 351 Population and Planning 3
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3

Social Sciences WGS
ENG 308 Contemporary Issues in Ecofeminism 3
PS 306 Gender and Politics in the United States 3
PSY 406 Psychology of Gender 3
SOC 204 Sociology of Family 3
SOC 304 Gender and Society 3
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 306 Gender and Politics in the United States 3
WGS 308 Contemporary Issues in Ecofeminism 3
WGS 406 Psychology of Gender 3

Semester Sequence
This is a sample.

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<td>CH 201</td>
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<tr>
<td>or MA 241</td>
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</table>
The Science Education: Middle Grades Science concentration (BS) degree is one of five undergraduate degree options in the Science Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the pedagogical strategies to teach science in the middle grades. Students complete courses focused on the sciences and science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 6-8. They will be able to seek employment opportunities in education and make a positive difference in their communities.

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• The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
• Outreach and tutoring in local schools

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Department of STEM Education
North Carolina State University
208 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Plan Requirements

Science Education (BS): Middle Grades Science Concentration: 120

Total Units

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Mathematical and Natural Sciences

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<td>PY 131</td>
<td>Conceptual Physics ¹</td>
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<tr>
<td>PY 124</td>
<td>Solar System Astronomy ¹</td>
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<tr>
<td>BIO 105</td>
<td>Biology in the Modern World ¹</td>
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<tr>
<td>PB 213</td>
<td>Plants and Civilization ¹</td>
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<td>FS 201</td>
<td>Introduction to Food Science ¹</td>
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<td>GN 301</td>
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<td>Introduction to Human Nutrition ¹</td>
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Science Electives ¹,³

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<td>Classroom Assessment Principles and Practices Professional Learning Lab ¹</td>
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HI/PHI of Science & SS Electives

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<td>PHI 340</td>
<td>Philosophy of Science</td>
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Social Sciences Elective (p. 447)

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Social Sciences Electives

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Social Sciences ANT

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<td>Cultural Anthropology</td>
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<td>Unearthing the Past: Introduction to World Archaeology</td>
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Social Sciences ANS

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<td>ANT 261</td>
<td>Technology in Society and Culture</td>
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<td>ANT 310</td>
<td>Native Peoples and Cultures of North America</td>
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<td>ANT 315</td>
<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
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Social Sciences ANT

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<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<td>ANT 346</td>
<td>Peoples and Cultures of Southeast Asia</td>
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<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
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¹ A grade of C or higher is required.
² A grade of C- or higher is required.
³ Students should consult their academic advisors to determine how to complete this requirement.
⁴ A grade of B- or higher is required.

Total Hours 120
ANT 371 Human Variation 3
ANT 389 Fundamentals of Archaeological Research 3
SOC 261 Technology in Society and Culture 3

Social Sciences ARE
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
ARE 301 Intermediate Microeconomics 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 433 U.S. Agricultural Policy 3
EC 301 Intermediate Microeconomics 3

Social Sciences COM
COM 112 Interpersonal Communication 3
COM 289 Science Communication and Public Engagement 3
COM 292 Language, Communication, and Culture 3
COM 392 International and Crosscultural Communication 3
HSS 392 International and Crosscultural Communication 3

Social Sciences EC
EC 201 Principles of Microeconomics 3
EC 202 Principles of Macroeconomics 3
EC 205 Fundamentals of Economics 3

Social Sciences ENG
ENG 210 Introduction to Language and Linguistics 3

Social Sciences FOR
FOR 472 Forest Soils 4
NR 460 Renewable Natural Resource Management and Policy 3
NR 560 Renewable Natural Resource Management and Policy 3

Social Sciences GEO
GEO 200 Principles of Geography 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3

Social Sciences Catch All
AEE 323 Leadership Development in Agriculture and Life Sciences 3
AS 321 Leading People and Effective Communication I 3
COM 392 International and Crosscultural Communication 3
HON 295 Honors Special Topics-Social Science 3
HSS 392 International and Crosscultural Communication 3
MS 302 Applied Leadership in Small Unit Operations 3
NR 219 Natural Resource Markets 3
NS 210 Leadership and Management 3
SSGE 295 Social Sciences Special Topics 3
SSGK 295 Social Sciences and Global Knowledge Special Topics 3
SSUS 295 Social Sciences and U.S. Diversity Special Topics 3

Social Sciences PRT
PRT 152 Introduction to Parks, Recreation and Tourism 3
PRT 200 Health, Wellness and the Pursuit of Happiness 3

Social Sciences PS
LPS 315 Public Leadership 3
PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 203 Introduction to Nonprofits 3
PS 231 Introduction to International Relations 3
PS 236 Issues in Global Politics 3
PS 241 Introduction to Comparative Politics 3
PS 301 The Presidency and Congress 3
PS 302 Campaigns and Elections in the US Political System 3
PS 303 Race in U.S. Politics 3
PS 305 The Justice System in the American Political Process 3
PS 309 Equality and Justice in United States Law 3
PS 310 Public Policy 3
PS 312 Introduction to Public Administration 3
PS 314 Science, Technology and Public Policy 3
PS 320 U.S. Environmental Law and Politics 3
PS 331 U.S. Foreign Policy 3
PS 335 International Law 3
PS 336 Global Environmental Politics 3
PS 341 European Politics 3
PS 342 Politics of China and Japan 3
PS 345 Governments and Politics in the Middle East 3
PS 353 Issues in Latin American and Caribbean Politics 3

Social Sciences SOC
AFS 305 Racial and Ethnic Relations 3
ANT 261 Technology in Society and Culture 3
GEO 220 Cultural Geography 3
SOC 202 Principles of Sociology 3
SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 261 Technology in Society and Culture 3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 351 Population and Planning 3
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3

Social Sciences WGS
ENG 308 Contemporary Issues in Ecofeminism 3
PS 306 Gender and Politics in the United States 3
PSY 406 Psychology of Gender 3
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<td>SOC 304</td>
<td>Gender and Society</td>
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<td>WGS 304</td>
<td>Gender and Society</td>
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<td>WGS 306</td>
<td>Gender and Politics in the United States</td>
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<td>Contemporary Issues in Ecofeminism</td>
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<td>WGS 406</td>
<td>Psychology of Gender</td>
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**Semester Sequence**

This is a sample.

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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>General Chemistry Laboratory</td>
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<td>Elements of Calculus</td>
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<td>Calculus for Life and Management Sciences A</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>COM 110</td>
<td>Public Speaking</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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1 A grade of C (2.0) or better is required for core content courses, up to two courses with a grade below a C is permitted.

2 A grade of C or higher is required.

3 B- or better is required

**Science Education (BS): Physics Concentration**

The Science Education: Physics concentration (BS) degree is one of five undergraduate degree options in the Science Education program in the Department of STEM Education.
This degree program prepares teacher-leaders to have a deep understanding of the pedagogical strategies to teach high school Physics. Students complete courses focused on Physics and Science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
- Context knowledge — understanding the culture of the school, community and society in which educational institutions exist and function

Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website.

Department of STEM Education
North Carolina State University
208 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

### Plan Requirements

#### Science Education (BS): Physics Concentration: 120 Total Units

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#### Sciences

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<td>CH 201</td>
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<td>or PY 124</td>
<td>Solar System Astronomy</td>
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<tr>
<td>SS 200</td>
<td>Climate Change and Sustainability</td>
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#### Science Education

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<tr>
<td>EMS 205</td>
<td>Introduction to Teaching Science</td>
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<tr>
<td>EMS 373</td>
<td>Instructional Materials in Science</td>
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<tr>
<td>EMS 375</td>
<td>Methods of Teaching Science I</td>
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<tr>
<td>EMS 475</td>
<td>Methods of Teaching Science II</td>
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<td>EMS 476</td>
<td>Student Teaching in Science</td>
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<tr>
<td>EMS 495</td>
<td>Senior Seminar in Mathematics and Science Education</td>
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#### Education and Psychology

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<tr>
<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools</td>
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<tr>
<td>ELP 344</td>
<td>School and Society</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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<tr>
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<td>Classroom Assessment Principles and Practices</td>
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<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
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<td>Educational Psychology</td>
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#### HI/PHI of Science & SS Electives

Select one of the following:

- HI 312 | Scientific Revolution and European Society, 1500-1800 | 3     |
- HI 341 | Technology in History                        |       |
- HI 342 | Rise of Modern Science                       |       |
- PHI 340| Philosophy of Science                        |       |
- STS 301| Science and Civilization                     |       |
- Social Sciences Elective (p. 451)            | 3     |

#### General Education Program (GEP) Courses

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<th>Code</th>
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<tr>
<td>GEP</td>
<td>Humanities (p. 1423)</td>
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<td>GEP</td>
<td>Health and Exercise Studies (p. 1422)</td>
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<td>GEP</td>
<td>Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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<tr>
<td>GEP</td>
<td>U.S. Diversity (p. 1431) (verify requirement)</td>
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</table>
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 120

1 A grade of C or higher is required.
2 A grade of C- or higher is required.
3 A grade of B- or higher is required.

Physics Electives

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<tr>
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<td>Fluid Physics</td>
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<tr>
<td>PY 125</td>
<td>Astronomy Laboratory</td>
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<tr>
<td>PY 203</td>
<td>University Physics III</td>
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<tr>
<td>PY 328</td>
<td>Stellar and Galactic Astrophysics</td>
<td>3</td>
</tr>
<tr>
<td>PY 341</td>
<td>Relativity, Gravitation and Cosmology</td>
<td>3</td>
</tr>
<tr>
<td>PY 401</td>
<td>Quantum Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PY 402</td>
<td>Quantum Physics II</td>
<td>3</td>
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<tr>
<td>PY 407</td>
<td>Introduction to Modern Physics</td>
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</tr>
<tr>
<td>PY 411</td>
<td>Mechanics I</td>
<td>3</td>
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<tr>
<td>PY 412</td>
<td>Mechanics II</td>
<td>3</td>
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<tr>
<td>PY 413</td>
<td>Thermal Physics</td>
<td>3</td>
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<tr>
<td>PY 414</td>
<td>Electromagnetism I</td>
<td>3</td>
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<tr>
<td>PY 415</td>
<td>Electromagnetism II</td>
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<td>PY 499</td>
<td>Independent Research in Physics</td>
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<td>Mechanics I</td>
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<td>PY 512</td>
<td>Mechanics II</td>
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<td>Electromagnetism I</td>
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</tr>
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<td>PY 515</td>
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Social Sciences Electives

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<td>ANT 251</td>
<td>Physical Anthropology</td>
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<td>ANT 252</td>
<td>Cultural Anthropology</td>
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<td>ANT 253</td>
<td>Unearthing the Past: Introduction to World Archaeology</td>
<td>3</td>
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<td>ANT 254</td>
<td>Language and Culture</td>
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<td>ANT 261</td>
<td>Technology in Society and Culture</td>
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<tr>
<td>ANT 310</td>
<td>Native Peoples and Cultures of North America</td>
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<tr>
<td>ANT 315</td>
<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
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<td>ANT 325</td>
<td>Andean South America</td>
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<tr>
<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<tr>
<td>ANT 346</td>
<td>Peoples and Cultures of Southeast Asia</td>
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<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
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<td>ANT 371</td>
<td>Human Variation</td>
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<td>ANT 389</td>
<td>Fundamentals of Archaeological Research</td>
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<td>SOC 261</td>
<td>Technology in Society and Culture</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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Social Sciences COM

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<td>COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
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<tr>
<td>COM 292</td>
<td>Language, Communication, and Culture</td>
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<td>HSS 392</td>
<td>International and Crosscultural Communication</td>
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Social Sciences EC

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<td>EC 202</td>
<td>Principles of Macroeconomics</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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Social Sciences ENG

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<tr>
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<td>Introduction to Language and Linguistics</td>
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Social Sciences FOR

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<td>FOR 472</td>
<td>Forest Soils</td>
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<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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Social Sciences GEO

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<tr>
<td>GEO 200</td>
<td>Principles of Geography</td>
<td>3</td>
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<tr>
<td>GEO 220</td>
<td>Cultural Geography</td>
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<td>SOC 220</td>
<td>Cultural Geography</td>
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Social Sciences Catch All

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<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
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<td>AS 321</td>
<td>Leading People and Effective Communication I</td>
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<tr>
<td>COM 392</td>
<td>International and Crosscultural Communication</td>
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<tr>
<td>HON 295</td>
<td>Honors Special Topics-Social Science</td>
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<tr>
<td>HSS 392</td>
<td>International and Crosscultural Communication</td>
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<tr>
<td>MS 302</td>
<td>Applied Leadership in Small Unit Operations</td>
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<tr>
<td>NR 219</td>
<td>Natural Resource Markets</td>
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<td>NS 210</td>
<td>Leadership and Management</td>
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<tr>
<td>SSGE 295</td>
<td>Social Sciences Special Topics</td>
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<td>SSGK 295</td>
<td>Social Sciences and Global Knowledge Special Topics</td>
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<td>Social Sciences and U.S. Diversity Special Topics</td>
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Social Sciences PRT

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<tr>
<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism</td>
<td>3</td>
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<td>PRT 200</td>
<td>Health, Wellness and the Pursuit of Happiness</td>
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Social Sciences PS

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<td>PS 201</td>
<td>American Politics and Government</td>
<td>3</td>
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<td>PS 202</td>
<td>State and Local Government</td>
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<tr>
<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<td>PS 231</td>
<td>Introduction to International Relations</td>
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<td>PS 236</td>
<td>Issues in Global Politics</td>
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<td>PS 241</td>
<td>Introduction to Comparative Politics</td>
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<td>PS 301</td>
<td>The Presidency and Congress</td>
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### Semester Sequence

This is a sample.

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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>ED 100</td>
<td>Intro to Education</td>
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<tr>
<td>PY 201</td>
<td>University Physics I</td>
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<tr>
<td>or PY 205</td>
<td>or Physics for Engineers and Scientists I</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>MA 141</td>
<td>Calculus I</td>
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<td>Academic Writing and Research</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>MA 242</td>
<td>Calculus III</td>
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<td>Public Speaking</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>PY 123</td>
<td>Stellar and Galactic Astronomy</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>Introduction to Teaching in Today’s Schools</td>
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<td>Geology I: Physical</td>
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<tr>
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<td>Geology I Laboratory</td>
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</table>
Science Education, Secondary

The degree of Bachelor of Science in Science Education may be obtained by selecting one of 5 concentrations offered by the Department of STEM Education in the College of Education: Secondary Science Physics, Secondary Science Biology, Secondary Science Earth Sciences, Secondary Science Chemistry, Middle Grades Science. There is a crucial need for experienced classroom science teachers and double majoring is a path to earn a degree that can be used to teach either middle or high school sciences. The Science Education degree program prepares teacher-leaders to have a deep understanding of the sciences they will teach as well as the ability to demonstrate different pedagogical strategies in the classroom. Students complete courses focused on science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 6-8 or 9-12 sciences. They will be able to seek employment opportunities in education and make a positive difference in their communities.

The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
- Context knowledge — understanding the culture of the school, community and society in which educational institutions exist and function

Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website.

Faculty

Technology, Engineering and Design Education (BS), Graphic Communication Concentration

The degree of Bachelor of Science in Technology, Engineering, and Design Education is offered by the Department of STEM Education in the College of Education. With an emphasis on innovation and active learning, this program prepares individuals for a variety of engineering and design employment opportunities, including a teacher licensure option and a non-licensure graphics communications option.
Graphics Communications

Through the study of technical graphics language and design processes, students learn how to think in the language of graphics to effectively communicate ideas and solve technical problems. They actively visualize, design, model, simulate, analyze, and document solutions in technical graphics studies courses and explore the role graphics play in all areas of engineering.

The goals and objectives of the BS degree in Technology, Engineering, and Design Education: Graphic Communications Option are:

- Develop technical skills and an understanding of the technical graphics language
- Develop the ability to apply knowledge, skill and creativity in solving technical problems
- Understand and appreciate the historical evolution of graphic communications
- Understand and assess the impact of current technical graphics developments and trends
- Demonstrate an ability to teach others about graphic communications

For more information about this program, visit our website.

Department of Science, Technology, Engineering and Mathematics Education (STEM)
North Carolina State University
510 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Contact
Nolan Fahrer
Assistant Teaching Professor
nefahrer@ncsu.edu
919-515-1741

Plan Requirements

Technology, Engineering and Design Education (BS): Graphic Communication Concentration: 120 Total Units

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<tr>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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Professional Education

E 101 Introduction to Engineering & Problem Solving 2 1
or ED 100 Intro to Education
ELP 344 School and Society 2 3
EDP 304 Educational Psychology 2 3
TDE 452 Lab Planning in Technology Education 2 3
TDE 407 Field Work in Technology Education 2 6

GC Technical Electives

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Professional Technical Content

D 100 Design Inquiry I: Methods and Processes 2 3
or ISE 216 Product Development and Rapid Prototyping
GC 120 Foundations of Graphics 2 3
GC 250 Architectural Graphic Communications 2 3
TDE 110 Materials & Processes Technology 2 3
TDE 131 Technology through Engineering and Design I 2 3
TDE 205 Desktop Publishing and Imaging Technology 2 3
TDE 331 Technology Through Engineering and Design II 2 3
TDE 481 Research & Development in Technology Education 2 3

GEP Courses

GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

<table>
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<td>Free Electives 2</td>
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Total Hours 120

1 A grade of C- or higher is required.
2 A grade of C or higher is required.
3 Students should consult their academic advisors to determine which courses fill this requirement.

For more information about this program, visit our website.
### Management Electives

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<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
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<td>Racial and Ethnic Relations</td>
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<td>Technology in Society and Culture</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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<td>Financial Management</td>
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<td>Information Systems Management</td>
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<td>A Closer Look at Capitalism</td>
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<td>Issues in Business Ethics</td>
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<td>American Politics and Government</td>
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<td>Race in U.S. Politics</td>
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<td>Equality and Justice in United States Law</td>
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<td>Industrial and Organizational Psychology</td>
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<td>Jobs and Work</td>
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<td>ST 350</td>
<td>Economics and Business Statistics</td>
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<td>Introduction to Science, Technology, and Society</td>
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### GC Technical Electives

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<td>Basic Technical Animation</td>
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<td>GC 340</td>
<td>Concepts of Website Development</td>
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<td>GC 350</td>
<td>Applied CAD/D and Geometric Controls</td>
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<td>GC 420</td>
<td>Visual Thinking</td>
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<td>GC 450</td>
<td>Advanced Graphics Usage with CAD</td>
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<td>TDE 230</td>
<td>Scientific and Technical Visualization</td>
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<td>TDE 261</td>
<td>Digital Media Education</td>
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<td>TDE 351</td>
<td>Ceramics: The Art and Craft of Clay</td>
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<td>TDE 359</td>
<td>Electronics Technology</td>
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<td>TDE 371</td>
<td>Emerging Issues in Technology</td>
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<td>TDE 385</td>
<td>Robotics Education</td>
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### Semester Sequence

This is a sample.
# Technology, Engineering and Design Education (BS): Licensure Concentration

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<tr>
<th>Course</th>
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<td>ED 100 or E 101</td>
<td>Intro to Education or Introduction to Engineering &amp; Problem Solving</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>TDE 110</td>
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<td>Calculus I</td>
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<td>CH 100</td>
<td>Chemistry and Society</td>
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<tr>
<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<td>TDE 205</td>
<td>Desktop Publishing and Imaging Technology</td>
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<td>GC or TDE Technical Elective</td>
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<td>Physics for Engineers and Scientists I</td>
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1. A grade of C or higher is required.
2. Critical Path (CP): This course is required in the first year of TDE and part of the critical path.
3. A C- or better is required for courses in this category
4. Only one course in this category may be passed with a D. The other course must be at least a C-.

## Technology, Engineering and Design Education (BS): Licensure Concentration

The degree of Bachelor of Science in Technology, Engineering, and Design Education is offered by the Department of STEM Education in the College of Education. With an emphasis on innovation and active learning, this program prepares individuals for a variety of engineering and design employment opportunities, including a teacher licensure option and a non-licensure graphics communications option.

### Teacher Licensure

Through the study of engineering and design processes, students learn how to solve technological problems, invent and innovate. They actively design, model, simulate and analyze solutions to technological challenges, study courses and explore the contributions of systems engineering for developing and sustaining a well-designed world.
Methods in teaching middle and high school students about engineering and design processes are also covered.

The goals and objectives of the BS degree in Technology, Engineering, and Design Education: Teaching Licensure are:

- Develop technical skills and an understanding of technical processes
- Develop the ability to apply knowledge, skill and creativity in solving technical problems
- Understand and appreciate the historical evolution of technology
- Understand and assess the impact of current technological developments and trends
- Demonstrate an ability to teach others about technology

For more information about this program, visit our website.

Department of Science, Technology, Engineering and Mathematics Education (STEM)
North Carolina State University
510 Poe Hall, 2310 Stinson Drive
Raleigh, NC 27695

Contact
Nolan Fahrer
Assistant Teaching Professor
nefahrer@ncsu.edu
919-515-1741

Plan Requirements

Technology, Engineering and Design Education (BS): Licensure Concentration: 120 Total Units

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<thead>
<tr>
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Social Sciences and IP

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Mathematical and Natural Sciences

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Select one of the following:

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<tr>
<td>&amp; PY 206</td>
<td>and Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td>BIO 105</td>
<td>Biology in the Modern World</td>
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Professional Technical Content

<table>
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<tbody>
<tr>
<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
<td>3</td>
</tr>
<tr>
<td>or ISE 216</td>
<td>Product Development and Rapid Prototyping</td>
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<tr>
<td>GC 120</td>
<td>Foundations of Graphics</td>
<td>3</td>
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<tr>
<td>GC 250</td>
<td>Architectural Graphic Communications</td>
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<tr>
<td>TDE 110</td>
<td>Materials &amp; Processes Technology</td>
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</tr>
<tr>
<td>TDE 131</td>
<td>Technology through Engineering and Design I</td>
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</tr>
<tr>
<td>TDE 205</td>
<td>Desktop Publishing and Imaging Technology</td>
<td>3</td>
</tr>
<tr>
<td>TDE 331</td>
<td>Technology Through Engineering and Design II</td>
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<td>TDE 481</td>
<td>Research &amp; Development in Technology</td>
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TDE Technical Electives

TDE Technical Electives (p. 458) 1

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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>or ED 100</td>
<td>Intro to Education</td>
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<tr>
<td>ED 204</td>
<td>Introduction to Teaching in Today’s Schools</td>
<td>2</td>
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<tr>
<td>TDE 202</td>
<td>Introduction to Technology Engineering and Design Education</td>
<td>2</td>
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<td>ELP 344</td>
<td>School and Society</td>
<td>3</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
<td>2</td>
</tr>
<tr>
<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab 2</td>
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<td>EDP 304</td>
<td>Educational Psychology</td>
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<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
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<td>TDE 452</td>
<td>Lab Planning in Technology Education</td>
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<td>Curriculum and Methods in Technology Education</td>
<td>4</td>
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<td>TDE 457</td>
<td>Student Teaching in Technology Education</td>
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<tr>
<td>TDE 495</td>
<td>Senior Seminar in Technology Education</td>
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</table>

GEP Courses

GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives 3 3

Total Hours 120

1 A grade of C- or higher is required.
2 A grade of C or higher is required.
**TDE Technical Electives**

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<th>Code</th>
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<td>GC 330</td>
<td>Basic Technical Animation</td>
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<tr>
<td>GC 340</td>
<td>Concepts of Website Development</td>
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<tr>
<td>GC 350</td>
<td>Applied CAD/D and Geometric Controls</td>
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<tr>
<td>GC 420</td>
<td>Visual Thinking</td>
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<tr>
<td>GC 450</td>
<td>Advanced Graphics Usage with CAD</td>
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<tr>
<td>TDE 230</td>
<td>Scientific and Technical Visualization</td>
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<td>TDE 261</td>
<td>Digital Media Education</td>
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<td>TDE 351</td>
<td>Ceramics: The Art and Craft of Clay</td>
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<td>TDE 359</td>
<td>Electronics Technology</td>
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<td>TDE 371</td>
<td>Emerging Issues in Technology</td>
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<td>TDE 385</td>
<td>Robotics Education</td>
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**Semester Sequence**

This is a sample.

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<th>Course</th>
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<tr>
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<tr>
<td>ED 100</td>
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<td>or E 101</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>GC 120</td>
<td>Foundations of Graphics 1,2</td>
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<td>GEP Mathematical Sciences (p. 1428) 1,2</td>
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<tr>
<td>TDE 110</td>
<td>Materials &amp; Processes Technology</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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</tr>
<tr>
<td><strong>Hours</strong></td>
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<tr>
<td>CH 100</td>
<td>Chemistry and Society</td>
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<tr>
<td>CH 101/102</td>
<td>Chemistry - A Molecular Science</td>
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</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
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<tr>
<td>GC 250</td>
<td>Architectural Graphic Communications</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>Select one of the following: 1,2</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
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<tr>
<td><strong>Second Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td>PY 131</td>
<td>Conceptual Physics</td>
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<td>University Physics I</td>
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<td>PY 205/206</td>
<td>Physics for Engineers and Scientists I</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools 1,2</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>TDE 452</td>
<td>Lab Planning in Technology Education 1</td>
<td>3</td>
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<td>TDE 457</td>
<td>Student Teaching in Technology Education 1</td>
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<tr>
<td><strong>TDE 202</strong></td>
<td>Introduction to Teaching Technology 1,2</td>
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<tr>
<td><strong>TDE 131</strong></td>
<td>Technology through Engineering and Design I 1,2</td>
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<td><strong>TDE 205</strong></td>
<td>Desktop Publishing and Imaging Technology 1,2</td>
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**Spring Semester**

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<tr>
<td>BIO 105</td>
<td>Biology in the Modern World</td>
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<tr>
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<td>3</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<tr>
<td>ISE 216</td>
<td>Product Development and Rapid Prototyping 1 or Design Inquiry I: Methods and Processes</td>
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<tr>
<td>GC or TDE Technical Elective 3</td>
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**Third Year**

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<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab 1</td>
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<td>EDP 304</td>
<td>Educational Psychology 1</td>
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<td>ELP 344</td>
<td>School and Society 1</td>
<td>3</td>
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<td>GC or TDE Technical Elective 3</td>
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</tr>
<tr>
<td>GC or TDE Technical Elective 3</td>
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<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 100</td>
<td>Chemistry and Society</td>
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<td>CH 101/102</td>
<td>Chemistry - A Molecular Science</td>
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<td>COM 110</td>
<td>Public Speaking</td>
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<td>GC 250</td>
<td>Architectural Graphic Communications</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td></td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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**Fourth Year**

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<td>ECI 416</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>TDE 456</td>
<td>Curriculum and Methods in Technology Education</td>
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<tr>
<td>TDE 481</td>
<td>Research &amp; Development in Technology Education 1</td>
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<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<tr>
<td>TDE 452</td>
<td>Lab Planning in Technology Education 1</td>
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<tr>
<td>TDE 457</td>
<td>Student Teaching in Technology Education 1</td>
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</table>
TDE 495 Senior Seminar in Technology Education ³ ³

| Hours | 14 |

| Total Hours | 120-121 |

1. A grade of C or higher is required.
2. Critical Path (CP): This course is required in the first year of TDE and part of the critical path.
3. A grade of C- or higher is required.
4. Only one course in this category may be passed with a D. The other course must be at least a C-.

Technology, Engineering and Design Education (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Technology, Engineering and Design minor broadens students’ comprehension of the technological society in which they live. This is accomplished through the investigation and manipulation of tools, materials, and machines related to technology. Further, students experience technology coursework in applications such as information and communication systems; emerging technologies, robotics education, and evaluation of technological impacts on society, individuals, and culture. Minor programs are individually designed to meet the needs of the student and to complement their major.

Admissions

Students must submit a “Declare a Minor” form to the contact person below.

Certification

Prior to the end of the second week of the student’s final semester, the student must sign the Application for Minor form (provided by the minor contact person). This form is a list of all grades received in the courses to be considered for the minor as well as the courses to be taken during the student’s final semester.

Contact Person

Nolan Fahrer
STEM Education
510F Poe Hall
919.515.1741
nefahrer@ncsu.edu

Effective Date: 1/2012

SIS Code: 13TEM

Plan Requirements

• Complete a minimum of 16 hours of coursework in Technology, Engineering and Design Education
• A minimum grade of ‘C’ (2.0 or better must be achieved in each course counting towards the minor with the exception of TDE 490 Special Problems in Technology Education (an “S” is acceptable for this course).
• Students who have transfer credit from another institution that they believe is equivalent to GC 120 Foundations of Graphics should consult the contact person listed below for approval and inclusion in the minor.

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<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
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<td>GC 120</td>
<td>Foundations of Graphics</td>
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<tr>
<td>TDE 110</td>
<td>Materials &amp; Processes Technology</td>
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Elective Courses

Select three of the following:

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<tbody>
<tr>
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<td>Technology through Engineering and Design I</td>
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<td>Desktop Publishing and Imaging Technology</td>
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<td>TDE 261</td>
<td>Digital Media Education</td>
</tr>
<tr>
<td>TDE 331</td>
<td>Technology Through Engineering and Design II</td>
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<tr>
<td>TDE 351</td>
<td>Ceramics: The Art and Craft of Clay</td>
</tr>
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<td>TDE 359</td>
<td>Electronics Technology</td>
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<tr>
<td>TDE 371</td>
<td>Emerging Issues in Technology</td>
</tr>
<tr>
<td>TDE 385</td>
<td>Robotics Education</td>
</tr>
<tr>
<td>&amp; TDE 386</td>
<td>and Robotics Education Lab</td>
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<tr>
<td>TDE 481</td>
<td>Research &amp; Development in Technology Education</td>
</tr>
<tr>
<td>TDE 490</td>
<td>Special Problems in Technology Education</td>
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Total Hours: 15

Department of Teacher Education and Learning Sciences (TELS)

The TELS Department advances education through scholarship, leadership, and advocacy. We prepare professionals who are committed to equity and social justice, have deep content knowledge, demonstrate strong working knowledge of effective pedagogies, and realize the potential of digital technologies to enhance learning.

We shape the field of education by engaging in research that addresses current challenges, and by participating in cross-disciplinary work that deals with real problems in forward-looking ways. The department exemplifies an innovative merging of teacher education and the learning sciences that results in new pathways for teaching, scholarship, leadership, and service. The preparation that our students receive is unmatched in scope, priorities, and outcomes, assuring that our graduates are able to make profound contributions to education and society.

With over 300 undergraduate students, 250 graduate students, and 40 full-time faculty members, we offer three bachelor’s programs, two certificates, six master’s programs, and one PhD program. We are the place where a deep understanding of current issues in teaching and learning comes together with a forward-looking vision for the promises of equity and digital learning to push the field of education forward. Our nationally ranked graduate degree and certificate programs are led by faculty and staff who are committed to the success of our students.

For contact information and details of our undergraduate programs, visit our undergrad website.

Contact

John Lee
Department Head and Professor Department of Teacher Education and Learning Sciences
Faculty

Professors
Cathy Crossland, Director, Diagnostic Teaching Clinic
Jessica DeCuir-Gunby, Director, Doctoral Programs
John Lee, Department Head

Glenn Kleiman
Patricia Marshall
John Nietfeld
Kevin Oliver
Ed Sabornie
Hiller Spires

Associate Professors
Candy Beal
Sarah Carrier
Dennis Davis
Deniz Eseryel
DeLeon Gray
Jessica Hunt
Meghan Manfra
James Minogue, Director, Undergraduate Programs
Margareta Thomson
Temple Walkowiak
Angela Wiseman
Carl Young

Assistant Professors
Christy Byrd
Michelle Falter
Jill Grifenhagen
Shiyan Jiang
Crystal Lee
Paula McAvoy
Jamie Pearson
Jackie Relyea
Jonee Wilson

Teaching Associate Professors
Laura Bottomley
Valerie Faulkner
Ann Harrington
Linda McCabe Smith

Teaching Assistant Professors
Drinda Benge
Sarah Cannon
Micha Jeffries, Director, Master of Arts in Teaching Programs (MAT)
Joanna Koch
Julia McKeown

Lecturers
April Bartley
Cheryl Caddell
Marcia Davis
Kristin Hoffmann
Betsy Knight
Kari Kuebel
Melanie Smith

Coordinator, University-School Partnership
Keith Walkowiak

Plans
- Education, General Studies (BS) (p. 460)
- Elementary Education (BS): Science, Technology, Engineering, and Mathematics Concentration (p. 462)
- Middle Grades Education (BS): Language Arts and Social Studies Concentration (p. 466)
- Middle Grades Language Arts and Social Studies Program (MSL) (p. 468)

Education, General Studies (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas)!
### Plan Requirements

**Education, General Studies (BS): 120 Total Units**

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<td>- COM 112 Interpersonal Communication</td>
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<td>- COM 211 Argumentation and Advocacy</td>
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<td></td>
<td><strong>Humanities &amp; Social Sciences</strong></td>
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<tr>
<td>PSY 200</td>
<td>Introduction to Psychology</td>
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<td>SOC 202</td>
<td>Principles of Sociology</td>
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<td>History Elective (p. 461)</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>School and Society</td>
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<td>- PSY 475 Child Psychology</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematics Sciences/Natural Sciences/Engineering)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine how to complete this requirement.

### Advanced Writing Electives

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<td>Fiction Writing</td>
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<td>ENG 289</td>
<td>Poetry Writing</td>
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<td>ENG 292</td>
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<td>Introduction to News and Article Writing</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>ENG 332</td>
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<td>ENG 333</td>
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### History Electives

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<td>AFS 276</td>
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<td>HI 205</td>
<td>Western Civilization Since 1400</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>American History I</td>
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<td>HI 252</td>
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<td>HI 264</td>
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<td>HON 290</td>
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<td>HON 293</td>
<td>Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge</td>
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### Semester Sequence

This is a sample.

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<td><strong>Spring Semester</strong></td>
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<td>Introduction to Statistics</td>
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<tr>
<td>SOC 202</td>
<td>Principles of Sociology</td>
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Elementary Education (BS): Science, Technology, Engineering, and Mathematics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Plan Requirements

Elementary Education (BS): Science, Technology, Engineering, and Mathematics Concentration: 120 Total Units

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<td>Calculus for Elementary Education I</td>
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<td>Calculus for Elementary Education II</td>
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<td>Chemistry - A Molecular Science &amp; CH 102 and General Chemistry Laboratory</td>
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1. Must earn a grade of C (2.0) or better.
### STEM Concentration: Additional Math Electives

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<td>Topics in Contemporary Mathematics</td>
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<td>MA 105</td>
<td>Mathematics of Finance</td>
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<td>MA 107</td>
<td>Precalculus I</td>
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<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<td>Introduction to Finite Mathematics with Applications</td>
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<td>MA 205</td>
<td>Elements of Matrix Computations</td>
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<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<td>ANS 208</td>
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<td>ANT 261</td>
<td>Technology in Society and Culture</td>
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<td>ARS 257</td>
<td>Technology in the Arts</td>
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<td>Design Inquiry I: Methods and Processes</td>
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<td>Intro to Instruction Technology for Educators</td>
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<td>Women and Gender in Science and Technology</td>
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<td>STS 214</td>
<td>Introduction to Science, Technology, and Society</td>
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<td>Ethical Dimensions of Progress</td>
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<td>Survey of African-American Literature</td>
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<td>AFS 349</td>
<td>African Literature in English</td>
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<td>AFS 448</td>
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<td>African-American Literature</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<td>Gender, Ethnicity &amp; Identity in the Ancient World</td>
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<td>COM 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<td>ENG 206</td>
<td>Studies In Drama</td>
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<td>Studies in Poetry</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>History of the English Language</td>
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<td>African Literature in English</td>
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<td>Studies in British Poetry</td>
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<td>The American Novel of the 19th Century</td>
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<td>American Fiction, Twentieth Century and Beyond</td>
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<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Biblical Backgrounds of English Literature</td>
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<td>3</td>
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<tr>
<td>ELM 430</td>
<td>Teaching Language Arts in the Elementary School</td>
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<tr>
<td>ELM 450</td>
<td>The Arts for Elementary Education</td>
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<tr>
<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<td>ELM 484</td>
<td>Student Teaching in Elementary Education</td>
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<td>ELM 480</td>
<td>Connections Seminar IV Linking Theory and Practice</td>
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<tr>
<td><strong>Hours</strong></td>
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<tr>
<td><strong>Total Hours</strong></td>
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</tbody>
</table>

1 A grade of C or higher is required.
2 Student must pass with grade of B or higher to be considered for candidacy into the Elementary Education Program.

Middle Grades Education (BS): Language Arts and Social Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Plan Requirements

Middle Grades Education (BS): Language Arts and Social Studies
Concentration: 126 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Math &amp; Natural Science</strong></td>
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<tr>
<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
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<td><strong>English Language Arts</strong></td>
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<tr>
<td>EN 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>or ELE 235</td>
<td>Introduction to Educational Leadership</td>
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<tr>
<td>EN 265</td>
<td>American Literature I</td>
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<td>or EN 266</td>
<td>American Literature II</td>
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<td>EN 262</td>
<td>English Literature II</td>
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<tr>
<td>EN 328</td>
<td>Language and Writing</td>
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</tr>
<tr>
<td>or EN 422</td>
<td>Writing Theory and the Writing Process</td>
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</tr>
<tr>
<td><strong>Social Studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HI 205</td>
<td>Western Civilization Since 1400</td>
<td>2</td>
</tr>
<tr>
<td>or HI 233</td>
<td>The World Since 1750</td>
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<tr>
<td>HI 364</td>
<td>History of North Carolina</td>
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<td>Select one of the following:</td>
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<tr>
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<td>African-American History Through the Civil War, 1619-1865</td>
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<td>African-American History Since 1865</td>
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<td>HI 455</td>
<td>History of the Civil Rights Movement</td>
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<td>Select one of the following:</td>
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<td>PS 231</td>
<td>Introduction to International Relations</td>
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<tr>
<td>PS 236</td>
<td>Issues in Global Politics</td>
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<tr>
<td>PS 241</td>
<td>Introduction to Comparative Politics</td>
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<td>COM 112</td>
<td>Interpersonal Communication</td>
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<td><strong>Professional Education</strong></td>
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<tr>
<td>ED 100</td>
<td>Intro to Education</td>
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<td>ECI 204</td>
<td>Intro to Teaching</td>
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<tr>
<td>ECI 305</td>
<td>Equity and Education</td>
<td>2</td>
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<tr>
<td>ECI 306</td>
<td>Middle Years Reading</td>
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<td>ECI 307</td>
<td>Teaching Writing Across the Curriculum</td>
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<tr>
<td>ECI 309</td>
<td>Teaching in the Middle Years</td>
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<td>ECI 445</td>
<td>New Literacies, Emerging Technologies, and Electronic Portfolios</td>
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<td>ECI 405</td>
<td>Literature for Adolescents</td>
<td>2</td>
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<tr>
<td>ECI 416</td>
<td>Teaching Exceptional Students in the Mainstreamed Classroom</td>
<td>2</td>
</tr>
<tr>
<td>ED 204</td>
<td>Introduction to Teaching in Today's Schools</td>
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<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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<tr>
<td>ED 312</td>
<td>Classroom Assessment Principles and Practices</td>
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<tr>
<td>EDP 304</td>
<td>Educational Psychology</td>
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<tr>
<td>ELP 344</td>
<td>School and Society</td>
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<tr>
<td>HESM 280</td>
<td>Responding to Emergencies</td>
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<tr>
<td><strong>GEP Courses</strong></td>
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<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
<td></td>
<td>3</td>
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<tr>
<td>GEP Natural Sciences (p. 1429)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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</tr>
<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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</table>

Total Hours: 126

1. A grade of C- or higher is required.
2. A grade of C or higher is required.
3. Students should consult their academic advisors to determine how to complete this requirement.

Anthropology Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Anthropology Electives</strong></td>
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<tr>
<td>ANT 251</td>
<td>Physical Anthropology</td>
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<td>ANT 252</td>
<td>Cultural Anthropology</td>
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<tr>
<td>ANT 253</td>
<td>Unearthing the Past: Introduction to World Archaeology</td>
<td>3</td>
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<tr>
<td>ANT 254</td>
<td>Language and Culture</td>
<td>3</td>
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<tr>
<td>ANT 261</td>
<td>Technology in Society and Culture</td>
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</tr>
<tr>
<td>ANT 310</td>
<td>Native Peoples and Cultures of North America</td>
<td>3</td>
</tr>
<tr>
<td>ANT 315</td>
<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
<td>3</td>
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<tr>
<td>ANT 325</td>
<td>Andean South America</td>
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<tr>
<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<td>ANT 346</td>
<td>Peoples and Cultures of Southeast Asia</td>
<td>3</td>
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<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
<td>3</td>
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<td>ANT 371</td>
<td>Human Variation</td>
<td>3</td>
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<tr>
<td>ANT 389</td>
<td>Fundamentals of Archaeological Research</td>
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<tr>
<td>SOC 261</td>
<td>Technology in Society and Culture</td>
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Semester Sequence

This is a sample.

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<thead>
<tr>
<th>Course</th>
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<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td>ED 100</td>
<td>Intro to Education</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>HI 205</td>
<td>Western Civilization Since 1400</td>
<td>3</td>
</tr>
<tr>
<td>or HI 233</td>
<td>The World Since 1750</td>
<td>3</td>
</tr>
<tr>
<td>MA 103</td>
<td>Topics in Contemporary Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
Middle Grades Language Arts and Social Studies Program (MSL)

GEP Health and Exercise Studies (p. 1422) 1

Spring Semester
COM 112 Interpersonal Communication 1 3
ARE 201 Introduction to Agricultural & Resource Economics 1 3
or EC 201 or Principles of Microeconomics
GEP Natural Sciences (p. 1429) 1
GEP Mathematical Sciences (p. 1428) 3
ENG 265 American Literature I 1 3
or ENG 266 American Literature II
GEP Health and Exercise Studies (p. 1422) 1

Hours 16

Second Year
Fall Semester
ENG 262 English Literature II 1 3
GEP Interdisciplinary Perspectives (p. 1426) 2-3
Hi Elective 1 3
ECI 204 Intro to Teaching 1 2
ED 204 Introduction to Teaching in Today's Schools 1 2
ENG Elective 1 3

Hours 14

Spring Semester
GEP Interdisciplinary Perspectives (p. 1426) 3
ECI 309 Teaching in the Middle Years 1 3
ENG Elective 1 3
Select one of the following: 1
PS 231 Introduction to International Relations
PS 236 Issues in Global Politics
PS 241 Introduction to Comparative Politics
Select one of the following: 1
HI 372 African-American History Through the Civil War, 1619-1865
HI 373 African-American History Since 1865
HI 455 History of the Civil Rights Movement
GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) 3

Hours 15-16

Third Year
Fall Semester
ECI 305 Equity and Education 1 3
ELP 344 School and Society 1 3
EDP 304 Educational Psychology 1 3
HESM 280 or HESM 285 Responding to Emergencies or Personal Health
ED 311 Classroom Assessment Principles and Practices 1 2
ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1 1
ANT Elective 1 3

Hours 17

Spring Semester
ECI 306 Middle Years Reading 1 3
ECI 307 Teaching Writing Across the Curriculum 1 3
ENG Elective 1 3
ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom 1 3
HI 364 History of North Carolina 1 3

Hours 15

Fourth Year
Fall Semester
ECI/ENG 405 Literature for Adolescents 1 3
ECI 430 Methods and Materials for Teaching Language Arts in the Middle Grades 1 4
ECI 435 Methods and Materials for Teaching Social Studies in the Middle Grades 1 4
ENG 328 Language and Writing 1 3
or ENG 422 Writing Theory and the Writing Process
ECI 445 New Literacies, Emerging Technologies, and Electronic Portfolios 1 2

Hours 16

Spring Semester
ECI 454 Student Teaching in English/Language Arts 1 6
ECI 464 Student Teaching in Social Studies 1 6

Hours 12

Total Hours 123-124

1 A grade of C or higher is required.

Middle Grades Language Arts and Social Studies Program (MSL)

The goal of the MSL Program is to prepare teachers to effectively educate young adolescents while being responsive to their unique needs, interests and abilities. Graduates earn licensure for teaching grades six through nine in the English language arts and social studies disciplines.

The MSL Program offers an undergraduate degree and initial licensure in two dynamic content areas that prepares teachers to effectively educate and impact the lives of young adolescents while being responsive to their unique needs, interests, and abilities. Students learn how to implement high-quality English language arts and social studies instruction with three major focus areas:

- Digital Literacies
- Inquiry-based Learning
- Citizenship

Students are provided with the opportunity to earn an undergraduate degree and initial licensure for sixth through ninth grade.

For contact information and more details about our program, please visit our website.

Department of Teacher Education and Learning Sciences (TELS)
North Carolina State University
Faculty

English Teacher Education

Students desiring to become secondary English teachers in grades 9-12 will be enrolled in the College of Humanities and Social Sciences. In that college's section of this catalog, curriculum requirements for the teacher education option can be found under the Department of English. Students desiring to become Language Arts teachers in grades 6-9 will be enrolled in the College of Education.

View information on the Bachelor of Arts (B.A.) in English: Teacher Education Concentration (p. 686) here.

Faculty

Professor

Jeff Reaser, Associate Professor

French Teacher Education

Students desiring to be licensed to teach French K-12 by the State of North Carolina will be enrolled in the College of Humanities and Social Sciences. The curriculum requirements for the teacher education option in French can be found under the Department of Foreign Languages and Literatures in the College of Humanities and Social Sciences.

View information on the Bachelor of Arts (B.A.) in Foreign Languages and Literatures: Foreign Language French Education Concentration (p. 730) here.

Faculty

Program Coordinator, French Teacher Education

Hannah Bollinger

Spanish Teacher Education

Students desiring to be licensed to teach Spanish K-12 by the State of North Carolina will be enrolled in the College of Humanities and Social Sciences. The curriculum requirements for the teacher education option in Spanish can be found under the Department of Foreign Languages and Literatures in the College of Humanities and Social Sciences.

View information on the Bachelor of Arts (B.A.) in Foreign Languages and Literatures: Foreign Language Spanish Education Concentration (p. 745) here.

Faculty

Program Coordinator, Spanish Teacher Education

Hannah Bollinger

Technology, Engineering and Design Education

For more information about this department, including contact information, visit the department (http://ced.ncsu.edu/academics/Departments/DesignEducation/Undergraduate/).

With an emphasis on innovation and active learning, this program prepares individuals for a variety of engineering and design employment opportunities, including a teacher licensure option and a non-licensure graphics communications option.

Specific curriculum requirements are available online (https://www.arts.ncsu.edu/php/coursecat/degree_requirements.php).

Student Success and Advising Center

Poe Hall, Room 505
Phone: (919) 515-0595

Curricula in Technology, Engineering and Design Education

Nolan Fahrer, Undergraduate Program Coordinator

Poe Hall, Room 510 E
Program phone: (919) 515-1741

Faculty

Undergraduate Program Coordinator

N. Fahrer, Teaching Assistant Professor

Faculty

A. Clark, Professor
C. Denson, Assoc. Professor
N. Fahrer, Teaching Asst Professor
T. Jones, Asst Professor
B. Matthews, Asst Professor & Facilities Manager
P. Newby, Lecturer
K.G. Sutton, Teaching Assistant Professor

U.S. Culture and Cooperative Education (Certificate) (GTC)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Intensive one or two semester study abroad program designed for international students to further their overseas academic program, increase understanding of American culture and improve English language skills.
Contact Information

The North Carolina Global Training Initiative (GTI)
Michael Bustle
Campus Box 7573, NC State University
Raleigh, NC 27695-7573
Phone: 919-515-2961
Fax: 919-515-1402
gti@ncsu.edu
Website: http://www.ncsu.edu/gti (http://www.ncsu.edu/gti/)

Academic Structure

Term Effective: 1/2007, 1/2010-new title
Plan Code: 02GTCCTU
CIP Code: 30.2001
Description: Undergraduate Certificate in US Culture and Cooperative Education
Offered on-campus only

Plan Requirements

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>Required Courses</td>
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</tr>
<tr>
<td>GTI 401</td>
<td>US Culture and Education Colloquium</td>
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<td>COP 101</td>
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<tr>
<td>or COP 501</td>
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<td>Elective Courses</td>
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1 Other specific courses (3 to 6 credit hours) may be required or recommended with the departmental advisor provided the total number of hours meet or exceed at least half-time status (minimum 6 hours).

The certificate student will consult with the sponsoring faculty member and/or the coordinator of advising and will (no later than the close of the course registration period) develop a plan of work depending on the interest and ability of student, availability of seats, and schedule. No new courses need to be developed – students will enroll in existing courses as appropriate and upon recommendation from academic advisor.

U.S. Culture and Education (Certificate) (GTE)

Intensive one or two semester study abroad program designed for international students to further their overseas academic program, increase understanding of American culture and improve English language skills.

Contact Information

The North Carolina Global Training Initiative (GTI)
Campus Box 7573
NC State University
Raleigh, NC 27695-7573
Phone: 919-515-2961
Fax: 919-515-1402
gti@ncsu.edu
Website: http://www.ncsu.edu/gti (http://www.ncsu.edu/gti/)

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Required Course</td>
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<td>GTI 401</td>
<td>US Culture and Education Colloquium</td>
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</tr>
<tr>
<td>Elective Courses 1</td>
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<td>9</td>
</tr>
</tbody>
</table>

Total Hours

1 Other specific courses may be required or recommended with the departmental advisor provided the total number of hours meet or exceed full time status.

The certificate student will consult with the sponsoring faculty member and/or the coordinator of advising and will (no later than the close of the course registration period) develop a plan of work depending on the interest and ability of student, availability of seats, and schedule. No new courses need to be developed – students will enroll in existing courses as appropriate and upon recommendation from academic advisor.

College of Engineering

For more information about this college, including contact information, visit the department (http://www.engr.ncsu.edu/).

118 and 120 Page Hall
NCSU Box 7904
Raleigh, NC 27695-7904
Phone: (919) 515-3263
fax: (919) 515-8702
e-mail: engineering@ncsu.edu

People who seek a challenging technical career in research and development, design, construction, production, maintenance, technical sales, management, teaching, or other careers requiring a methodical, creative approach to problem solving, should consider an engineering or computer science education. At NC State, the College of Engineering has a distinguished and internationally recognized faculty, and the College of Engineering offers the opportunity for ambitious students to become the leaders and prime movers of our increasingly technological world. Because of the great influence of science and technology on our everyday lives, today’s engineers and computer scientists must be acutely aware of, and responsible for, the effects their creations may have on society. In addition to safety, aesthetics, economics, and energy, today’s technologists must consider environmental, sociological, and other “human concern” costs.

College of Engineering graduates work in diverse careers around the world. Most are practicing engineers, but because their education has equipped them well to address problems in a wide variety of fields, many College of Engineering graduates have become corporate presidents, lawyers, medical doctors, and leaders in government. The College of Engineering has engineering degree programs in twelve academic departments and three affiliated departments. These departments include: Biological and Agricultural Engineering; Joint UNC/NC State Department of Biomedical Engineering; Chemical and Biomolecular Engineering; Civil, Construction, and Environmental Engineering; Computer Science; Electrical and Computer Engineering; Edward P. Fitts Department of Industrial and Systems Engineering; Materials Science and Engineering; Mechanical and Aerospace Engineering; Nuclear Engineering; Paper Science and Engineering within the Department of Forest Biomaterials; and Textile Engineering within the Department of
Textile Engineering, Chemistry and Science. Eighteen undergraduate degree programs are offered in these twelve departments. In addition, a degree program in Engineering is offered by special arrangement to the very few students who can clearly demonstrate the need for an individualized program of study. All departments also offer advanced studies leading to master's degrees and the Doctor of Philosophy degree. Consult the Graduate Catalog (http://www.ncsu.edu/grad/catalog/) for graduate degrees.

Seventeen programs in the College of Engineering are accredited by the Engineering Accreditation Commission of ABET; http://www.abet.org and are: aerospace engineering; biological engineering; chemical engineering; civil engineering; computer engineering; construction engineering; electrical engineering; BS in engineering Mechatronics concentration joint program with UNC Asheville; BS in engineering, Mechanical Engineering Systems concentration; environmental engineering; industrial engineering; materials science and engineering; mechanical engineering; nuclear engineering; paper science and engineering; and textile engineering. One program in the College of Engineering, computer science, is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org. Accreditation ensures that these programs satisfy requirements for acceptance by these nationally recognized agencies. All curricula and programs are designed to maintain the college's national and international reputation while meeting the needs of the people and industries of the state and region through effective instruction, competent research, and the development of new and meaningful contributions to scientific knowledge.

The Career Development Center (https://careers.dasa.ncsu.edu/) is maintained by the university to assist continuing students and graduating students in achieving their career goals.

High Impact Experiences

The College of Engineering is actively educating and preparing engineers that will impact our world. Student participation in High Impact experiences (https://www.engr.ncsu.edu/academics/undergrad/firstyear/activities/) -- work, research, international, and service -- is highly encouraged.

NC State College of Engineering students may, for instance, choose these High Impact experiences:

- International engagement
  - The Study Abroad Office (https://studyabroad.ncsu.edu/) offers assorted options based upon interests, location, duration, and areas of study including engineering majors.
  - Opportunities to work abroad, research abroad or volunteer service abroad are available.

- Work
  - The Career Development Center (https://careers.dasa.ncsu.edu/), which includes the Cooperative Education Program, offers career advising, support, and resources that allow students to search for job and internship opportunities that lead to gaining real-world experience while pursuing their degrees.
  - The Engineering Career Fair (https://www.engr.ncsu.edu/careerfair/) affords students the opportunity to meet with prospective employers and to learn more about the participating companies.

- Service

- Leadership and Civic Engagement (https://leadandengage.dasa.ncsu.edu/) sponsors Alternative Service Break (ASB) (https://leadandengage.dasa.ncsu.edu/asb/) and more opportunities for students to learn how to successfully lead teams with an inclusive lens, facilitate change, and maximize success in a multicultural environment.

- Many engineering student organizations, clubs, and honor societies (https://getinvolved.ncsu.edu/) include a service and outreach component for students to volunteer their time and talent.

Research

- The Office of Undergraduate Research (https://undergradresearch.dasa.ncsu.edu/) works to support and promote discovery-, inquiry-, and creativity-based opportunities through mentored research experiences for students.

- The College provides opportunities for undergraduate research within its academic departments as well as through its many Engineering Centers and Institutes (https://www.engr.ncsu.edu/researchcenters/).

Students interested in High Impact experiences may learn more through the primary resource (listed above) or Office of Academic Affairs.

Cooperative Education Program

This optional program is structured so that the student will alternate semesters of study with semesters of practical work as sophomores and juniors. The first and senior years are spent on campus, while sophomore and junior academic work is spread over a three-year period to permit alternating academic semesters with work-experience semesters. Students earn a salary while they are in industry. This income can prove useful in offsetting college expenses. The Co-op plan can be completed in five years, during which time the student receives 12 to 18 months of industrial experience.

Students in all curricula in the College of Engineering may apply for the Co-op program if they have a grade point average of 2.5 or better. Application for admission into the Co-op program should be made early in the spring semester of the freshman year. Students must be accepted into an engineering degree program prior to beginning the first Co-op assignment.

Further information may be obtained from:
Cooperative Education Program (https://careers.dasa.ncsu.edu/overview/)
Career Development Center
2100 Pullen Hall

Recognition of Graduates

All graduating students in the College of Engineering are invited to participate in the Recognition of the Graduates Event (https://www.engr.ncsu.edu/academics/undergrad/rings/), held annually in the spring semester. The event acknowledges the fellowship of engineers and computer scientists who are trained in science and technology and who are dedicated to the ethical practice, teaching, or administration of their profession. Students who are within 24 credits of graduation, or have recently graduated, are eligible.

The event includes a commitment to the "Obligation" and acceptance of a stainless steel ring to be worn on the little finger of the working hand. Only those who have met the high standards of professional engineering and computer science training or experience are invited to accept the
Obligation, which is voluntarily received for life. This commitment is not a trivial act but is, rather, like the Hippocratic Oath, a promise to practice the profession ethically, with integrity, tolerance and respect. The ring is worn as a visual symbol to attest to the wearer’s calling and symbolizes the unity of the profession in its goal of benefitting humankind. The stainless steel from which the ring is made depicts the strength of the profession.

**Benjamin Franklin Scholars Program**

A limited number of freshmen in the College of Engineering apply and are selected to participate in the Benjamin Franklin Scholars Program (https://ids.chass.ncsu.edu/dual/franklin.php). Students completing the program earn a Bachelor of Science in an engineering discipline or in computer science and a bachelor’s degree in humanities or social sciences.

This double-degree program, a joint undertaking of the College of Engineering and the College of Humanities and Social Sciences, provides a unique opportunity to integrate a solid base of knowledge in technology or science with a broad humanistic and social perspective. The curriculum for the double-degree program has four main components:

1. a strong general education,
2. specially designed interdisciplinary courses,
3. all technical course requirements associated with the engineering or computer science degree, and
4. and a second major in the humanities and social sciences chosen from among the traditional majors or an interdisciplinary major.

Students who have been accepted into a College of Engineering degree program, have declared a major in the College of Humanities and Social Sciences or Economics, and have at least a 3.0 GPA are generally eligible to apply to the program. With careful planning, the program can be completed in five years.

For more information, contact:
Dr. Ross Bassett, Program Director
ross_bassett@ncsu.edu
or the Office of Academic Affairs (118 Page Hall)

**Grand Challenge Scholars Program**

The National Academy of Engineering’s list of fourteen Grand Challenges for Engineering in the 21st century is a call to action and a means of focusing society’s attention on the opportunities and challenges affecting our quality of life. E 102 Engineering in the 21st Century is an interdisciplinary course for first-year students to explore the Grand Challenges and how engineers are actively designing and implementing technological solutions.

The mission of the Grand Challenge Scholars Program is to increase the awareness of future engineers about the challenges that face our world today. The College of Engineering, in partnership with the National Academy of Engineering, established this program, which aims to progressively develop undergraduate scholars of diverse engineering disciplines and backgrounds focused on solutions to the Grand Challenges by broadening their outlook on societal concerns, promoting social responsibility, lifelong learning, and on-going engagement in the problems facing the 21st century world.

There are five core competencies that guide all Grand Challenge Scholars in choosing their curricular and complementary high impact experiences:

- **Talent Competency**: mentored research/creative experience on a Grand Challenge-like topic
- **Multidisciplinary Competency**: understanding the multiple disciplines of engineering systems solutions developed through personal engagement
- **Entrepreneurship Competency**: understanding, preferably developed through experience, of the necessity of a viable business model for solution implementation
- **Multicultural Competency**: understanding different cultures, preferably through multicultural experiences, to ensure cultural acceptance of proposed engineering solutions
- **Social Consciousness Competency**: understanding that the engineering solutions should primarily serve people and society reflecting social consciousness

Students who have been accepted into a College of Engineering degree program and have at least a 3.0 GPA are generally eligible to apply to the program.

For more information, visit the Grand Challenge Scholars Program website (http://go.ncsu.edu/grandchallenges/), e-mail grandchallenges@ncsu.edu with Grand Challenge Scholars Program in the subject field, or contact the Office of Academic Affairs (118 Page Hall).

**Computers**

Computers, both lab-based and student-owned, are central to engineering education in the college. The College of Engineering recommends that all incoming students own a desktop, laptop, or similarly powerful tablet to use in classroom, lab, and mobile settings. If students plan to purchase one, then Engineering Information Technology provides advice and guidance on purchasing student-owned computing at https://it.engr.ncsu.edu/

The College of Engineering also provides its students with a large number of workstation labs for the purpose of running high-end engineering applications. The first-year computer lab course, E 115 Introduction to Computing Environments, instructs students in the use of their own computers to interface effectively with the vast resources of the college computing environment. The course emphasizes students’ responsibility for their own computer, including security and hands-on maintenance.

**Transfer Programs**

Every year, more than 25 percent of the students receiving a degree in engineering at NC State University are students who began their education at another institution. Students with non-engineering degrees or one or more years of academic work completed at other institutions may apply for transfer admission to the College of Engineering (https://www.engr.ncsu.edu/admissions/transfer-admissions/) through the Office of Undergraduate Admissions (https://admissions.ncsu.edu/apply/ transfers/).
Transfer Admissions into the College of Engineering

Students are admitted from community colleges, four-year colleges and universities, and foreign institutions. Students currently attending or anticipating attendance at other institutions are advised to contact the Office of Academic Affairs for information on transfer requirements, transfer course credit and admission to NC State.

Undergraduate Engineering Partnerships with Other Institutions

The College of Engineering at NC State University has extended engineering degree opportunities through formal partnership agreements with a number of North Carolina institutions to increase diversity and to enhance access to populations who would not otherwise easily have access to an engineering discipline.

In most programs, you begin your instruction at a partner institution and then transfer to and attend NC State in Raleigh to complete your engineering degree. However, site-based degree programs allow transfer students to earn an undergraduate engineering degree from NC State without having to move to Raleigh. Both types of programs are ABET-accredited programs. Visit the College's website to learn more about our partnerships at https://www.engr.ncsu.edu/admissions/transfer-admissions/partnerships/ or the home institutions.

Golden LEAF Biomanufacturing Training and Education Center

Biomanufacturing is the production of useful products such as penicillin through the use of biological molecules and living organisms. The Golden LEAF Biomanufacturing Training and Education Center (BTEC) simulates a biomanufacturing pilot plant capable of producing biopharmaceutical products and packaging them in a sterile, current Good Manufacturing Practices (cGMP)-like environment, and is the only facility of its kind in the nation and one of only a few in the world.

The BTEC hands-on, laboratory-intensive academic program is provided using large-scale equipment, including bioreactors, downstream separation and purification processes, bioreactor control systems, and aseptic processing operations. In addition to undergraduate and graduate courses, the BTEC educational program includes an undergraduate Minor in Biomanufacturing, and a University Certificate in Biomanufacturing. A Post-baccalaureate Certificate in Biomanufacturing is available for students who have earned a bachelor’s level degree. Undergraduate students majoring in chemical engineering may elect to complete a concentration in biomanufacturing sciences. The BTEC graduate program will include a Minor in Biomanufacturing, a Master of Science degree, and a Professional Science Masters in Biomanufacturing.

For additional information, please visit the BTEC website (http://www.btec.ncsu.edu/).

Faculty

Dean
Louis A. Martin-Vega

Executive Associate Dean, Research and Graduate Programs
John G. Gilligan

Associate Dean, Academic Affairs
Jerome P. Lavelle

Associate Dean, Faculty Advancement
Christine S. Grant

Associate Dean, Graduate Programs
Douglas S. Reeves

Assistant Dean, Academic Affairs
David W. Parish

Teaching Assistant Professor
Tameshia Ballard Baldwin

Director, Women in Engineering and Outreach
Laura Bottomley

Director, Minority Engineering Programs
Angelitha Daniel

Director, Recruiting, Enrollment Management, and Educational Partnerships
Kim Roberts

Director, Student Engagement
Brian Koehler

Director, Women in Science and Engineering
Katherine Titus-Becker

Director, Engineering Village
Niko Brown

Director, Assessment
Matt Stimpson
Coordinator of Advising
Mary Clare Robbins

Coordinator, Engineering First Year Programs
Hailey Queen

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• Department of Computer Science (p. 513)
• Department of Electrical and Computer Engineering (p. 523)
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• Department of Mechanical and Aerospace Engineering (p. 552)
• Department of Nuclear Engineering (p. 560)
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• Construction Engineering (BS) (p. 508)
• Electrical Engineering (BS) (p. 531)
• Electrical Engineering (BS), Renewable Electric Energy Systems Concentration (p. 535)
• Engineering (BS) (p. 573)
• Engineering (BS): Mechanical Engineering Systems Concentration (p. 589)
• Engineering (BS): Mechatronics Concentration (p. 592)
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Department of Biological and Agricultural Engineering

For more information about this department, including contact information, visit the department (p. 223).

The Department of Biological and Agricultural Engineering (BAE) applies engineering principles and the fundamentals of biologically-based systems and tools, primarily in agriculture and the environment. The scope of BAE ranges in scale from the molecular to the ecosystem level, for the safe, efficient, and environmentally sound production, processing and management of agricultural, biological and natural resources. From biomechanics to food processing and water management, we’re engineering solutions for a sustainable future.

The BAE department provides excellent educational opportunities at the undergraduate level with programs that are well recognized as among the finest in the United States.

The BE curriculum includes concentrations in agricultural engineering, bioprocess engineering, ecological engineering, and environmental engineering. All concentrations within the BE curriculum emphasize core courses in biology, mathematics, physics, chemistry, hydraulics, mechanics, materials, and thermodynamics, which collectively provide solid training in basic science and engineering. The curriculum...
is designed to prepare each graduate to master fundamentals of engineering and biology, develop the ability to solve engineering problems, improve self-confidence, and apply the creative process of engineering design. The educational experience is capped off with a two semester senior level course that immerses each graduate in the team approach to developing engineering solutions to complex problems. By the time of graduation, approximately 80% of BE graduates will have passed the Fundamentals in Engineering exam and thus be well on their way toward licensure as a Professional Engineer.

Opportunities

BE students learn to solve a wide variety of engineering problems and will have opportunities for specialization through selection of a specific concentration. Scientific and engineering principles are applied: to conserve and manage air, energy, soil and water resources; to manage, protect and restore natural ecosystems; to understand and utilize biological, chemical and physical processes for the production and conversion of biomass to bio energy; to analyze, understand and utilize mechanical properties of biological materials; to design and develop machinery systems for all phases of agricultural and food production; to design and evaluate structures and environmental control systems for housing animals, plant growth, and biological product storage; to develop improved systems for processing and marketing food and agricultural products; and to design sensor-based instrumentation and control systems for biological and agricultural applications.

Graduates of the BE curriculum receive a Bachelor’s of Engineering in Biological Engineering, qualifying them for positions in design, development, and research in industry, government and public institutions. The curriculum also prepares students for post-graduate work leading to advanced degrees. Typical positions filled by recent BE graduates include: stream and wetlands restoration project manager; product design; development and testing engineer; plant engineering and management; engineering analysis and inspection for federal and state agencies; engineering consultant and research engineer. Entry-level salary ranges for BE graduates are similar to those of Civil, Industrial, and Mechanical Engineering graduates.

Curricula

The BE curriculum is jointly administered by the College of Agriculture and Life Sciences and the College of Engineering and combines the fields of engineering, biology and agriculture. The BE curriculum is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org). BE graduates are qualified to become registered professional engineers by passing the appropriate examinations and upon completing the engineering experience requirements. Specific curriculum requirements are available online.

BAE faculty, in concert with program constituencies, has developed the following undergraduate program objectives. Within the first five years following graduation, NC State’s Biological Engineering graduates will:

• Excel in their careers or in graduate school by applying their knowledge of engineering principles, processes, and procedures;
• Practice engineering professionally and ethically;
• Communicate effectively in a professional environment; and
• Be engaged in life-long learning and professional development.

Faculty

Head
G.A. Fox

Associate Head Undergraduate Coordinator
S.A. Hale

Department Extension Leader
M.R. Burchell

Director of Graduate Programs
J.J. Classen

Distinguished University Professor and William Neal Reynolds Professor
W.F. Hunt

Professors
M.D. Boyette
M.R. Burchell
J. Cheng
M.S. Chinn
G.A. Fox
S.A. Hale
G.T. Roberson
S.B. Shah
L. Wang-Li
M. Youssef
W. Yuan

Associate Professor
F. Birgand
J.J. Classen
S.G. Hall
P. Kolar

Assistant professors
A. Beck
C.F. Castro-Bolina
Department of Chemical and Biomolecular Engineering

Like the field of chemical engineering itself, our department’s work transcends disciplinary lines. Our students, faculty, and alumni work with colleagues across the academic and engineering spectrum in fields such as biotechnology, polymers, nanotechnology, energy and environmentally responsive processes, and biomanufacturing. Our students learn by doing in cutting-edge labs and facilities. They work hand-in-hand with industry and government partners to get things done, from sponsored research that advances our understanding of the world to senior design projects that tackle real-life problems. When they graduate, our students are ready for the next step: roughly 85% go into the chemical or pharmaceutical industries, and 15% pursue graduate or processional studies.

Department Highlights:

- Undergraduate students have the option to pursue concentrations within the curriculum, including Biomolecular, Biomanufacturing, Nanoscience, and Sustainable Engineering,
Energy, and the Environment. We also offer a departmental Honors Program.
- The American Institute of Chemical Engineers (AIChE) student chapter has been consistently recognized as one of several Outstanding Chapters for the last 20 years
- Almost 20% of NCSU CHE students have a university, college, or departmental scholarship.
- Many internship and co-op opportunities are available, with almost 15% of our students completing a co-op.

For more information about our department, including contact information, visit our website (https://www.cbe.ncsu.edu/).

Department of Chemical and Biomolecular Engineering
North Carolina State University
Campus Box 7905
Raleigh, NC 37695-7905

Contact
Dr. Peter Fedkiw
Professor and Department Head
North Carolina State University
2006 Engineering Building 1
Raleigh, NC 27695-7905
Phone: 919-515-3572
Email: fedkiw@ncsu.edu

Faculty
Head
P. S. Fedkiw

Associate Head
J. Genzer

Celanese Acetate Professor
G. Parsons

Director
L.G. Bullard, Director of Undergraduate Studies
R.M. Kelly, Director of NCSU Biotechnology Program
S.A. Khan, Director of Graduate Programs

Teaching Professor
L.G. Bullard

William R. Kenan, Jr. Distinguished Professor of Chemical Engineering
J.M. DeSimone

H. Worley Clark Distinguished University Professor
K.E. Gubbins

Camille Dreyfus Professor
C.K. Hall

Camille Dreyfus Professor Emeritus
H.B. Hopfenberg

Alcoa Professor
S.A. Khan
R.M. Kelly
M. Dickey

Distinguished University Professor
D.F. Ollis
R. Spontak

INVISTA Professor
O. Velev

Professors
M.C. Flickinger
C.S. Grant
J.M. Haugh
H.H. Lamb
P.K. Lim
P.R. Westmoreland

Professor Emeritus
K.O. Beatty

Adjunct Professor
A. Andrady
G. Findenegg
Biomanufacturing (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Undergraduate Certificate in Biomanufacturing (“BTEC credential”) is designed for both NC State students and for persons from outside the University who wish to gain hands-on experience with, and understanding of, the technology and operational protocols of large-scale cGMP biomanufacturing operations. This knowledge base will prepare Certificate recipients to quickly contribute to a cGMP biomanufacturing operation in significant ways and should reduce the time needed for on-the-job training in those operations. The Certificate educational focus includes gene expression technologies, bioreactors, downstream separation and purification processes, and aseptic processing operations.

Program Coordinator
Pa Nhia Moore
195 BTEC Bldg.
Centennial Campus
Raleigh, NC 27695-7928
919.515.0213
Pa_Moore@ncsu.edu

Admissions Requirements
Students enrolled at North Carolina State University who are in good academic standing are eligible for admission to this University Certificate program. In addition, non-degree students with evidence of having completed introductory courses in both biology and organic chemistry, or who have consent of the Certificate Program administrator may enroll in the program. Students who complete the undergraduate Minor in Biomanufacturing or the Post Baccalaureate Certificate in Biomanufacturing are not eligible for the Undergraduate Certificate in Biomanufacturing.

Plan of Study
Contact the Program Coordinator.
Registration Information
Contact the Program Coordinator.

Academic Structure
Term Effective: 8/2012
Plan Code: 14BTECCTU, 32BTECCTU
CIP Code: 26.1201
Description: Undergraduate Certificate in Biomanufacturing
Offered: On-campus format

Plan Requirements
Requirements for the Undergraduate Certificate in Biomanufacturing include a minimum of 12 credit hours as specified below. All courses must be completed with a grade of 'C-' or better.

Prerequisites: All students must complete both CH 101 Chemistry - A Molecular Science and BIO 183 Introductory Biology: Cellular and Molecular Biology, or have departmental approval of like courses completed. The courses must be completed with a grade of C- or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEC 220</td>
<td>Introduction to Drug Development and Careers in Biomanufacturing</td>
<td>1</td>
</tr>
<tr>
<td>BEC/CHE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
<td>2</td>
</tr>
<tr>
<td>or BEC 330</td>
<td>Principles and Applications of Bioseparations</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses
Select nine credits of the following:

- BAE 425 Industrial Microbiology and Bioprocessing
- BBS/FS 426 Upstream Biomanufacturing Laboratory
- BCH 351 General Biochemistry
- BEC 436 Introduction to Downstream Process Development
- BEC/CHE 462 Fundamentals of Bio-Nanotechnology
- BEC/CHE 463 Fermentation of Recombinant Microorganisms
- BEC 475 Global Regulatory Affairs for Medical Products
- BEC 480 cGMP Fermentation Operations
- BEC 485 cGMP Downstream Operations
- BEC/CHE 488 Animal Cell Culture Engineering
- BEC 497 Biomanufacturing Research Projects
- BIT 410 Manipulation of Recombinant DNA
- BIT 466 Animal Cell Culture Techniques
- GN 311 Principles of Genetics
- BME/BEC 483 Tissue Engineering Technologies

Total Hours: 12

Biomanufacturing (Certificate) (For Post-Baccalaureate Students)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! The Certificate in Biomanufacturing provides graduates with the knowledge base and hands-on skills that will prepare them to quickly contribute to a cGMP biomanufacturing operation in significant ways and should reduce the time needed for on-the-job training in those operations.

Program Coordinator
Pa Nhia Moore
195 BTEC Bldg.
Centennial Campus
Raleigh, NC 27695-7928
919.515.0213
pa_moore@ncsu.edu
website: http://www.btec.ncsu.edu/

Admissions Requirements
Contact the Program Coordinator.

Plan of Study and Registration Information
Contact the Program Coordinator.

Academic Structure
Term Effective: 1/2009
Plan Code: 32BTECCTU
CIP Code: 26.1201
Description: Undergraduate Certificate in Biomanufacturing
Offered: On-campus format

Plan Requirements
Prerequisite: In order to enroll in the first course in the program, applicants must have earned a bachelor’s level degree, and have completed CH 223 Organic Chemistry II (or equivalent) and either BIO 183 Introductory Biology: Cellular and Molecular Biology, or have departmental approval of like courses completed. Interested graduates should contact the BTEC Office for Student Coordination at 919-513-2000 for information and application materials.

Requirements for the Post-Baccalaureate Undergraduate Certificate in Biomanufacturing include a minimum of 13 credit hours as specified below. All courses must be completed with a grade of 'C-' or higher:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select five credits of the following:</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>MB 420</td>
<td>Fundamentals of Microbial Cell Biotransformations</td>
<td></td>
</tr>
<tr>
<td>BEC 330</td>
<td>Principles and Applications of Bioseparations</td>
<td></td>
</tr>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
<td></td>
</tr>
<tr>
<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
<td></td>
</tr>
<tr>
<td>Select one of the following foci:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Upstream Focus:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<tr>
<td>&amp; BEC 480</td>
<td>and cGMP Fermentation Operations</td>
<td></td>
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<tr>
<td>Downstream Focus:</td>
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<td></td>
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<tr>
<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
<td></td>
</tr>
<tr>
<td>&amp; BEC 485</td>
<td>and cGMP Downstream Operations</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses
**Biomanufacturing (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The Minor in Biomanufacturing is intended to provide new graduates with the knowledge base and hands-on skills that will prepare them to quickly contribute to a cGMP biomanufacturing operation in significant ways and should reduce the time needed for on-the-job training in those operations. Interested students should contact the representatives listed below.

**Administration of the Minor in Biomanufacturing**

The BTEC staff will hold primary responsibility for administration of the Minor in Biomanufacturing Information about the Minor and application materials will be handled by an Administrative Assistant and the Assistant Director for Student Coordination will be the primary contact and academic advisor for the students who elect to enroll in the Minor.

**Contacts**

For additional information about the Minor in Biomanufacturing contact:

Pa Nhia Moore  
195 BTEC Bldg  
Centennial Campus  
919.515.0213  
Pa_Moore@ncsu.edu

**SIS Code: 14BTECM**

**Plan Requirements**

Requirements for the undergraduate Minor in Biomanufacturing include a minimum of 15 credit hours as specified below. All courses must be completed with a grade of "C-" or higher.

**Prerequisite Courses to Enter the Minor:** All students must complete both CH 101 Chemistry - A Molecular Science and BIO 183 Introductory Biology: Cellular and Molecular Biology. The courses must be completed with a grade of C- or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEC 220</td>
<td>Introduction to Drug Development and Careers in Biomanufacturing</td>
<td>1</td>
</tr>
</tbody>
</table>

Select one of the following:

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
<td></td>
</tr>
<tr>
<td>BEC 462</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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</tr>
<tr>
<td>BEC/CHE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
<td>BEC 475</td>
<td>Global Regulatory Affairs for Medical Products</td>
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<tr>
<td>BEC 480</td>
<td>cGMP Fermentation Operations</td>
<td></td>
</tr>
<tr>
<td>BEC 485</td>
<td>cGMP Downstream Operations</td>
<td></td>
</tr>
<tr>
<td>BIT 466</td>
<td>Animal Cell Culture Techniques</td>
<td></td>
</tr>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
<td></td>
</tr>
<tr>
<td>MB 455</td>
<td>Microbial Biotechnology</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours: 13**

**Elective Courses:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
<td></td>
</tr>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
<td></td>
</tr>
<tr>
<td>BCH 351</td>
<td>General Biochemistry</td>
<td>2</td>
</tr>
<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BEC 363</td>
<td>Foundations of Recombinant Microorganisms for Biomanufacturing</td>
<td>2</td>
</tr>
<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
<td></td>
</tr>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>BEC/CHE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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**Total Hours: 15-16**

**Chemical Engineering (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

**Plan Requirements**

**Chemical Engineering (BS): 125 Total Units**

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**Total Hours: 125**
### ENG 101
Academic Writing and Research ²  
Hours 4

### Spring Semester

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### Fourth Year

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Total Hours 105

¹ A grade of C or higher is required.
² A grade of C- or higher is required.

### Code Title Hours

#### GEP Courses

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<td>U.S. Diversity (p. 1431) (verify requirement)</td>
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Total Hours 20

¹ Students should consult their academic advisors to determine which courses fill this requirement.

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<td>BEC 488</td>
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<td>Advanced Biomanufacturing and Biocatalysis</td>
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### Semester Sequence

This is a sample.

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#### Fall Semester

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### Third Year

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<td>Chemical Process Thermodynamics</td>
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<tr>
<td>ECE 331</td>
<td>Principles of Electrical Engineering or Structure and Properties of Engineering Materials</td>
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<tr>
<td>CHE 395</td>
<td>Professional Development Seminar</td>
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#### Spring Semester

Chemistry Elective: 4 units

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CHE 312</td>
<td>Transport Processes II</td>
<td>3</td>
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<tr>
<td>CHE 316</td>
<td>Thermodynamics of Chemical and Phase Equilibria</td>
<td>3</td>
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<tr>
<td>CHE 330</td>
<td>Chemical Engineering Lab I</td>
<td>4</td>
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<tr>
<td>Free Elective</td>
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</table>

### Fourth Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CHE 331</td>
<td>Chemical Engineering Lab II</td>
<td>2</td>
</tr>
<tr>
<td>CHE 446</td>
<td>Design and Analysis of Chemical Reactors</td>
<td>3</td>
</tr>
<tr>
<td>CHE 450</td>
<td>Chemical Engineering Design I</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
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#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>CHE 435</td>
<td>Process Systems Analysis and Control</td>
<td>3</td>
</tr>
<tr>
<td>CHE 451</td>
<td>Chemical Engineering Design II</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

### Chemical Engineering (BS): Biomanufacturing Sciences Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Biomanufacturing Sciences Concentration provides students with the knowledge base and hands-on skills that prepare them to quickly contribute to a biomanufacturing operation. Pharmaceuticals, vaccines, enzymes, and bio-fuels are example products. Students completing this concentration also receive a Minor in Biomanufacturing.

### Plan Requirements

**Chemical Engineering (BS): Biomanufacturing Sciences Concentration: 125 Total Units**

<table>
<thead>
<tr>
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<th>Hours</th>
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<tr>
<td><strong>Fall Semester</strong></td>
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</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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</tr>
<tr>
<td>or CH 103</td>
<td>or General Chemistry I for Students in Chemical Sciences</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>or CH 104</td>
<td>or General Chemistry Laboratory I for Students in Chemical Sciences</td>
<td>1</td>
</tr>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
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</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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</table>

| Hours | 14     |

| **Spring Semester** |                        |       |
| CH 201   | Chemistry - A Quantitative Science               | 3     |
| or CH 203| or General Chemistry II for Students in Chemical Sciences | 3 |

| Hours | 14     |

---

1. A grade of C or higher is required.
2. A grade of C- or higher is required.
Chemical Engineering (BS): Biomanufacturing Sciences Concentration

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
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<td>or CH 204</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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Second Year

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>CH 221</td>
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<tr>
<td>or CH 225</td>
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<tr>
<td>CH 222</td>
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<tr>
<td>or CH 226</td>
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<td>CHE 205</td>
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<tr>
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<tr>
<td>PY 208 &amp; PY 209</td>
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<td>BEC 220</td>
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<table>
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<tbody>
<tr>
<td>CH 223</td>
</tr>
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</tr>
<tr>
<td>CH 224</td>
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<td>or CH 228</td>
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<tr>
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<tr>
<td>BIO 183</td>
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<tr>
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<td>EC 205</td>
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| Hours | 17 |

Third Year

<table>
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<tr>
<td>CHE 311</td>
</tr>
<tr>
<td>or CHE 315</td>
</tr>
<tr>
<td>BCH 451</td>
</tr>
<tr>
<td>BEC 425</td>
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<td>BEC 463</td>
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| Hours | 14 |

Spring Semester

<table>
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<tr>
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<tr>
<td>CHE 312</td>
<td>Transport Processes II</td>
<td>3</td>
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<td>CHE 316</td>
<td>Thermodynamics of Chemical and Phase Equilibria</td>
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<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BEC 330</td>
<td>Principles and Applications of Bioseparations</td>
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| Hours | 10 |

Fourth Year

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<tr>
<td>CHE 395</td>
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<tr>
<td>CHE 446</td>
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<tr>
<td>BEC 436</td>
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<td>BEC 480</td>
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| Hours | 11 |

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<td>CHE 448</td>
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<td>CHE 435</td>
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<tr>
<td>CHE 451</td>
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<tr>
<td>Bioethics Elective (p. 485)</td>
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| Hours | 13 |

| Total Hours | 110 |

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

GEP Courses

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<tr>
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<tr>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Free Electives

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<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>Free Electives (12 Hr S/U Lmt)</td>
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</table>

| Total Hours | 17 |

1 Students should consult their academic advisors to determine which courses fill this requirement.

Biomanufacturing Electives

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BEC 445</td>
<td>Cell Line Development for Biomanufacturing</td>
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<td>Cell Line Development for Biomanufacturing</td>
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<td>BEC 462</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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<td>BEC 475</td>
<td>Global Regulatory Affairs for Medical Products</td>
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<tr>
<td>or BEC 575</td>
<td>Global Regulatory Affairs for Medical Products</td>
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</table>

| Hours | 14 |

1 Students should consult their academic advisors to determine which courses fill this requirement.
### Bioethics Electives

<table>
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<tr>
<th>Code</th>
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<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
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<tr>
<td>NR 303</td>
<td>Humans and the Environment</td>
<td>3</td>
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<tr>
<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
</tr>
<tr>
<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
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<td>STS 325</td>
<td>Bio-Medical Ethics</td>
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### Semester Sequence

This is a sample.

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<thead>
<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science $^1$ or General Chemistry I for Students in Chemical Sciences</td>
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<tr>
<td>or CH 103</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory $^1$ or General Chemistry Laboratory I for Students in Chemical Sciences</td>
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<tr>
<td>or CH 104</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving $^1$</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>1</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research $^1$</td>
<td>4</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
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</tr>
<tr>
<td>or CH 203</td>
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</tr>
<tr>
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<tr>
<td>or CH 204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II $^1$</td>
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</tr>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists $^1$</td>
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<td>Physics for Engineers and Scientists Laboratory $^1$</td>
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| **Second Year** |                                             |       |
| **Fall Semester** |                                             |       |
| BEC 220 | Introduction to Drug Development and Careers in Biomanufacturing | 1     |
| CH 221  | Organic Chemistry I $^2$ or Organic Chemistry I for Students in Chemical Sciences | 3     |
| or CH 225 |                                             |       |
| CH 222  | Organic Chemistry I Lab or Organic Chemistry Laboratory I for Students in Chemical Sciences | 1     |
| or CH 226 |                                             |       |
| CHE 205 | Chemical Process Principles                | 4     |
| MA 242  | Calculus III                               | 4     |
| PY 208  | Physics for Engineers and Scientists II    | 3     |
| PY 209  | Physics for Engineers and Scientists II Laboratory | 1     |
| **Hours** |                                             | 17    |
| **Spring Semester** |                                             |       |
| BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4     |
| CH 223  | Organic Chemistry II or Organic Chemistry II for Students in Chemical Sciences | 3     |
| or CH 227 |                                             |       |
| CH 224  | Organic Chemistry II Lab or Organic Chemistry Laboratory II for Students in Chemical Sciences | 1     |
| or CH 228 |                                             |       |
| CHE 225 | Introduction to Chemical Engineering Analysis $^2$ | 3     |
| MA 341  | Applied Differential Equations $^2$        | 3     |
| Select one of the following: |                                             |       |
| EC 205  | Fundamentals of Economics                   | 3     |
| EC 201  | Principles of Microeconomics                | 3     |
| ARE 201 | Introduction to Agricultural & Resource Economics | 3     |
| **Hours** |                                             | 17    |

| **Third Year** |                                             |       |
| **Fall Semester** |                                             |       |
| BCH 451 | Principles of Biochemistry                  | 4     |
| BEC 425 | Molecular Biology for Biomanufacturing      | 2     |
| BEC 463 | Fermentation of Recombinant Microorganisms  | 2     |
| CHE 311 | Transport Processes I $^1$                  | 3     |
| CHE 315 | Chemical Process Thermodynamics $^1$        | 3     |
| GEP Requirement (p. 1417) |                                             | 3     |
| **Hours** |                                             | 17    |
| **Spring Semester** |                                             |       |
| BEC 426 | Upstream Biomanufacturing Laboratory        | 2     |
| BEC 330 | Principles and Applications of Bioseparations | 2     |
| CHE 312 | Transport Processes II                      | 3     |
| CHE 316 | Thermodynamics of Chemical and Phase Equilibria | 3     |
| Free Elective |                                             | 3     |
| GEP Requirement (p. 1417) |                                             | 3     |
| **Hours** |                                             | 16    |
Fourth Year
Fall Semester
BEC 436  Introduction to Downstream Process Development  2
or BEC 435  cGMP Fermentation Operations  2
CHE 395  Professional Development Seminar  1
CHE 446  Design and Analysis of Chemical Reactors  3
CHE 450  Chemical Engineering Design I  3
GEP Requirement (p. 1417)  3

Spring Semester
Biomanufacturing Elective  2
CHE 448  Bioreactor Design  2
CHE 435  Process Systems Analysis and Control  3
CHE 451  Chemical Engineering Design II  3
Bioethics Elective (p. 485)  3
GEP Requirement (p. 1417)  3

Total Hours  127

1  A grade of C or higher is required.
2  A grade of C- or higher is required.

Career Opportunities
Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

Chemical Engineering (BS): Biomolecular Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Biomolecular Concentration emphasizes hands-on laboratory molecular biology skills that are highly relevant to pharmaceutical, medical, engineering, and agricultural fields. Students completing this concentration also receive a Minor in Biotechnology.

Plan Requirements
Chemical Engineering (BS): Biomolecular Concentration: 127 Total Units
### Third Year
#### Fall Semester
- **BCH 451**: Principles of Biochemistry 4
- **CHE 311**: Transport Processes I 2 3
- **CHE 315**: Chemical Process Thermodynamics 2 3
- **BIT 410**: Manipulation of Recombinant DNA 4
- **CHE 395**: Professional Development Seminar 1

#### Hours 14

#### Spring Semester
- **BIT Lab Modules Group I** (p. 487) 2
- **BIT Lab Modules Group II** (p. 487) 2
- **CHE 312**: Transport Processes II 3
- **CHE 316**: Thermodynamics of Chemical and Phase Equilibria 3
- **CHE 330**: Chemical Engineering Lab I 4

#### Hours 15

### Fourth Year
#### Fall Semester
- **CHE 447**: Bioreactor Engineering 3
- **CHE 450**: Chemical Engineering Design I 3
- **Biotech Minor Group E Elective** (p. 487) 3
- **CHE 497**: Chemical Engineering Projects I 3

#### Hours 12

#### Spring Semester
- **CHE 435**: Process Systems Analysis and Control 3
- **CHE 451**: Chemical Engineering Design II 3
- **CHE 551**: Biochemical Engineering 3
- **Technical Elective** (p. 488) 2

#### Hours 11

#### Total Hours 113

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

### Code Title Hours

#### GEP Courses
- **GEP Humanities** (p. 1423) 6
- **GEP Social Sciences** (p. 1430) 3
- **GEP Health and Exercise Studies** (p. 1422) 2
- **GEP Additional Breadth** (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- **GEP U.S. Diversity** (p. 1431) (verify requirement)
- **GEP Global Knowledge** (p. 1419) (verify requirement)
- **Foreign Language Proficiency** (p. 1417) (verify requirement)

#### Total Hours 14

### BIT Lab Modules Group I

#### Code Title Hours
- **BIO 572**: Proteomics 3
- **BIT 462**: Gene Expression Analysis: Microarrays 2
- **BIT 464**: Protein Purification 2
- **BIT 465**: Real-time PCR Techniques 2
- **BIT 467**: PCR and DNA Fingerprinting 2
- **BIT 473**: Protein Interactions 2
- **BIT 562**: Gene Expression Analysis: Microarrays 2
- **BIT 564**: Protein Purification 2
- **BIT 565**: Real-time PCR Techniques 2
- **BIT 567**: PCR and DNA Fingerprinting 2
- **BIT 572**: Proteomics 3
- **BIT 573**: Protein Interactions 2
- **CH 572**: Proteomics 3

### BIT Lab Modules Group II

#### Code Title Hours
- **BIO 572**: Proteomics 3
- **BIT 462**: Gene Expression Analysis: Microarrays 2
- **BIT 464**: Protein Purification 2
- **BIT 465**: Real-time PCR Techniques 2
- **BIT 466**: Animal Cell Culture Techniques 2
- **BIT 467**: PCR and DNA Fingerprinting 2
- **BIT 468**: Genome Mapping 2
- **BIT 471**: RNA Interference and Model Organisms 2
- **BIT 473**: Protein Interactions 2
- **BIT 481**: Plant Tissue Culture and Transformation 2
- **BIT 562**: Gene Expression Analysis: Microarrays 2
- **BIT 564**: Protein Purification 2
- **BIT 565**: Real-time PCR Techniques 2
- **BIT 566**: Animal Cell Culture Techniques 2
- **BIT 567**: PCR and DNA Fingerprinting 2
- **BIT 568**: Genome Mapping 2
- **BIT 569**: RNA Purification and Analysis 2
- **BIT 571**: RNA Interference and Model Organisms 2
- **BIT 572**: Proteomics 3
- **BIT 573**: Protein Interactions 2
- **BIT 595**: Special Topics 1-6
- **CH 572**: Proteomics 3
- **PB 481**: Plant Tissue Culture and Transformation 2
- **PO 466**: Animal Cell Culture Techniques 2
- **PO 566**: Animal Cell Culture Techniques 2

### Biotech Minor Group E Electives

#### Code Title Hours
- **IDS 201**: Environmental Ethics 3
- **IDS 303**: Humans and the Environment 3
- **NR 303**: Humans and the Environment 3
- **PHI 325**: Bio-Medical Ethics 3
- **STS 302**: Contemporary Science, Technology and Human Values 3
ST 304 Ethical Dimensions of Progress 3
ST 325 Bio-Medical Ethics 3

Technical Electives

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<td>BBS 526</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BEC 330</td>
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Semester Sequence

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Spring Semester

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GEP Health and Exercise Studies (p. 1422) 1

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Second Year

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GEP Health and Exercise Studies (p. 1422) 1

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Third Year

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GEP Requirement (p. 1417) 3

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GEP Requirement (p. 1417) 3

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Fourth Year

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CHE 497  Chemical Engineering Projects I  3
GEP Requirement (p. 1417)  3
Biotech Minor Group E Elective  3

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**Spring Semester**

CH 435  Process Systems Analysis and Control  3
CH 451  Chemical Engineering Design II  3
CH 452  Biomolecular Engineering  2
CH 448  Bioreactor Design  2

GEP Requirement (p. 1417)  3

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**Total Hours**  128

1  A grade of C- or higher is required.
2  A grade of C or higher is required.

**Career Opportunities**

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

**Chemical Engineering (BS): CHE/TE Dual Major**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Plan Requirements**

Chemical Engineering (BS): CHE/TE Dual Major: 144 Total Units

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**Spring Semester**

CH 223       | Organic Chemistry II                            | 3     |
| or CH 227    | or Organic Chemistry II for Students in Chemical Sciences | |     |
| CH 224       | Organic Chemistry II Lab                        | 1     |
| or CH 228    | or Organic Chemistry Laboratory II for Students in Chemical Sciences | |     |
| CHE 225      | Introduction to Chemical Engineering Analysis ² | 3     |
| MA 341       | Applied Differential Equations I ²              | 3     |
| TE 201       | Fiber Science                                  | 4     |
| MAE 206      | Engineering Statics                            | 3     |
| or CE 214    | or Engineering Mechanics-Statics               | |     |

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**Spring Semester**

ST 370       | Probability and Statistics for Engineers      | 3     |
| CHE 312      | Transport Processes II                         | 3     |
CHE 316  Thermodynamics of Chemical and Phase Equilibria  3  
TE 205  Analog and Digital Circuits  4  
TE 302  Textile Manufacturing Processes and Systems II  4  

| Hours | 17 |

**Fourth Year**

**Fall Semester**

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**Second Year**

**Fall Semester**

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**Spring Semester**

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<td>TE 201</td>
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<td>MAE 206</td>
<td>Engineering Statics</td>
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<td>or CE 214</td>
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<td>Applied Differential Equations I</td>
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**Semester Sequence**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Critical Path Courses- Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<tr>
<th>Course</th>
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<td>Introduction to Computing Environments</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Calculus I</td>
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<td><strong>GEP Health and Exercise Studies (p. 1422)</strong></td>
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**Acad Writing Research**

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Third Year

Fall Semester

CH 315  Quantitative Analysis  3
CH 316  Quantitative Analysis Laboratory  1
TE 301  Engineering Textile Structures I: Linear Assemblies  3
GC 120  Foundations of Graphics  3
CHE 311  Transport Processes I (CP)  3
CH 315  Quantitative Analysis (CP)  3

Hours: 16

Spring Semester

TE 302  Textile Manufacturing Processes and Systems II  4
ST 370  Probability and Statistics for Engineers  3
CHE 312  Transport Processes II  3
CHE 316  Thermodynamics of Chemical and Phase Equilibria  3
TE 205  Analog and Digital Circuits  4

Hours: 16

Fourth Year

Fall Semester

CHE 446  Design and Analysis of Chemical Reactors  3
GEP Requirement (p. 1417)  3
GEP Requirement (p. 1417)  3
TE 401  Textile Engineering Design I  4
Select one of the following:
EC 205  Fundamentals of Economics  3
EC 201  Principles of Microeconomics  3
ARE 201  Introduction to Agricultural & Resource Economics  3

Hours: 16

Spring Semester

TE 402  Textile Engineering Design II  4
TE 404  Textile Engineering Quality Improvement Laboratory  3
TE 424  Textile Engineering Quality Improvement Laboratory  1
GEP Requirement (p. 1417)  3
GEP Requirement (p. 1417)  3
CHE 395  Professional Development Seminar  1

Hours: 17

Fifth Year

Fall Semester

CHE 330  Chemical Engineering Lab I  4
CHE 435  Process Systems Analysis and Control  3
PCC 301  Technology of Dyeing and Finishing  3
PCC 304  Technology of Dyeing & Finishing Laboratory  1
GEP Requirement (p. 1417)  3

Hours: 15

Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

Chemical Engineering (BS): Green Chemistry and Engineering Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Chemical Engineering (BS): Green Chemistry and Engineering Concentration

Spring Semester
CH 201 or CH 203  Chemistry - A Quantitative Science 2 3
or General Chemistry II for Students in Chemical Sciences
CH 202 or CH 204  Quantitative Chemistry Laboratory 2 1
or General Chemistry Laboratory II for Students in Chemical Sciences
MA 241  Calculus II 2 4
PY 205 & PY 206  Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory 2 4

Select one of the following:
ARE 201  Introduction to Agricultural & Resource Economics 3
ARE 201A  Introduction to Agricultural & Resource Economics
EC 201  Principles of Microeconomics
EC 205  Fundamentals of Economics

Hours 15

Second Year

Fall Semester
CH 221 or CH 225  Organic Chemistry I 2 3
or Organic Chemistry I for Students in Chemical Sciences
CH 222 or CH 226  Organic Chemistry I Lab 2 1
or Organic Chemistry Laboratory I for Students in Chemical Sciences
CHE 205  Chemical Process Principles 2 4
MA 242  Calculus III 2 4

Hours 12

Spring Semester
CH 223 or CH 227  Organic Chemistry II 3
or Organic Chemistry II for Students in Chemical Sciences
CH 224 or CH 228  Organic Chemistry II Lab 2 1
or Organic Chemistry Laboratory II for Students in Chemical Sciences
CHE 225  Introduction to Chemical Engineering Analysis 2 3
MA 341  Applied Differential Equations I 2 3
PY 208 & PY 209  Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory 4

Hours 14

Third Year

Fall Semester
CH 315 & CH 316  Quantitative Analysis 4
and Quantitative Analysis Laboratory
CHE 311  Transport Processes I 2 3
CHE 315  Chemical Process Thermodynamics 2 3
ECE 331 or MSE 201  Principles of Electrical Engineering or Structure and Properties of Engineering Materials 3

Hours 13

Spring Semester
CHE 331  Chemical Engineering Lab II 2
CHE 446  Design and Analysis of Chemical Reactors 3
CHE 450  Chemical Engineering Design I 3
Concentration Elective (p. 493) 3
CHE 395  Professional Development Seminar 1

Hours 12

Fourth Year

Fall Semester
CHE 331  Chemical Engineering Lab II 2
CHE 446  Design and Analysis of Chemical Reactors 3
CHE 450  Chemical Engineering Design I 3
Concentration Elective (p. 493) 3

Hours 103

Free Electives
Free Electives (12 Hr S/U Lmt) 1 3
Total Hours 20

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Code Title Hours
GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 3

Free Electives
Free Electives (12 Hr S/U Lmt) 1 3
Total Hours 20

1 Students should consult their academic advisors to determine which courses fill this requirement.

Chemistry Electives

Code Title Hours
BCH 351 General Biochemistry 3
BCH 451 Principles of Biochemistry 4
CH 335 Principles of Green Chemistry 4
CH 437 Physical Chemistry for Engineers 4
CH 610 Special Topics In Chemistry 1-6
FS 402 Chemistry of Food and Bioprocessed Materials 4
FS 502 Chemistry of Food and Bioprocessed Materials 4
PCC 461 Chemistry of Polymeric Materials 3
PCC 464 Chemistry of Polymeric Materials Laboratory 1
PSE 335 Principles of Green Chemistry 4
CH 401 Systematic Inorganic Chemistry I 3
CH 415 Analytical Chemistry II 3

Concentration Electives

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<td>CE 373</td>
<td>Fundamentals of Environmental Engineering</td>
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<td>CE 476</td>
<td>Air Pollution Control</td>
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<td>CE 477</td>
<td>Principles of Solid Waste Engineering</td>
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<td>CE 478</td>
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<td>CE 484</td>
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Semester Sequence

This is a sample.

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<td>Introduction to Engineering &amp; Problem Solving ²</td>
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<td>E 115</td>
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<td>Hour                                                                 16</td>
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MA 242 | Calculus III ²                                            | 4     |
| GEP Requirement (p. 1417)                                 | 3     |

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<td>Transport Processes I ²</td>
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<td>Hour                                                                 15</td>
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<td>Hour                                                                 17</td>
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¹ A grade of C or higher is required.
² A grade of C- or higher is required.
Career Opportunities

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Chemical Engineering (BS): Honors Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The Honors Program allows students to gain a deeper understanding of chemical engineering principles than would be acquired by completing the standard CHE curriculum. Admission to the program requires students to have earned a minimum overall GPA of 3.5 and a minimum GPA of 3.5 in CHE 205 Chemical Process Principles and CHE 225 Introduction to Chemical Engineering Analysis. An honors thesis based on a supervised research experience and completion of at least one semester of faculty-supervised research are required for completion of the Honors Program.

Plan Requirements

Chemical Engineering (BS): Honors Concentration: 127 Total Units

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<td>Introduction to Engineering &amp; Problem Solving (^2)</td>
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<td>Introduction to Computing Environments</td>
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<td><strong>Spring Semester</strong></td>
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<td>CH 223 or CH 227</td>
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<td><strong>Fall Semester</strong></td>
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<td>CH 315 &amp; CH 316</td>
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<td>Transport Processes (^2)</td>
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<td>Chemical Process Thermodynamics (^2)</td>
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<td>Professional Development Seminar</td>
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<td>FS 402</td>
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**Fourth Year**

**Fall Semester**

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<td>CHE 497</td>
<td>Chemical Engineering Projects I</td>
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<td>Chemical Reaction Engineering</td>
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**Spring Semester**

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**Total Hours** 110

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

### Honors Electives

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### Semester Sequence

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**Career Opportunities**

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

**Chemical Engineering (BS): Nanoscience Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The Nanoscience Concentration develops students’ understanding of the scientific and technological principles associated with the design and manufacture of patterns and devices with features and advanced functionality on the nanometer scale.

**Plan Requirements**

Chemical Engineering (BS): Nanoscience Concentration: 125 Total Units

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Chemical Engineering (BS): Nanoscience Concentration

CHE 225  Introduction to Chemical Engineering Analysis  3
MA 341  Applied Differential Equations I  3
MSE 201  Structure and Properties of Engineering Materials  3

Hours  13

Third Year
Fall Semester
Select one of the following Chemistry Electives:  4

PCC 464  Chemistry of Polymeric Materials Laboratory
BCH 351  General Biochemistry
BCH 451  Principles of Biochemistry
CH 437  Physical Chemistry for Engineers
CH 610  Special Topics in Chemistry
CH 437  Physical Chemistry for Engineers
FS 402  Chemistry of Food and Bioprocessed Materials
CHE 311  Transport Processes I  3
CHE 315  Chemical Process Thermodynamics  3
CHE 395  Professional Development Seminar  1

Hours  11

Spring Semester

CH 437  Physical Chemistry for Engineers  4
CHE 312  Transport Processes II  3
CHE 316  Thermodynamics of Chemical and Phase Equilibria
CHE 330  Chemical Engineering Lab I  4

Hours  14

Fourth Year
Fall Semester
CHE 331  Chemical Engineering Lab II  2
CHE 446  Design and Analysis of Chemical Reactors  3
CHE 450  Chemical Engineering Design I  3
Nanosciences Elective (p. 498)  3

Hours  11

Spring Semester

CHE 435  Process Systems Analysis and Control  3
CHE 451  Chemical Engineering Design II  3
Nanosciences Elective (p. 498)  3

Hours  9

Total Hours  105

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

GEP Interdisciplinary Perspectives (p. 1426)  3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt)  3

Total Hours  20
1 Students should consult their academic advisors to determine which courses fill this requirement.

Nanosciences Electives

Code  Title  Hours
BEC 462  Fundamentals of Bio-Nanotechnology  3
BEC 562  Fundamentals of Bio-Nanotechnology  3
CHE 460  Nano-Electronic Materials  3
CHE 461  Polymer Sciences and Technology  3
CHE 462  Fundamentals of Bio-Nanotechnology  3
CHE 465  Colloidal and Nanoscale Engineering  3
CHE 467  Polymer Rheology  3
CHE 562  Fundamentals of Bio-Nanotechnology  3
E 304  Introduction to Nano Science and Technology  3
ECE 331  Principles of Electrical Engineering  3
MSE 355  Electrical, Magnetic and Optical Properties of Materials  3
MSE 455  Polymer Technology and Engineering  3
MSE 460  Microelectronic Materials  3
PY 407  Introduction to Modern Physics  3

Semester Sequence

This is a sample.

Course  Title  Hours
First Year
Fall Semester
CH 101  Chemistry - A Molecular Science  1
CH 102  General Chemistry Laboratory  2
E 101  Introduction to Engineering & Problem Solving  3
E 115  Introduction to Computing Environments  1
ENG 101  Academic Writing and Research  3
MA 141  Calculus I  4
GEP Health and Exercise Studies (p. 1422)  1

Hours  15

Spring Semester

CH 201  Chemistry - A Quantitative Science  2
CH 202  Quantitative Chemistry Laboratory  3
MA 241  Calculus II  4
PY 205  Physics for Engineers and Scientists I  1
PY 206  Physics for Engineers and Scientists I Laboratory  1

Select one of the following:  3

EC 205  Fundamentals of Economics
Fourth Year

Fall Semester

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Spring Semester

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Total Hours: 125

Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

Chemical Engineering (BS): Sustainable Engineering, Energy, and the Environment

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oip.ncsu.edu/pgas/)! The Sustainable Engineering, Energy, and Environment Concentration connects chemical engineering concepts with global grand challenges in...
the generation of clean and affordable energy, as well as sustainable and environmentally responsible engineering practices.

**Plan Requirements**

**Chemical Engineering (BS): Sustainable Engineering, Energy, and the Environment: 125 Total Units**

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A grade of C or higher is required.

A grade of C- or higher is required.

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1 Students should consult their academic advisors to determine which courses fill this requirement.

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develop an understanding of the fundamental concepts and practice of chemical engineering. This minor should prepare undergraduate students in environmental engineering, pulp and paper technology, and chemistry for graduate study in chemical engineering with a minimum amount of prerequisite work following their acceptance into the graduate program.

Admissions and Certification of Minor

Admission to the minor will require a minimum 2.5 over-all grade point average at NC State, and a grade of 'B' or higher on the first enrollment in CHE 205. An application for the minor must be submitted to Dr. Lisa Bullard, 2012 Engineering Bldg I, 919.515.7455, lisa_bullard@ncsu.edu. Dr. Bullard will also certify the completion of the student’s minor program. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in 2001 Engineering Bldg I and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Lisa Bullard
2012 Engineering Bldg I
919. 515.7455
lisa_bullard@ncsu.edu

SIS Code: 14CMM

Plan Requirements

The Chemical Engineering Minor requires a minimum of 19 hours. All courses must be completed with a grade of 'C-' or higher:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>CHE 225</td>
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<td>CHE 311</td>
<td>Transport Processes I</td>
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<tr>
<td>CHE 315</td>
<td>Chemical Process Thermodynamics</td>
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<td>CHE 316</td>
<td>Thermodynamics of Chemical and Phase Equilibria</td>
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<td>CHE 446</td>
<td>Design and Analysis of Chemical Reactors</td>
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<td></td>
<td>Total Hours</td>
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</table>

Career Opportunities

Careers in chemical engineering are sometimes exciting, always demanding, and ultimately provide a sense of accomplishment and achievement. Graduates find employment in sub-disciplines such as production, technical service, sales, management and administration; research and development; and consulting and teaching. Students desiring careers in teaching, research, or consulting are encouraged to continue their education and pursue a graduate degree (consult the Graduate Catalog). The undergraduate curriculum also provides strong preparation for graduate study in a wide range of professional specialties, and chemical engineering graduates often pursue careers in the medical sciences, business management, and law.

Chemical Engineering (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The minor in Chemical Engineering is intended to allow students to develop an understanding of the fundamental concepts and practice of chemical engineering.
Our overarching theme is sustainable infrastructure for society and our mission as civil, construction, and environmental engineers is to develop engineering solutions to better the human condition by improving infrastructure, human health, and the environment. This includes the design, construction and operation of facilities that we use daily including roads, bridges, tunnels, buildings, clean water for drinking and recreation, transportation networks, flood control systems and much more. We live by the principle that diversity makes us stronger and everyone has the right to be respected. Welcome to the Department of Civil, Construction, and Environmental Engineering.

Department Highlights:

- The Department will be moving into the new state-of-the-art Fitts-Woolard Hall on Centennial Campus in Fall 2020.
- The Department maintains state-of-the-art computing facilities and laboratories for teaching and research.
- Many students gain work experience through cooperative education (Co-Op) and internships.
- There are more than 25 student organizations and honor societies affiliated with the Department.
- Through the generous support of industry and program alumni, many scholarships and awards are available to students, in addition to university, college, and need-based financial aid.
- The Department offers an annual faculty led summer study abroad program, in addition to a wide range of programs offered by the Study Abroad Office in which our students participate.
- We have numerous opportunities for students to become involved in research with faculty and we offer an undergraduate research thesis option.
- Selected students may be admitted to the Accelerated Bachelors/Masters (ABM) program.

For more information about our Department, including contact information, visit our website (https://www.ccee.ncsu.edu/).

Department of Civil, Construction, and Environmental Engineering
North Carolina State University
Campus Box 7908
Raleigh, NC 27695-7908

Contact
Dr. R. Seracino
Professor and Associate Head for Undergraduate Programs
North Carolina State University
Mann Hall 203A
Raleigh, NC 27695-7908
Phone: 919-515-7626
Email: rudi_seracino@ncsu.edu

Faculty

Distinguished University Professor and Head
M.A. Barlaz

Associate Head for Graduate Programs
S.R. Ranjithan

Associate Head for Undergraduate Programs
R. Seracino

Coordinator of Advising
T. N. Aziz

Jimmy D. Clark Distinguished University Professor
Y.R. Kim

E. I. Clancy Distinguished Professor
E.J. Jaselskis

Glen E. Futrell Distinguished University Professor
H.C. Frey

Distinguished University Professor Emeritus
P. Zia

Distinguished Professor of Civil Engineering and Construction Emeritus
J.M. Hanson
S. Rizkalla

Edward I. Weisiger Distinguished Scholar
M. Liu

Edward I. Weisiger Distinguished Professor Emeritus
D. Johnston

Professors
S. Arumugam
M.A. Barlaz
E.Z. Berglund
J.W. Baugh, Jr.
E.D. Brill, Jr.
F.L. de los Reyes
J.J. Ducoste
M.A. Gabr
Adjunct Professor
M. Breen
M.G. Calvi

Professor of the Practice
B.L. Edge
J.A. Rispoli

Associate Professor
C.A. Castorena
J.F. DeCarolis
J.C. Dietrich
A.P. Grieshop
J. Johnson
B.M. Montoya
M. Pour-Ghaz
S. Underwood

Associate Professor Emeriti
W.L. Bingham
A.C. Chao
J.C. Smith

Adjunct Associate Professor
L.R. Goode

Assistant Professor
A. Albert
T.N. Aziz
E. Bardaka
A. Cabas-Mijares
D.F. Call
F. Garcia Menendez
K. Han
J. Kearns
D. R. Obenour
J. Patrick
Educational Objectives in Civil Engineering

Within a few years of graduation alumni of the Civil Engineering program will:

1. Function successfully in a professional environment by utilizing and enhancing their problem-solving and communication skills;
2. Continue learning through graduate or other professional education and obtaining licensure where appropriate;
3. Function in team-oriented, multidisciplinary open-ended engineering activities considering the societal and economic impacts of engineering decisions, and the professional and ethical responsibilities of civil engineers.
4. Promote organizational success with consideration of cost and time management while practicing and promoting ethical behavior and stewardship of a sustainable environment

Civil Engineering Degree

The Civil Engineering curriculum provides academic discipline in mathematics, the physical sciences, the humanities and social sciences, and the technical aspects of civil engineering. After introductory exposure to several of the professional areas such as environmental and water resources, geotechnical, structures, transportation and construction engineering, the student builds additional depth in several of these specialties. Students learn to include principles of sustainability in civil infrastructure designs and understand basic concepts in project management, business, public policy, leadership, and professional ethics.

Specific curriculum requirements are available on the Office of Undergraduate Courses and Curricula website, https://oucc.dasa.ncsu.edu/engineering-COE/.

Plan Requirements

Civil Engineering (BS): 125 Total Units

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<th>Course</th>
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<td>CH 101</td>
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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving 2</td>
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<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<td>MA 141</td>
<td>Calculus I 1</td>
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<td>ENG 101</td>
<td>Academic Writing and Research 2</td>
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<tr>
<td>MA 241</td>
<td>Calculus II 1</td>
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<td>CE 250</td>
<td>Introduction to Sustainable Infrastructure 2</td>
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<td>TDE 220</td>
<td>Civil Engineering Graphics</td>
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<td>MA 242</td>
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<td>Introduction to Computing: Python</td>
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<td>CE 225</td>
<td>Mechanics of Solids 2</td>
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<td>CE 282</td>
<td>Hydraulics 2</td>
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</table>
MA 305 or MA 341  Introductory Linear Algebra and Matrices or Applied Differential Equations I  3
MSE 200  Mechanical Properties of Structural Materials  3
PY 208  Physics for Engineers and Scientists II  3
PY 209  Physics for Engineers and Scientists II Laboratory  1

**Third Year**

**Fall Semester**

CE 332 or CE 342  Materials of Construction or Engineering Behavior of Soils and Foundations  3
Select one of the following:  3
- CE 305  Traffic Engineering
- CE 327  Reinforced Concrete Design
- CE 339  Civil Engineering Systems
- CE 383  Hydrology and Urban Water Systems
CE Junior Elective (p. 506)  3
ST 370  Probability and Statistics for Engineers  3

**Spring Semester**

CE 332 or CE 342  Materials of Construction or Engineering Behavior of Soils and Foundations  4
Select one of the following:  3
- CE 305  Traffic Engineering
- CE 327  Reinforced Concrete Design
- CE 339  Civil Engineering Systems
- CE 383  Hydrology and Urban Water Systems
CE Junior Elective (p. 506)  3
Basic Science Elective (p. 506)  3
Select one of the following:  3
- ECE 331  Principles of Electrical Engineering
- MAE 201  Engineering Thermodynamics I
- MAE 208  Engineering Dynamics

Total Hours  16

**Fourth Year**

**Fall Semester**

CE Senior Elective (p. 506)  3
CE Senior Elective (p. 506)  3
Senior Elective (p. 507)  3
COM 110 or ENG 331  Public Speaking or Communication for Engineering and Technology  3

Total Hours  12

**Spring Semester**

CE Senior Elective (p. 506)  3
CE Senior Elective (p. 506)  3
CE 420 or CE 450  Structural Engineering Project or Civil Engineering Project  3

Total Hours  9

Total Hours  108

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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<td>Reinforced Concrete Design</td>
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<td>CE 367</td>
<td>Mechanical and Electrical Systems in Buildings</td>
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<td>CE 373</td>
<td>Fundamentals of Environmental Engineering</td>
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<td>Hydrology and Urban Water Systems</td>
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<td>BIO 183</td>
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<td>FOR 260</td>
<td>Forest Ecology</td>
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<td>FW 221</td>
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<td>Highway Design</td>
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<td>Railroad System Planning, Design, and Operation</td>
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<td>Principles of Pavement Design</td>
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<td>CE 426</td>
<td>Structural Steel Design</td>
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<td>CE 435</td>
<td>Engineering Geology</td>
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<td>CE 437</td>
<td>Civil Engineering Computing</td>
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<td>Seepage, Earth Embankments and Retaining Structures</td>
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<td>Building Construction Engineering</td>
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<td>CE 476</td>
<td>Air Pollution Control</td>
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<td>Principles of Solid Waste Engineering</td>
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<td>CE 478</td>
<td>Energy and Climate</td>
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<td>Air Quality</td>
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<td>Water Supply and Waste Water Systems</td>
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<td>Introduction to Coastal and Ocean Engineering</td>
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<td>Water Resources Engineering</td>
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<td>CE 505</td>
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<td>CE 507</td>
<td>Sensors, Instrumentation, and Data Analytics for Transportation Networks</td>
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<td>Daylighting and Passive Energy Systems for Architecture</td>
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<td>ARC 522</td>
<td>Building Energy Modeling and Simulation</td>
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<td>FRP Strengthening and Repair of Concrete Structures</td>
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<td>Properties of Concrete and Advanced Cement-Based Composites</td>
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<td>CE 535</td>
<td>Introduction to Numerical Methods for Civil Engineers</td>
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<td>Computer Methods and Applications</td>
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<td>Information Technology and Modeling</td>
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<td>Soil and Site Improvement</td>
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<td>Coastal Hydrodynamics</td>
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<td>Hydraulics Of Ground Water</td>
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<td>Special Topics in Civil Engineering Computing</td>
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<td>MAE 310</td>
<td>Heat Transfer Fundamentals</td>
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<td>MAE 315</td>
<td>Dynamics of Machines</td>
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## Semester Sequence

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### First Year

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<td>Academic Writing and Research</td>
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<td>Calculus I</td>
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### Second Year

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| GEP Health and Exercise Studies (p. 1422) | 1 |

### Third Year

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| GEP Requirement (p. 1417) | 3 |

#### Spring Semester

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#### Career Opportunities

Society will always need constructed facilities to live, work, and sustain their lives and environment, and civil, construction, and environmental engineers will always be needed to plan, design, and construct these facilities. Civil, construction, and environmental engineering comprise such diversified fields that graduates have a wide choice in types and locations of employment. Jobs range from federal, state, or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a big city, an industrial center, or even in a foreign country. Careers in either professional practice or teaching and research are common for many graduates who complete advanced degrees.

### Construction Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Construction Engineering Degree

The Construction Engineering curriculum is designed for the student interested in the planning, design, direction, and management of construction projects. It includes the core course requirements in mathematics, the physical sciences, and the humanities and social sciences. After exposure to engineering fundamentals and engineering design of facilities, the curriculum provides a series of specialty courses in construction engineering related to the analysis, design, and management of the construction process. The General Construction Concentration is designed for students pursuing careers in the building, residential, highway, and heavy construction industry.

Specific curriculum requirements are available on the Office of Undergraduate Courses and Curricula website, https://oucc.dasa.ncsu.edu/engineering-COE/ (https://oucc.dasa.ncsu.edu/engineering-COE/)

Educational Objectives in Construction Engineering

Within a few years of graduation alumni of the Construction Engineering program will:

1. Function successfully in careers emphasizing application of construction engineering and management principles with the ability to solve a broad set of engineering problems in construction.
2. Practice construction engineering including the design and management of the construction process to achieve needed safety, quality, durability, sustainability, and economic objectives.
3. Function in team-oriented, multi-disciplinary, open-ended engineering activities considering the societal and economic impacts of construction, and the professional and ethical responsibilities of the construction engineer.
4. Engage in life-long learning through graduate study, self study, or continuing education; pursue licensure; provide mentoring to those under their supervision and influence; and provide leadership in their employment organizations, industry associations and professional societies.

Plan Requirements

Construction Engineering (BS): 128 Total Units

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<td>Civil Engineering Graphics</td>
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**Spring Semester**

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Management Science Elective (p. 510) 3

Total Hours 18

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

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GEP Requirement (p. 1417) 3

**Second Year**

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Total Hours 16

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<td>Reinforced Concrete Design</td>
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<td>Hydraulics</td>
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Total Hours 114

**GEP Courses**

GEP Humanities (p. 1423) 6

GEP Health and Exercise Studies (p. 1422) 2

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

GEP Interdisciplinary Perspectives (p. 1426) 3

GEP U.S. Diversity (p. 1431) (verify requirement) 3

GEP Global Knowledge (p. 1419) (verify requirement) 3

GEP Health and Exercise Studies (p. 1422) 1

Total Hours 14

**Management Science Electives**

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<td>U.S. Environmental Law and Politics</td>
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<td>Jobs and Work</td>
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Total Hours 14

**Semester Sequence**

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<td>Introduction to Engineering &amp; Problem Solving</td>
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Second Year

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Basic Science Elective 3

Total Hours 18

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Total Hours 16

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<td>CE 466</td>
<td>Building Construction Engineering</td>
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</table>
Educational Objectives in Environmental Engineering

Within a few years of graduation alumni of the Environmental Engineering program will:

1. Function successfully in a professional environment by utilizing and enhancing their problem-solving and communication skills.
2. Continue learning through graduate or other professional education and obtaining licensure where appropriate.
3. Promote organizational success with consideration of cost and time management, and demonstrate global and societal awareness, while practicing and promoting ethical behavior and stewardship of a sustainable environment.

Plan Requirements

Environmental Engineering (BS): 128 Total Units

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<thead>
<tr>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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Career Opportunities

Society will always need constructed facilities to live, work, and sustain their lives and environment, and civil, construction, and environmental engineers will always be needed to plan, design, and construct these facilities. Civil, construction, and environmental engineering comprise such diversified fields that graduates have a wide choice in types and locations of employment. Jobs range from federal, state, or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a big city, an industrial center, or even in a foreign country. Careers in either professional practice or teaching and research are common for many graduates who complete advanced degrees.

Environmental Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

Environmental Engineering Degree

The Environmental Engineering curriculum is designed for students interested in environmental sustainability. The curriculum provides students with the foundations in science, mathematics, and engineering required to observe, understand, model, and analyze environmental systems as well as to design critical components of society’s infrastructure. Upon graduation, students are prepared to work in such areas as water treatment, water resources engineering and management, air pollution control, solid waste management, and energy management. The curriculum emphasizes the interdisciplinary nature of environmental engineering with courses in both engineering and life sciences, including specialized courses on energy and climate, pollution control, and waste management.

Specific curriculum requirements are available on the Office of Undergraduate Courses and Curricula website, https://oucc.dasa.ncsu.edu/engineering-COE/
Environmental Engineering (BS)

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<td>SSC 442</td>
<td>Soil and Environmental Biogeochemistry</td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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**Third Year**

**Fall Semester**

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<td>Civil Engineering Graphics or GIS 280</td>
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**Spring Semester**

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<td>Civil Engineering Systems</td>
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<td>Engineering Thermodynamics I</td>
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<td>U.S. Environmental Law and Politics or Global</td>
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**Fourth Year**

**Fall Semester**

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<td>Air Pollution Control or Air Quality</td>
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<td>CE 484</td>
<td>Water Supply and Waste Water Systems</td>
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<td>Water Resources Engineering</td>
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**Spring Semester**

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<td>Principles of Solid Waste Engineering</td>
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**Total Hours**

**117**

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

### ENE Elective I

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<td>CE 479</td>
<td>Air Quality</td>
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<td>CE 487</td>
<td>Introduction to Coastal and Ocean Engineering</td>
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<tr>
<td>CE 578</td>
<td>Energy and Climate</td>
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<td>Air Pollution Control</td>
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<td>CE 499</td>
<td>Undergraduate Research Thesis in Civil, Construction and Environmental Engineering</td>
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<td>Building Energy Efficiency &amp; Renewable Energy</td>
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<td>CE 478</td>
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<td>Air Quality</td>
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<td>CE 487</td>
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### Semester Sequence

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<td>Chemistry - A Molecular Science</td>
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<td>Introduction to Computing Environments</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>MA 141</td>
<td>Calculus</td>
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<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
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</tbody>
</table>
GEP Requirement (p. 1417) 3

Spring Semester

CE 477 Principles of Solid Waste Engineering 3
CE 481 Environmental Engineering Project 3
ENE Elective II 3
ENE Elective III 3
GEP Requirement (p. 1417) 3

Hours
15
Total Hours 128

Spring Semester

BIO 183 Introductory Biology: Cellular and Molecular Biology 4
CE 373 Fundamentals of Environmental Engineering 3
Earth System Chemistry Elective 3
MA 341 Applied Differential Equations I 3
CE 282 Hydraulics 3
GEP Health and Exercise Studies (p. 1422) 1

Hours
17

Third Year

Fall Semester

CE 378 Environmental Chemistry and Microbiology 4
TDE 220 Civil Engineering Graphics or GIS 280
PY 208 Physics for Engineers and Scientists II 3
ST 370 Probability and Statistics for Engineers 3
COM 110 Public Speaking 3
PY 209 Physics for Engineers and Scientists II Laboratory 1

Hours
17

Spring Semester

CE 381 Hydraulics Systems Measurements Lab 1
CE 383 Hydrology and Urban Water Systems 3
CE 339 Civil Engineering Systems 3
MAE 201 Engineering Thermodynamics I 3
PS 320 or PS 336 U.S. Environmental Law and Politics or Global Environmental Politics 3
GEP Requirement (p. 1417) 3

Hours
16

Fourth Year

Fall Semester

CE 488 Water Resources Engineering 3
CE 476 or CE 479 Air Pollution Control or Air Quality 3
ENE Elective I 3
CE 484 Water Supply and Waste Water Systems 3

Career Opportunities

Society will always need constructed facilities to live, work, and sustain their lives and environment, and civil, construction, and environmental engineers will always be needed to plan, design, and construct these facilities. Civil, construction, and environmental engineering comprise such diversified fields that graduates have a wide choice in types and locations of employment. Jobs range from federal, state, or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a big city, an industrial center, or even in a foreign country. Careers in either professional practice or teaching and research are common for many graduates who complete advanced degrees.

Department of Computer Science

To see what you will learn while pursuing this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Computer Science in the College of Engineering at NC State University offers a Bachelor of Science in Computer Science degree. The degree is nationally accredited by the Computing Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/). Core courses provide a foundation for all students in programming languages, data structures, software engineering, computer architectures, the theory of computation, the basics of building secure software and systems, teaming and communication, and the social and ethical dimensions of the practice of computer science. Students explore the mathematical methods needed to analyze and compare both computation problems themselves and alternative approaches to solving them. All Computer Science majors must complete a team project in Senior Design. Projects under the auspices of the department’s Senior Design Center have industrial sponsors, so student teams gain experience working jointly with industry representatives to achieve project goals. Senior Design teams are expected to solve a technical computing problem while effectively communicating their work and process to various audiences.

Students take a variety of courses to explore more advanced areas, among them artificial intelligence, cloud computing, compilers, computer architecture and multiprocessors, computer graphics, cryptography, database management systems, data science, development and operations, educational technology, file organization and processing, human-computer interface design, multimedia technology, networks, privacy, security (computer, network, and software), sensor systems,
social computing, and web services. We offer two concentrations in Game Development and Cybersecurity, which allow for specialization in depth.

The Department of Computer Science also offers two undergraduate elective tracks in Security ([https://www.csc.ncsu.edu/academics/undergrad/tracks/security.php](https://www.csc.ncsu.edu/academics/undergrad/tracks/security.php)) and Entrepreneurship ([https://www.csc.ncsu.edu/academics/undergrad/tracks/entrepreneurship.php](https://www.csc.ncsu.edu/academics/undergrad/tracks/entrepreneurship.php)). The tracks provide the opportunity for students to focus on a key set of CSC Restricted Elective courses that provide focus in an area of interest. The Undergraduate Track in Security teaches students the skills necessary to build, analyze, and reason about secure and private systems beyond the security coverage in the core curriculum. The Undergraduate Track in Entrepreneurship provides the opportunity for students to engage in entrepreneurial endeavors and connect with the broader entrepreneurial community at NC State. Both tracks are recognized by a letter of completion.

**Departmental Highlights**

NC State Computer Science was established in 1967 and is one of the oldest Computer Science departments in the county.

- Opportunity for undergraduate research for coursework or stipend.
- Applied learning through our award-winning capstone Senior Design Center projects. Most projects are industrially sponsored and challenge students to deliver a cohesive software system solving a problem.
- More than 100 companies actively partner with the department via sponsored programs, research, scholarships, projects, and initiatives.
- A variety of student organizations ([https://www.csc.ncsu.edu/academics/students_orgs.php](https://www.csc.ncsu.edu/academics/students_orgs.php)) providing leadership skills, service, networking, and informal learning opportunities, including ACM/AITP, HackPack, Honors Programs/Honors Societies, Linux Users Group, STARS Student Leadership Corps, and Women in Computer Science.
- Academic Alliance Member of National Center for Women and Information Technology (NC WIT)
- Areas of expertise in artificial intelligence, bioinformatics and computational sciences, computer-based education, graphics and visualization, high-performance & power-aware systems, networks, security, software engineering, theory and algorithms.

**Departmental Information**

The Department of Computer Science is located in Engineering Building II on NC State’s Centennial Campus.

Department of Computer Science: [https://www.csc.ncsu.edu/](https://www.csc.ncsu.edu/)

Contact: Computer Science Academic Advising: [https://www.csc.ncsu.edu/academics/undergrad/advising/](https://www.csc.ncsu.edu/academics/undergrad/advising/)

**Faculty**

**Department Head**

G.A. Rothermel, and Professor

**Director of Graduate Programs**

G.N. Rouskas

**Director of Undergraduate Programs**

S.S. Heckman

**Director of Advising (Undergraduate)**

B.J. Adams

**Distinguished University Research Professor**

D.L. Bitzer

**Distinguished Professor**

M.A. Vouk, and Associate Vice Chancellor for Research Development

L.A. Williams, and Co-Director - NCSU Science of Security Lablet

**Distinguished University Professor**

J.C. Lester, and Director of the Center for Educational Informatics

M. Rappa

**SAS Distinguished Professor**

J. Doyle

**Alumni Distinguished Graduate Professor**

H. Perros

G.N. Rouskas

M.P. Singh, and Co-Director - NCSU Science of Security Lablet

**Professors**

T.M. Barnes

R.Y. Chirkova

R. Dutta, and Interim Associate Department Head

E.F. Gehringer

X. Gu

C.G. Healey, and Goodnight Distinguished Professor Analytics, Institute for Advanced Analytics

T.J. Menzies

F. Mueller

D.S. Reeves, and Associate Dean for Graduate Programs, College of Engineering
N.F. Samatova
C.D. Savage
X. Shen
M.F. Stallmann

Associate Professors
K. Anyanwu Ogan
D.R. Bahler
M. Chi
W.H. Enck, and Director of Wolfpack Security & Privacy Research (WSPR) Laboratory
V. Freeh, and Assistant Director of Undergraduate Programs
K. Harfoush
S. Heber
A. Jhala
N. Matsuda
D.L. Roberts
D.R. Sheehy
R. Vatsavai
B. Watson

Assistant Professors
A. Das
G. Jin
A. Kapravelos
C. Lynch
C. Martens
J.P. Ore
C.J. Parnin
T. Price
B. Reaves
A. Scafuro
M. Shahzad
K.T. Stolee
R. Yu

Research Professor
P.A. Dreher

Teaching Associate Professor
T. Battestilli
S.S. Heckman
D.B. Sturgill

Teaching Assistant Professors
B. Akram
S.P. Balik
I. Dominguez
J. Jennings
J. King
J.Y. Schmidt

Lecturers
B.J. Adams
M. Heil, and Director of Senior Design Center
D.A. Lasher, and Scheduling Officer
TA. Marini, and Assistant Director of Undergraduate Advising

Emeritus
W. Chou
E.W. Davis
R.J. Fornaro
T.L. Honeycutt
D.F. McAllister
W.E. Robbins
W.J. Stewart
A.L. Tharp
D.J. Thuente

Visiting Research Professor
F. Brglez

Associate Vice Chancellor of Partnerships and Economic Development
D.H. Kekas
Director of Development & External Relations
K. Tate

Director of Development
S. Seltzer

Director of Graduate Career Services
L. Rand-Pickett

Research and Development Staff
V. Catete
T.S. Coates, and Assistant Director of External Relations
K.S. Culbertson
B. Liu
D. Kremer
W. Min
B.W. Mott
S. Reaves
J.P. Rowe
P. Smith
R. Spain
R.G. Taylor
S. Taylor
D.R. Wright

Adjuncts
A.I. Anton
K.E. Boyer
R. Chillarege
A. Dagnino
S.W. Hunter
P. Ning
I. Rhee
A. Rindos
A. Rivers
R.A. St.Amant
J.N. Staddon

J.P. Streck
H.W. Tseng
X. Wang
T. Xie
R.M. Young
T. Yu

Associate Members of the Department
For a list of Associate Members of the Department, please see the Computer Science Department's webpage

Plans

• Computer Programming (Certificate) (For Post-Baccalaureate Students, Distance Education) (p. 516)
• Computer Programming (Minor) (p. 517)
• Computer Science (BS) (p. 518)
• Computer Science (BS), Game Development Concentration (p. 520)

Computer Programming (Certificate) (For Post-Baccalaureate Students, Distance Education)

To see what you will learn while pursuing this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Computer Science Department offers the Computer Programming Certificate (CPC) to post-baccalaureate students (PBS) to enable them to change careers, enhance their professional credentials, or simply learn more about computer programming. The focus of the required courses is the theory and practice of the basics of Computer Science and computer programming. Rather than teach applications and a single skill set, the program focuses on higher-order analytical skills that are crucial to mastery of an ever-changing field. This certificate is offered via Distance Education through Engineering Online.

Admissions Requirements

Although anyone with the prerequisites can take CSC classes offered through the CPC Program, the CPC is a distance-only program for PBS students. After students have been accepted as an NDS student at NC State, they may apply for the CPC program. Students must submit a BS/BA transcript from a degree other than computer science or computer engineering. The certificate is awarded to students completing the required courses with a grade point average of 2.0 or above.

Engineering Online and the Department of Computer Science jointly maintain and distribute a written description for interested prospective students. The Director of Advising for the Department of Computer Science coordinates with Registration & Records in the issuing of certificates.
Students may enroll for classes through Engineering Online (https://www.engineeringonline.ncsu.edu/apply-and-enroll/enroll/).

**Program Coordinators**

Certificate Director  
Dr. Sarah Heckman  
North Carolina State University  
Department of Computer Science-Engineering  
Campus Box 8206  
Raleigh, NC 27695  
919-515-2042  
sarah_heckman@ncsu.edu

Director of Engineering Online  
Dr. Linda Krute  
North Carolina State University  
College of Engineering – Dean’s Office  
Campus Box 7547  
Raleigh, NC 27695  
919-515-5440  
linda_krute@ncsu.edu

**Academic Structure**

Term Effective: 1/1979; 8/2011, 1/2019  
Plan Code: 14CPCTU, 32CPCTU  
CIP Code: 14.0901  
Description: Undergraduate Certificate in Computer Programming  
Offered: Distance Education (https://online-distance.ncsu.edu/program/undergraduate-certificate-in-computer-programming/) format only

**Plan Requirements**

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<thead>
<tr>
<th>Code</th>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus ¹</td>
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<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java ²</td>
<td>3</td>
</tr>
<tr>
<td>CSC 216</td>
<td>Software Development Fundamentals ²</td>
<td>3</td>
</tr>
<tr>
<td>CSC 217</td>
<td>Software Development Fundamentals Lab ²</td>
<td>1</td>
</tr>
<tr>
<td>CSC 226</td>
<td>Discrete Mathematics for Computer Scientists</td>
<td>3</td>
</tr>
<tr>
<td>CSC 230</td>
<td>C and Software Tools</td>
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</tr>
<tr>
<td>CSC 236</td>
<td>Computer Organization and Assembly Language for Computer Scientists</td>
<td>3</td>
</tr>
<tr>
<td>CSC 246</td>
<td>Concepts and Facilities of Operating Systems for Computer Scientists</td>
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<tr>
<td>CSC 316</td>
<td>Data Structures and Algorithms</td>
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<tr>
<td></td>
<td><strong>Total Hours</strong></td>
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</tr>
</tbody>
</table>

¹ Please note that students who intend to pursue graduate study after completion of the CPC need MA 141 Calculus I, not MA 121 Elements of Calculus.
² with a grade of C or better

The Department of Computer Science waives the pre/co-requisite of MA 121 Elements of Calculus or MA 131 Calculus for Life and Management Sciences A or MA 141 Calculus I so students interested in the CPC may begin by taking CSC 116 Introduction to Computing - Java. However, a Calculus I class remains a requirement for the CPC program. E 115 Introduction to Computing Environments is waived as a prerequisite for CSC 116 Introduction to Computing - Java since this is a DE program and E 115 Introduction to Computing Environments material is not needed for student success.

**Computer Programming (Minor)**

To see what you will learn while pursuing this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Computer Science offers a Minor in Computer Programming to undergraduate majors in any field except Computer Science, Electrical Engineering, and Computer Engineering. The objectives of this minor are to:

1. Encourage students to combine computing with their own disciplines.
2. Promote quality and process when developing computing solutions.
3. Give graduating seniors with a minor in computer programming an added advantage in the job market.

The minor requires completion of 22 credit hours from the Computer Science core.

**Admissions and Certification of Minor**

**Admissions**

Undergraduates will be admitted to the Minor in Computer Programming only after they have completed CSC 116 Introduction to Computing - Java with a grade of C or higher and have an overall GPA of at least 2.25. Students should submit the application for the Minor in Computer Programming (https://www.csc.ncsu.edu/academics/undergrad/advising/forms.php) via an online form to the CSC Coordinator for Academic Minor, as listed below, who will be the minor advisor. Students must have a posted grade in order to submit an application.

**Certification**

The Department of Computer Science Advising Office will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact Person**

Ms. ToniAnn Marini  
Daniels Hall 219-A  
919-515-7920  
tamarini@ncsu.edu  
go.ncsu.edu/tamarini (http://go.ncsu.edu/tamarini/)

SIS Code: 14CPM

**Plan Requirements**

Completion of 22 credit hours.

All courses in the minor must be completed with a grade point average of 2.0 or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSC 116</td>
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</tr>
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</table>
Computer Science (BS)

Like all first-year students in the College of Engineering, students intending to major in Computer Science take a core of courses in the humanities, chemistry, mathematics, physics, and computing. After successfully completing required courses, students may apply to join the Department of Computer Science as degree-seeking students. The Computer Science curriculum teaches the skills needed to understand, design, implement, test, and deploy computer systems and software of all kinds. Students are expected to work on teams to effectively solve computing problems in various domains and communicate their work to a technical audience. Additionally, students explore the mathematical methods needed to analyze and compare both computation problems themselves and alternative approaches to solving them.

Core courses provide a foundation for all students in programming languages, data structures, software engineering, computer architectures, the theory of computation, the basics of building secure software and systems, teaming and communication, and the social and ethical dimensions of the practice of computer science.

Computer science electives are chosen in consultation with advisers, usually starting during the junior year. These electives allow exploration of more advanced areas: among them artificial intelligence, cloud computing, compilers, computer architecture and multiprocessors, computer graphics, cryptography, database management systems, data science, development and operations, educational technology, file organization and processing, human-computer interface design, multimedia technology, networks, privacy, security (computer, network, and software), sensor systems, social computing, and web services. A special focus is on skills that help our students be competitive in the global economy. These skills include technical communication, understanding of business principles in organizations that use information technology, an aptitude for innovation, an understanding of intellectual property issues, and an understanding of the latest technologies, such as web-services, security, as well as both closed and open source solutions and engineering issues.

The Department of Computer Science offers two undergraduate elective tracks in Security (https://www.csc.ncsu.edu/academics/undergrad/tracks/security.php) and Entrepreneurship (https://www.csc.ncsu.edu/academics/undergrad/tracks/entrepreneurship.php). The tracks provide the opportunity for students to focus on a key set of CSC.

Restricted elective courses that provide depth in an area of interest. The Undergraduate Track in Security teaches students the skills necessary to build, analyze, and reason about secure and private systems beyond the security coverage in the core curriculum. Topics include both an overview of computer and network security and a variety of more in-depth topics, including systems security, network security, software security, privacy, and cryptography. The Undergraduate Track in Entrepreneurship provides the opportunity for students to engage in entrepreneurial endeavors and connect with the broader entrepreneurial community at NC State. Both tracks are recognized by a letter of completion.

All Computer Science majors must complete a team project in Senior Design. Projects under the auspices of the department’s Senior Design Center have industrial sponsors, so student teams gain experience working jointly with industry representatives to achieve project goals. Senior Design teams are expected to solve a technical computing problem while effectively communicating their work and process to various audiences.

The undergraduate curriculum leads to a Bachelor of Science in Computer Science. This program is nationally accredited by the Computing Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org)/.

Plan Requirements

Computer Science (BS): 121 Total Units

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<tr>
<th>Course</th>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<tr>
<td>MA 141</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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Total Hours: 14

Spring Semester

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<td>CSC 116</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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<td>ARE 201</td>
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<td>ARE 201A</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>E 102</td>
<td>Engineering in the 21st Century</td>
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Total Hours: 16

Second Year

Fall Semester

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<td>Discrete Mathematics for Computer Scientists</td>
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<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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**Hours** 15

**Spring Semester**

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<tr>
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<tbody>
<tr>
<td>CSC 230</td>
<td>C and Software Tools</td>
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<td>CSC 316</td>
<td>Data Structures and Algorithms</td>
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<td>MA 305</td>
<td>Introductory Linear Algebra and Matrices</td>
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<td>Basic Science Elective</td>
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**Hours** 12

**Third Year**

**Fall Semester**

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<td>Concepts and Facilities of Operating Systems for Computer Scientists</td>
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<td>CSC 333</td>
<td>Automata, Grammars, and Computability</td>
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<td>ST 370</td>
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**Hours** 12

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<td>ENG 331</td>
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**Hours** 8

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<td>MA 241</td>
<td>Calculus II</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>PY 206</td>
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<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
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</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td></td>
</tr>
<tr>
<td>E 102</td>
<td>Engineering in the 21st Century</td>
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**Hours** 16

**Second Year**

**Fall Semester**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSC 216</td>
<td>Software Development Fundamentals</td>
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</tr>
<tr>
<td>CSC 217</td>
<td>Software Development Fundamentals Lab</td>
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<td>CSC 226</td>
<td>Discrete Mathematics for Computer Scientists</td>
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<td>MA 242</td>
<td>Calculus III</td>
<td>4</td>
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<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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<tr>
<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<tr>
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</table>

**Hours** 16

**Spring Semester**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSC 230</td>
<td>C and Software Tools</td>
<td>3</td>
</tr>
<tr>
<td>CSC 316</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>MA 305</td>
<td>Introductory Linear Algebra and Matrices</td>
<td>3</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
<td>3</td>
<td></td>
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<tr>
<td>Basic Science Elective</td>
<td>3</td>
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**Hours** 15
Third Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
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<tbody>
<tr>
<td>CSC 236 Computer Organization and Assembly Language for Computer Scientists</td>
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<tr>
<td>CSC 246 Concepts and Facilities of Operating Systems for Computer Scientists</td>
<td>3</td>
</tr>
<tr>
<td>CSC 333 Automata, Grammars, and Computability</td>
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</tr>
<tr>
<td>ST 370 Probability and Statistics for Engineers</td>
<td>3</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
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Spring Semester

<table>
<thead>
<tr>
<th>Hours</th>
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CSC 326 Software Engineering | 4 |
CSC 379 Ethics in Computing | 1 |
ENG 331 Communication for Engineering and Technology | 3 |
GEP Health and Exercise Studies (p. 1422) | 1 |
Other Restricted Elective | 3 |

Fourth Year

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CSC Restricted Elective</td>
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<tr>
<td>CSC Restricted Elective</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
<td>3</td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td>3</td>
</tr>
<tr>
<td>Other Restricted Elective</td>
<td>3</td>
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Spring Semester

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
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<tbody>
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<td>15</td>
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</table>

CSC 492 Senior Design Project | 3 |
CSC Restricted Elective | 3 |
Other Restricted Elective | 3 |
Free Elective | 3 |
GEP Requirement (p. 1417) | 3 |

Total Hours | 121 |

1 Courses required for matriculation (CODA).
2 A grade of C or higher is required.
3 To be selected from CH 201, PY 123, 124, any PY course with a prerequisite of PY 208, or any PB, BIO, MEA, or ZO course.
4 One of the following two conditions regarding the major GPA is required: I) the major GPA, which consists of all CSC courses attempted at NCSU, must be 2.0 or higher or II) a student whose major grade point average is below 2.0 may graduate if no CSC course used to satisfy the major requirements has a grade below a C-.
5 Grade of C- or higher required.

Career Opportunities

Designing computer systems, and the software that runs on them is the job of computer scientists. Computer scientists find demand for their innovation, design, analysis, testing, and engineering skills across all domains. As a direct consequence of the increasingly critical role of computers in society, the discipline of computer science has enjoyed rapid growth for many years, with the trend likely to continue. Employment projections indicate a critical nationwide shortfall in the supply of people skilled in computing and information technology, and a resulting steady rise in demand and salaries, for decades to come. Computer Science graduates from NC State are in high demand, including by employers that are extremely selective in their national recruiting.

Anchoring one corner of the world-famous Research Triangle Park, and located in modern state-of-the-art teaching and research facilities on NC State's Centennial Campus, the department and its students and faculty benefit from strong and active industry partnerships. NC State Computer Science is one of the top suppliers in the nation of new graduate hires to a number of high-tech companies, including several Fortune 500 companies, some with a substantial presence in the Research Triangle. Starting salaries for our undergraduates now average over $75,000 and show a steady increase. Opportunities are also plentiful for graduate study for those who wish to pursue the field in more depth.

Computer Science (BS), Game Development Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Like all first-year students in the College of Engineering, students intending to major in Computer Science take a core of courses in the humanities, chemistry, mathematics, physics, and computing. After successfully completing required courses, students may apply to join the Department of Computer Science as degree-seeking students. The Computer Science curriculum teaches students the skills needed to understand, design, implement, test, and deploy computer systems and software of all kinds. Students are expected to work on teams to effectively solve computing problems in various domains and communicate their work to a technical audience. Additionally, students explore the mathematical methods needed to analyze and compare both computation problems themselves and alternative approaches to solving them.

Core courses provide a foundation for all students in programming languages, data structures, software engineering, computer architectures, the theory of computation, the basics of building secure software and systems, teaming and communication, and the social and ethical dimensions of the practice of computer science.

Computer science electives are chosen in consultation with advisers, usually starting during the junior year. These electives allow exploration of more advanced areas: among them artificial intelligence, cloud computing, compilers, computer architecture and multiprocessors, computer graphics, cryptography, database management systems, data science, development and operations, educational technology, file organization and processing, human-computer interface design, multimedia technology, networks, privacy, security (computer, network, and software), sensor systems, social computing, and web services. A special focus is on skills that help our students be competitive in the global economy. These skills include technical communication, understanding of business principles in organizations that use information technology, an aptitude for innovation, an understanding of intellectual property issues, and an understanding of the latest technologies, such as web-services, security, as well as both closed and open source solutions and engineering issues.
The Department of Computer Science offers two undergraduate elective tracks in Security (https://www.csc.ncsu.edu/academics/undergrad/tracks/security.php) and Entrepreneurship (https://www.csc.ncsu.edu/academics/undergrad/tracks/entrepreneurship.php). The tracks provide the opportunity for students to focus on a key set of CSC Restricted elective courses that provide depth in an area of interest. The Undergraduate Track in Security teaches students the skills necessary to build, analyze, and reason about secure and private systems beyond the security coverage in the core curriculum. Topics include both an overview of computer and network security and a variety of more in-depth topics, including systems security, network security, software security, privacy, and cryptography. The Undergraduate Track in Entrepreneurship provides the opportunity for students to engage in entrepreneurial endeavors and connect with the broader entrepreneurial community at NC State. Both tracks are recognized by a letter of completion.

All Computer Science majors must complete a team project in Senior Design. Projects under the auspices of the department’s Senior Design Center have industrial sponsors, so student teams gain experience working jointly with industry representatives to achieve project goals. Senior Design teams are expected to solve a technical computing problem while effectively communicating their work and process to various audiences.

The undergraduate curriculum leads to a Bachelor of Science in Computer Science. This program is nationally accredited by the Computing Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/).

**Game Development Concentration**

Computer games are some of the most complex software development projects and employ some of the most advanced technologies of any application area of computer science. The entertainment software sector is a multi-billion dollar industry with increasing demand for new employees trained in these technologies and methods. In addition to the more familiar entertainment sector, these technologies also have applications to such areas as training, education, visualization, and social interaction forums — so-called “serious games.” North Carolina is now among the top tier of US states with centers of game industry employment. As the game industry continues to grow, demand by North Carolina companies for new graduates with a strong background in computer science with a focus on game development will also expand.

Many aspects of computer game development are unique to the game industry and the game development concentration provides specialized coursework in these areas. The game development concentration focuses on game development technologies while preserving the breadth and depth of the general computer science BS degree. The concentration requires that students take both the initial course on computer graphics (CSC 461 Computer Graphics) and the initial course on game engine design (CSC 481 Game Engine Foundations). They must choose as a concentration project either the graphics or game development advanced elective (CSC 462 Advanced Computer Graphics Projects or CSC 482 Advanced Computer Game Projects, respectively). Two additional games restricted electives are chosen from a list of CSC courses with content highly relevant to game development. Of the nine credit hours required for other electives, students in the concentration must select three courses from a list that spans topics such as fiction writing, film, and music. These courses provide grounding in the creation of conventional media and provide the background in these disciplines needed to participate in the multidisciplinary aspects of the design of games.

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**Plan Requirements**

**Computer Science (BS): Game Development Concentration: 121 Total Units**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
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</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I &amp; Physics for Engineers and Scientists I Laboratory</td>
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<td>Segement 1 of the following:</td>
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<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>E 102</td>
<td>Engineering in the 21st Century</td>
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<td><strong>Second Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td>CSC 216</td>
<td>Software Development Fundamentals</td>
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<td>CSC 217</td>
<td>Software Development Fundamentals Lab</td>
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<td>CSC 226</td>
<td>Discrete Mathematics for Computer Scientists</td>
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<td>MA 242</td>
<td>Calculus III</td>
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<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II &amp; Physics for Engineers and Scientists II Laboratory</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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</tr>
<tr>
<td>CSC 230</td>
<td>C and Software Tools</td>
<td>1</td>
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<tr>
<td>CSC 316</td>
<td>Data Structures and Algorithms</td>
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<td>MA 305</td>
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<tr>
<td>Basic Science Elective</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
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<tr>
<td><strong>Third Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>CSC 236</td>
<td>Computer Organization and Assembly Language for Computer Scientists</td>
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<tr>
<td>CSC 246</td>
<td>Concepts and Facilities of Operating Systems for Computer Scientists</td>
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<tr>
<td>CSC 333</td>
<td>Automata, Grammars, and Computability</td>
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**North Carolina State University**

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ST 370 Probability and Statistics for Engineers 3
GEP Requirement (p. 1417) 3

Hours 15

Spring Semester
CSC 326 Software Engineering 4
CSC 379 Ethics in Computing 1
CSC Games Restricted Elective (p. 522) 1 3
ENG 331 Communication for Engineering and Technology 3

GEP Health and Exercise Studies (p. 1422) 1
Games Restricted Elective (p. 522) 3

Hours 15

Fourth Year
Fall Semester
CSC 461 Computer Graphics 3
CSC 481 Game Engine Foundations 3
GEP Requirement (p. 1417) 6

Games Restricted Elective (p. 522) 3

Hours 15

Spring Semester
CSC 492 Senior Design Project 3
CSC 462 Advanced Computer Graphics Projects 3
or CSC 482 Advanced Computer Game Projects

CSC Games Restricted Electives (p. 522) 3
Games Restricted Elective (p. 522) 3
GEP Requirement (p. 1417) 3

Hours 15

Total Hours 121

1 A grade of C or higher is required.
2 Courses required for matriculation (CODA)
3 A grade of C- or higher is required.

The GPA earned in all courses attempted at NCSU must be 2.0 or higher. One of the following two conditions regarding the major GPA is required:

1. the major GPA, which consists of all CSC courses attempted at NCSU, must be 2.0 or higher or
2. a student whose major grade point average is below a 2.0 may graduate if no CSC course used to satisfy the major requirements has a grade below a C-.

Code Title Hours
GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 3
GEP U.S. Diversity (p. 1431) (verify requirement) 3
GEP Global Knowledge (p. 1419) (verify requirement) 3
Foreign Language Proficiency (p. 1417) (verify requirement) 3
Total Hours 17

Basic Science Electives
Code Title Hours
CH 201 Chemistry - A Quantitative Science 3
PY 123 Stellar and Galactic Astronomy 3
PY 124 Solar System Astronomy 3
any PY course with a prerequisite of PY 208
any PB, BIO, MEA, or ZO course

CSC Games Restricted Electives
Code Title Hours
CSC 281 Foundations of Interactive Game Design 3
CSC 411 Introduction to Artificial Intelligence 3
CSC 454 Human-Computer Interaction 3
CSC 462 Advanced Computer Interaction 3
CSC 482 Advanced Computer Game Projects 3
CSC 484 Building Game AI 3
CSC 582 Computer Models of Interactive Narrative 3
CSC 584 Building Game AI 3

Games Restricted Electives
Code Title Hours
COM 327 Critical Analysis of Communication Media 3
COM 427 Game Studies 3
ENG 282 Introduction to Film 3
ENG 288 Fiction Writing 3
ENG 376 Science Fiction 3
ENG 377 Fantasy 3
ENG 492 Special Topics in Film Styles and Genres 3
MUS 306 Music Composition with Computers 3

Semester Sequence
Code Title Hours
First Year Fall Semester
CH 101 Chemistry - A Molecular Science 1, 2 3
CH 102 General Chemistry Laboratory 1, 2 1
E 101 Introduction to Engineering & Problem Solving 1, 3 1
E 115 Introduction to Computing Environments 1 1
ENG 101 Academic Writing and Research 1, 3 4
MA 141 Calculus I 1, 2 4

Hours 14

Spring Semester
CSC 116 Introduction to Computing - Java 2 3
MA 241 Calculus II 2 4
PY 205 Physics for Engineers and Scientists I 1, 2 4
PY 206 Physics for Engineers and Scientists I Laboratory
Select one of the following: 5
EC 205 Fundamentals of Economics 3

1 A grade of C or higher is required.
2 Courses required for matriculation (CODA)
3 A grade of C- or higher is required.

This is a sample.
EC 201  Principles of Microeconomics
ARE 201  Introduction to Agricultural & Resource Economics
E 102  Engineering in the 21st Century 1, 2

<table>
<thead>
<tr>
<th>Courses required for matriculation (CODA)</th>
<th>Grade of C- or higher required.</th>
<th>Grade of C or higher required.</th>
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<tr>
<td>CSC 492  Senior Design Project</td>
<td>3</td>
<td>3</td>
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<tr>
<td>CSC 462 or CSC 482  Advanced Computer Graphics Projects 2</td>
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<td>3</td>
</tr>
<tr>
<td>CSC Games Restricted Elective 1</td>
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</tr>
<tr>
<td>Games Restricted Elective</td>
<td>3</td>
<td>3</td>
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<td>GEP Requirement (p. 1417)</td>
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</table>

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**Department of Electrical and Computer Engineering**

Box 7911, Engineering Building II
NC State University, Raleigh, NC 27606
Phone: (919) 515-2336

The professions of electrical engineering and computer engineering are concerned with the analysis, design, construction and testing of systems based on electrical phenomena. In contemporary society, electrical methods are used to communicate and store information, control equipment and systems, perform mathematical operations, and convert energy from one form to another. Frequently, two or more of these functions are important in the design of systems such as television, radio, telecommunications, computer, robots and intelligent machines, telemetry systems, solid-state electronics, vehicle safety systems, biomedical devices, environmental controls, electric machinery, and electric power generation and transmission facilities.
Computer engineering is a field in which digital techniques are used in system design. Low-cost solid-state microprocessors and memories permit computers to be widely incorporated in many different types of devices from toys to traffic control systems. To work effectively in this rapidly growing field, the computer engineer must understand both hardware and software techniques and must effectively use both in order to design, build and test complex digital systems. Both the electrical engineering and the computer engineering programs, which lead respectively to the degrees, Bachelor of Science in Electrical Engineering and Bachelor of Science in Computer Engineering, are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

**Program Educational Objectives**

The graduates of the Electrical and Computer Engineering (ECE) programs are expected to attain the following within a few years after graduation:

- Productive and successful practice of their ECE background in a diverse range of careers.
- Continuous improvement of their knowledge and skills through formal and informal means and flexibility in adapting to the changes in economic and technological environments.

**Scholarships and Awards**

Superior academic performance is recognized within this department in three ways: election of students to membership in the electrical engineering honor society, Eta Kappa Nu; awarding of merit scholarships; and presentation of awards to outstanding seniors. The department has one endowed merit scholarship for rising sophomores, the Eugene C. and Winifred Sakshaug Scholarship, and twenty-nine endowed scholarships which are usually awarded to juniors and seniors: William E. Clark, Elizabeth P. Cockrell, Eugene C. Denton, Virginia Stewart Easter Memorial, Ferrell Family, William and Tipton Gray, John and Ann Hauser, Llewellyn Hewett, William and Carol Highfill, Jessie Reid Holshouser, Jr, Charles Kenneth Little, L. A. Mahler, Robin & Susan Manning, Amelia N. Minta, Dewey Carr Ogburn Memorial Scholarship, Frank T. Pankotay, Maurice W. Partin, Ronald G. Pendred, Pratt Family, William DeRosset Scott III, E. Chester Seawald, Shruthi Sorra, Sidney White Spencer, Oracle, Fredrick J. Tischer, James and Julia Tommerdahl, Herbert B. Walker, Robert S. Wolf, Simon B. Woolard, North Carolina Electric Membership Corporation, and William D. Stevenson, Jr., the latter two of which are for students studying electric power systems. The department also provides resources for industry-sponsored, semester-long design projects, and the departmental Makerspace which requires each student to attend safety training prior to access—provides access to machine shop facilities (hand and power tools) and round the clock access to electronic components, soldering tools, test instrumentation, and fabrication equipment (circuit board and 3D printers).

In addition, nearby Engineering Building III houses a 24/7 public lab of over 70 computers running a variety of operating systems and industry standard software. This lab is available to all engineering students and is staffed by trained student operators. A student-owned laptop platform has been developed in the College of Engineering; combined with a comprehensive wireless network and many remote computer services, this program allows education to expand outside of traditional classroom and laboratory facilities.

Nearby, the state-of-the-art James B. Hunt, Jr. Library gives students an innovative environment filled with technology-abled furniture, high-definition video walls, 3D computing and visualization space, videoconferencing and telepresence facilities, and over 100 meeting areas for group work and study.

Inspiring a spirit of discovery, the Hunt Library will help to produce the next generations of technology-savvy citizens, employees, researchers, and scholars.

**Faculty**

**Head**

D.D. Stancil, *Alcoa Distinguished Professor*

__Associate Head__

G.T. Byrd, *Professor*

**Director of Graduate Programs**

P.D. Franzon, *Distinguished Professor*

**Coordinator of Advising**

C.W. Townsend, *Senior Lecturer*

**Distinguished University Professor**

B.J. Baliga
Named Distinguished Professor
S. Bhattacharya
I. Husain
F.A. Kish
T.K. Miller
D.D. Stancil
M.B. Steer

Distinguished Professor
S.M. Bedair
P.D. Franzon
V. Misra
H.T. Nagle
J.K. Townsend

Professors
M.E. Baran
A. Bozkurt
G.T. Byrd
M.Y. Chow
H. Dai
W.R. Davis
A. Duel-Hallen
M.J. Escuti
D.Y. Eun
B.A. Floyd
E. Grant
B.L. Hughes
K.W. Kim
R.M. Kolbas
A.H. Krim
N. Lu
S.M. Lukic
L. Lunardi
J.F. Muth
O. Oralkan
M.C. Ozturk
E. Rotenberg
M.L. Sichitiu
H.J. Trussell
J. Tuck
D. Vashaee
J.V. Veliadis
I. Viniotis
W. Wang
H. Zhou

Associate Professor
J. Adams
S.T. Alexander
D. Baron
M. Becchi
A. Chakraborty
A.J. Dean
I. Guvenc
M.W. Kudenov
E. Lobaton
Z. Pantic
D. Ricketts
C.M. Williams

Assistant Professor
A. Aysu
M. Daniele
Y. Jia
S.C. Lin
S. Pavlidis
W. Tang
C.W. Wong
T.M. Wu

Teaching Professor
G.A. Ybarra
Teaching Associate Professor
R.J. Evans
R. Gupta
K.J. Molnar
A.J. Rindos
M. Yadav
D.G. Yu

Teaching Assistant Professor
S.E. Hollar

Professor of the Practice
L. White

Research Professor
D.C. Hopkins
R. Khosla
D. Lubkeman
T.M. Paskova

Research Associate Professor
W. Yu

Research Assistant Professor
P.C. Colter
J.P. Dieffenderfer
B. Lee
W.S. Pitts
F.Y. Yamaner

Senior Lecturer
B. Compton
C. W. Townsend

Lecturers
P.D. Bowman
M.D. Brain
J.B. Carlson

B.D. Heard
A.D. Hoffler

Adjunct Professor
R.F. Bruce
C.I. Chang
M. Devetsikiotis
P.E. Garrou
W.C. Holton
Q.A. Huang
G.J. Iafrate
G. Lazzi
B.P. Lequesne
S.S. Schiffman
Y. Solihin
X. Wang
J.T. Whitted
Q.C. Zhang

Adjunct Associate Professor
E.B. Agamlo
M.W. Chandra
F. Frohlich
A.L. Gray
T.J. Holland
H. Kim
R.A. Roush
I.P. Wellenius
M. Yadav

Adjunct Assistant Professor
B. Calloway
G.J. Hayes
B. Kia
R. Mikail
K. Sundaresan
Adjunct Lecturer
J.A. Brown
C.M. Pignataro

Chancellor Emeritus
L.K. Monteith

Named Professor Emeritus
J.R. Hauser

Professor Emeriti
W.E. Alexander
T.H. Glisson
J.J. Grainger
M.A. Littlejohn
T.L. Mitchell
A.A. Nilsson
J.B. O'Neal
C.M. Osburn Jr.
W.E. Snyder

Associate Professor Emeritus
G.F. Bland
W.T. Easter
W.C. Peterson

Assistant Professor Emeritus
L.R. Herman

Plans

• Computer Engineering (BS) (p. 527)
• Electrical Engineering (BS) (p. 531)
• Electrical Engineering (BS), Renewable Electric Energy Systems Concentration (p. 535)

Computer Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Core Courses

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Many of the core courses are offered three times a year in fall, spring, and summer. A strong emphasis is placed on fundamental concepts in core courses so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years by additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, electromagnetics, and linear systems. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have a required two semester senior design project which gives students comprehensive experience in designing, building, and testing physical systems.

Curricula

In addition to the core courses described above, students in the electrical engineering curriculum take two foundational electives and four specialization electives in areas of their choice within the discipline and two technical electives that can be in either electrical engineering or selected engineering courses offered by other departments. Beyond the core, students in the computer engineering curriculum take courses in discrete mathematics, data structures, embedded systems, and complex digital systems, in addition to four specialization electives in areas of their choice and one technical elective. For both curricula, a variety of elective courses are offered in communications, computational intelligence, controls, digital signal processing, digital systems, nanotechnology, mechatronics, microelectronics, networking, robotics, and VLSI design. There are typically a dozen or more of these courses offered each fall and spring semester and two or three available each summer.

Plan Requirements

Computer Engineering (BS): 122 Total Units

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ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics
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1 A grade of C or higher is required.
2 A grade of C- or higher is required.

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## Software Systems

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<td>ECE 466</td>
<td>Compiler Optimization and Scheduling</td>
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<td>Object-Oriented Design and Development</td>
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## Special Topics

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<tr>
<td>ECE 492</td>
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## Semester Sequence

### This is a sample.

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<td>Mechanical Properties of Structural Materials</td>
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<td>Electric Circuits ²</td>
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<td>Fundamentals of Logic Design ²</td>
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<td>Analytical Foundations of Electrical and Computer Engineering ²</td>
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#### Hours 16

### Third Year

#### Fall Semester

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<td>ECE 306</td>
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#### Hours 16

### Spring Semester

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Select one of the following: 1

- ECE 380  | Engineering Profession for Electrical Engineers | 1     |
- ECE 381  | Engineering Profession for Computer Engineers | 1     |
- ECE 383  | Introduction to Entrepreneurship and New Product Development | 1     |
- ECE 310  | Design of Complex Digital Systems         | 3     |
- Open/Technical Elective                  | 3     |
- ENG 331  | Communication for Engineering and Technology | 3     |
- GEP Health and Exercise Studies (p. 1422) | 1     |

#### Hours 14

### Fourth Year

#### Fall Semester

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#### Hours 15

#### Spring Semester

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#### Hours 15

### Total Hours 122

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1 A grade of C or higher is required.
2 A grade of C- or higher is required.

### Electrical Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

### Core Courses

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Many of the core courses are offered three times a year in fall, spring, and summer. A strong emphasis is placed on fundamental concepts in core courses so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years by additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, electromagnetics, and linear systems. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have a required two semester senior design project which gives students comprehensive experience in designing, building, and testing physical systems.

### Curricula

In addition to the core courses described above, students in the electrical engineering curriculum take two foundational electives and four specialization electives in areas of their choice within the discipline and two technical electives that can be in either electrical engineering or selected engineering courses offered by other departments. Beyond the core, students in the computer engineering curriculum take courses in discrete mathematics, data structures, embedded systems, and complex digital systems, in addition to four specialization electives in areas of their choice and one technical elective. For both curricula, a variety of elective courses are offered in communications, computational intelligence, controls, digital signal processing, digital systems, mechatronics, microelectronics, networking, robotics, and VLSI design. There are typically a dozen or more of these courses offered each fall and spring semester and two or three available each summer.

### Plan Requirements

**Electrical Engineering (BS): 122 Total Units**

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<tr>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory ¹</td>
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<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<td>ENG 101</td>
<td>Academic Writing and Research ²</td>
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#### Hours 14

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<tr>
<td>ECE 109</td>
<td>Introduction to Computer Systems ²</td>
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¹ A grade of C or higher is required.
² A grade of C- or higher is required.

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MA 241 Calculus II 1 4
PY 205 Physics for Engineers and Scientists I 4
& PY 206 and Physics for Engineers and Scientists I Laboratory 1

Select one of the following: 3
ARE 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics
E 102 Engineering in the 21st Century 2

Hours 16

Second Year
Fall Semester
ECE 200 Introduction to Signals, Circuits and Systems 2 4
ECE 209 Computer Systems Programming 2 3
MA 242 Calculus III 4
PY 208 Physics for Engineers and Scientists II 4
& PY 209 and Physics for Engineers and Scientists II Laboratory

Hours 15

Spring Semester
COM 110 Public Speaking 3
ECE 211 Electric Circuits 2 4
ECE 212 Fundamentals of Logic Design 2 3
ECE 220 Analytical Foundations of Electrical and Computer Engineering 2 3

Hours 13

Third Year
Fall Semester
ECE 301 Linear Systems 3
ECE 302 Microelectronics 4
ST 371 Introduction to Probability and Distribution Theory 3

Select two of the following: 6
E 304 Introduction to Nano Science and Technology
ECE 305 Principles of Electromechanical Energy Conversion
ECE 308 Elements of Control Systems
ECE 306 or ECE 310 Introduction to Embedded Systems or Design of Complex Digital Systems

Hours 16

Spring Semester
ECE 303 Electromagnetic Fields 3
Select one of the following: 1
ECE 380 Engineering Profession for Electrical Engineers
ECE 381 Engineering Profession for Computer Engineers
ECE 383 Introduction to Entrepreneurship and New Product Development

EE Electives
Choose 2 from the same group of “Comm, Sig, Proc Sys” or “Control Sys” or “Circ, E&M Sys” or “Nano Sys” or “Power Sys” from the ECE and EE Electives List below
ENG 331 Communication for Engineering and Technology 3

Hours 13

Fourth Year
Fall Semester
Select one of the following: 3
ECE 482 Engineering Entrepreneurship and New Product Development I
ECE 484 Electrical and Computer Engineering Senior Design Project I
MAE 482 Engineering Entrepreneurship and New Product Development I

ECE Electives 6
Choose any two from the list of ECE and EE electives below

Hours 9

Spring Semester
Select one of the following: 3
ECE 483 Engineering Entrepreneurship and New Product Development II
ECE 485 Electrical and Computer Engineering Senior Design Project II
MAE 483 Engineering Entrepreneurship and New Product Development II
Open/Technical Electives 6

Hours 9

Total Hours 105

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Code Title Hours
GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 17

Code Title Hours
ECE and EE Electives
Comm, Sig, Proc Sys
ECE 402 Communications Engineering
ECE 420 Wireless Communication Systems
ECE 421 Introduction to Signal Processing
ECE 513 Digital Signal Processing
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<td>ECE 558</td>
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CSC 573  Internet Protocols  3
CSC 574  Computer and Network Security  3
CSC 575  Introduction to Wireless Networking  3
CSC 577  Switched Network Management  3
E 304  Introduction to Nano Science and Technology  3
ECE 305  Principles of Electromechanical Energy Conversion  3
ECE 306  Introduction to Embedded Systems  3
ECE 308  Elements of Control Systems  3
ECE 309  Data Structures and Object-Oriented Programming for Electrical and Computer Engineers  3
ECE 310  Design of Complex Digital Systems  3
ECE 402  Communications Engineering  3
ECE 403  Electronics Engineering  3
ECE 404  Introduction to Solid-State Devices  3
ECE 407  Introduction to Computer Networking  3
ECE 420  Wireless Communication Systems  3
ECE 421  Introduction to Signal Processing  3
ECE 422  Transmission Lines and Antennas for Wireless Communications  3
ECE 423  Introduction to Photonics and Optical Communications  3
ECE 424  Radio System Design  3
ECE 426  Analog Electronics Laboratory  3
ECE 434  Fundamentals of Power Electronics  3
ECE 436  Digital Control Systems  3
ECE 442  Integrated Circuit Technology and Fabrication  3
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ECE 452  Renewable Electric Systems  3
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ECE 455  Industrial Robotic Systems  3
ECE 456  Mechatronics  3
ECE 460  Embedded System Architectures  3
ECE 461  Embedded System Design  3
ECE 463  Microprocessor Architecture  3
ECE 464  ASIC and FPGA Design with Verilog  3
ECE 466  Compiler Optimization and Scheduling  3
ECE 468  Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems  3
ECE 470  Internetworking  3
ECE 489  Solid State Solar and Thermal Energy Harvesting  3
ECE 492  Special Topics in Electrical and Computer Engineering  3
ECE 511  Analog Electronics  3
ECE 513  Digital Signal Processing  3
ECE 514  Random Processes  3
ECE 515  Digital Communications  3
ECE 516  System Control Engineering  3
ECE 517  Object-Oriented Design and Development  3
ECE 518  Wearable Biosensors and Microsystems  3
ECE 522  Medical Instrumentation  3
ECE 523  Photonics and Optical Communications  3
ECE 524  Radio System Design  3
ECE 530  Physical Electronics  3
ECE 531  Principles Of Transistor Devices  3
ECE 532  Principles Of Microwave Circuits  3
ECE 533  Power Electronics Design & Packaging  3
ECE 534  Power Electronics  3
ECE 535  Design of Electromechanical Systems  3
ECE 540  Electromagnetic Fields  3
ECE 542  Neural Networks  3
ECE 544  Design Of Electronic Packaging and Interconnects  3
ECE 546  VLSI Systems Design  3
ECE 549  RF Design for Wireless  3
ECE 550  Power System Operation and Control  3
ECE 551  Smart Electric Power Distribution Systems  3
ECE 552  Renewable Electric Energy Systems  3
ECE 553  Semiconductor Power Devices  3
ECE 555  Computer Control of Robots  3
ECE 556  Mechatronics  3
ECE 557  Principles Of MOS Transistors  3
ECE 558  Digital Imaging Systems  3
ECE 560  Embedded System Architectures  3
ECE 561  Embedded System Design  3
ECE 563  Microprocessor Architecture  3
ECE 564  ASIC and FPGA Design with Verilog  3
ECE 566  Compiler Optimization and Scheduling  3
ECE 568  Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems  3
ECE 570  Computer Networks  3
ECE 573  Internet Protocols  3
ECE 574  Computer and Network Security  3
ECE 575  Introduction to Wireless Networking  3
ECE 577  Switched Network Management  3
ECE 581  Electric Power System Protection  3
ECE 582  Wireless Communication Systems  3
ECE 584  Electric Power Engineering Practicum II  3
ECE 585  The Business of the Electric Utility Industry  3
ECE 586  Communication and SCADA Systems for Smart Grid  3
ECE 589  Solid State Solar and Thermal Energy Harvesting  3
ISE 311  Engineering Economic Analysis  3
MAE 201  Engineering Thermodynamics I  3
MAE 208  Engineering Dynamics  3
MAE 302  Engineering Thermodynamics II  3
MAE 535  Design of Electromechanical Systems  3
MSE 489  Solid State Solar and Thermal Energy Harvesting  3
MSE 589  Solid State Solar and Thermal Energy Harvesting  3
PY 489  Solid State Solar and Thermal Energy Harvesting  3
PY 589  Solid State Solar and Thermal Energy Harvesting  3

Semester Sequence

This is a sample.
### Core Courses

The electrical and computer engineering curricula share core courses comprising a substantial portion of the first three years of study. Many of the core courses are offered three times a year in fall, spring, and summer. A strong emphasis is placed on fundamental concepts in core courses so that graduates are prepared for rapid technological changes common in the electrical and computer engineering professions. A comprehensive foundation in mathematics and the physical sciences in the freshman year is followed in subsequent years by additional core courses in mathematics, physics, electric circuit theory, digital logic, computer systems, electronics, electromagnetics, and linear systems. Laboratory work is designed to demonstrate fundamental principles and to provide experience in designing and testing electronic hardware and computer software. Both curricula have a required two semester
senior design project which gives students comprehensive experience in designing, building, and testing physical systems.

**Curricula**

In addition to the core courses described above, students in the electrical engineering curriculum take two foundational electives and four specialization electives in areas of their choice within the discipline and two technical electives that can be in either electrical engineering or selected engineering courses offered by other departments. Beyond the core, students in the computer engineering curriculum take courses in discrete mathematics, data structures, embedded systems, and complex digital systems, in addition to four specialization electives in areas of their choice and one technical elective. For both curricula, a variety of elective courses are offered in communications, computational intelligence, controls, digital signal processing, digital systems, nanotechnology, mechatronics, microelectronics, networking, robotics, and VLSI design. There are typically a dozen or more of these courses offered each fall and spring semester and two or three available each summer.

**Plan Requirements**

**Electrical Engineering (BS): Renewable Electric Energy Systems Concentration: 122 Total Units**

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<tr>
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<td>Microelectronics</td>
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<td>Engineering Profession for Electrical Engineers</td>
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<td>Principles of Electromechanical Energy Conversion</td>
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### Open/Technical Electives

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1. A grade of C or higher is required.

### REES Electives

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<td>Electric Motor Drives</td>
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### ECE Electives

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**Open/Technical Elective**

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Electrical Engineering (BS), Renewable Electric Energy Systems Concentration
Semester Sequence

This is a sample.

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1 A grade of C or higher is required.
2 A grade of C- or higher is required.
3 Students in the entrepreneurs program should take ECE 383/ECE 482/ECE 483, instead of ECE 380/ECE 484/ECE 485.
4 Major GPAs greater than 3.5 are required to take 5xx courses.
5 Students with major GPAs greater than 3.5 can take 5xx courses.

Department of Materials Science and Engineering

For more information about this department, including contact information, visit the department (http://www.mse.ncsu.edu).
What is Materials Science and Engineering?
Most of the technological innovations that we enjoy today are driven by the discovery of new materials. The future of our world depends on the discovery of new materials that are environmentally friendly, lightweight, sustainable and responsive. The design of novel materials will enable vehicles that are lighter and more fuel-efficient due to redesigned frames and tires; cell phones and laptops with ultra-thin damage-resistant glass for displays; biomaterials that repair and replace parts of the human body; soft robots that can safely interact with humans; new bionics; and materials for water purification.

MSE at NC State
The Department of Materials Science and Engineering at NC State is well-known as a small and friendly department that provides unique and high-impact opportunities for undergraduate students, including small class sizes, a hands-on laboratory, close interactions with world-renowned faculty, undergraduate research opportunities and high-quality laboratory and senior design experiences.

Advanced Degree Opportunity
More than 25 percent of all MSE B.S. degree recipients are enrolled in a graduate degree program at places such as MIT, UC Berkeley, Penn State, Georgia Tech, Purdue and NC State.

What is the Curriculum Like?
The materials engineer must understand the wide range of phenomena that occur in all classes of materials: metals, polymers, ceramics, and composites. The MSE curriculum includes fundamental courses in thermodynamics, kinetics and structure, followed by more applied courses that cover mechanical, thermal, electrical, magnetic and optical properties of materials. Two laboratory courses introduce students to analytical methods used to characterize the structure of materials at all length scales and to measure properties of all classes of materials. Cutting-edge technologies in materials science and engineering such as nanotechnology, biomaterials, computer modeling and forensics (materials degradation and failure analysis) are covered. Five technical electives are included, which allow students to select from a broad range of courses in materials processing, engineering, chemistry, physics, mathematics and other disciplines. The flexibility afforded by these technical electives allows students to customize their education to prepare them for careers in industry or for graduate school.

The two-semester capstone senior design sequence provides a bridge between concepts learned in the classroom and practical application of these concepts in an industrial setting. Teams of students work on real-world materials problems supported by local industrial sponsors.

The materials science and engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, and leads to the degree Bachelor of Science in Materials Science and Engineering. In addition to the base curriculum in Materials Science and Engineering, the department also offers curriculum concentrations in biomaterials and nanomaterials.

An accelerated 5-year BS/MS program is available for advanced study and further specialization. Graduate degrees are also offered (consult the Graduate Catalog (http://www.ncsu.edu/grad/catalog/)).

How Does MSE at NC State Compare to Other Departments?
The mission of the NC State Department of Materials Science and Engineering is to provide students with a sound materials science and engineering education, advance the understanding and application of scientific principles, enhance economic development, and improve the quality of life of our citizens through teaching, research, and outreach programs.

Materials Science and Engineering at NCSU is a small and friendly department, and we are consistently ranked in the top 20 nationally by US News and World Report. Students, professors and professional staff all get to know each other. There is plenty of opportunity for personal attention, for learning, for professional growth and for social gathering.

Program Educational Objectives
With the background knowledge in science, engineering, critical thinking and teamwork provided by the MSE curriculum, our alumni are fully prepared to achieve one or more of the following within five years of graduation:

- Practice materials engineering in academic, industrial, government or entrepreneurial organizations.
- Earn an advanced degree such as MS, PhD or MBA, leading to a career in academia, research and development, or technical management.
- Be promoted into leadership roles in their chosen career.
- Demonstrate by their participation in technical societies, community service, and professional activities, a high degree of service and ethical responsibility to their professional field and the community.

Faculty
Head
Donald W. Brenner, Department Head and Kobe Steel Distinguished Professor

Associate Head
Elizabeth Dickey, Professor and Associate Department Head

Director of Graduate Programs
Albena Ivanisevic, Professor & Director of Graduate Programs

Director of Undergraduate Programs
Yaroslava G. Yingling, Professor and Director of Undergraduate Program

Professors
C.M. Balik
D. Brenner
J. Cuomo
E. Dickey
N. El-Masry
A. Ivanisevic
J. Jones
C. Koch
T. LaBean
J. Narayan
R.O. Scattergood
R.J. Spontak
J. B. Tracy
Y. G. Yingling

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A. Amassian
L. Cao
R. Collazo
D. Irving
J. Kasichainula
J. LeBeau

Assistant Professor
V. Augustyn
V. Miller
S. Patala

Professor Emeriti
K. Bachmann
R.B. Benson, Jr.
H. Conrad
R.F. Davis
K. Havner
J.J. Hren
H. Palmour III
J. Russ

Teaching Assistant Professor
C.L. Reynolds

Associate Member of the Faculty
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D. Aspnes
S.M. Bedair, (Electrical and Computer Engineering)
M. Dickey
J. Genzer
R. Gorga
D. Griffis
C. Hall
Ola Harrysson
A. Hawari
J. Jur
J. Krim, (Physics)
H. Lamb
F. Ligler
Y. Liu
V. Misra, (Electrical and Computer Engineering)
K. Murty
R. Narayan, (Biomedical Engineering)
G. Parsons, (Chemical Engineering)
T. Paskova
M. Pasquinelli
S. Shannon, (Nuclear Engineering)
J. Strenkowski
D. Vashaee
O. Velev
X. Zhang
Y. Zhu

Adjunct Faculty
N. Biswas
M. Fiedler
E. Fuller
T. Luo
S. Mathaudhu
A. Melechko
J.T. Prater
P. Russell

**Plans**

- Materials Science and Engineering (BS) (p. 542)
- Materials Science and Engineering (BS): Biomaterials Concentration (p. 545)
- Materials Science and Engineering (BS): Nanomaterials Concentration (p. 548)
- Materials Science and Engineering (Minor) (p. 551)

**Materials Science and Engineering (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Plan Requirements**

**Materials Science and Engineering (BS): 126 Total Units**

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<tr>
<th>Course</th>
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| **Second Year** | | |
| **Fall Semester** | | |
| ST 370 | Probability and Statistics for Engineers | 3 |
| MA 242 | Calculus III | 4 |
| MSE 201 | Structure and Properties of Engineering Materials | 3 |
| PY 208 & PY 209 | Physics for Engineers and Scientists I & II | 4 |
| **Hours** | | 14 |
| **Spring Semester** | | |
| CH 220 | Introductory Organic Chemistry & Lab | 4 |
| MA 341 | Applied Differential Equations I | 3 |
| MSE 255 | Experimental Methods for Structural Analysis of Materials | 2 |
| MSE 260 | Mathematical Methods for Materials Engineers | 3 |
| MSE 270 | Materials Science and Engineering Seminar | 1 |
| **Hours** | | 13 |

| **Third Year** | | |
| **Fall Semester** | | |
| MSE 300 | Structure of Materials at the Nanoscale | 3 |
| MSE 301 | Introduction to Thermodynamics of Materials | 3 |
| MSE 320 | Introduction to Defects in Solids | 3 |
| MSE 335 | Experimental Methods for Analysis of Material Properties | 2 |
| Technical Elective (p. 543) | | 3 |
| **Hours** | | 14 |
| **Spring Semester** | | |
| MSE 355 | Electrical, Magnetic and Optical Properties of Materials | 3 |
| MSE 360 | Kinetic Processes in Materials | 3 |
| MSE 370 | Microstructure of Inorganic Materials | 3 |
| MSE 380 | Microstructure of Organic Materials | 3 |
| Engineering Elective (p. 543) | | 3 |
| **Hours** | | 15 |

| **Fourth Year** | | |
| **Fall Semester** | | |
| MSE 420 | Mechanical Properties of Materials | 3 |
| MSE 423 | Introduction to Materials Engineering Design | 1 |
| ENG 331 or ENG 333 | Communication for Engineering and Technology or Communication for Science and Research | 3 |
| MSE Processing Elective (p. 544) | | 3 |
| Technical Elective (p. 543) | | 3 |
| **Hours** | | 13 |
| **Spring Semester** | | |
| MSE 470 | Materials Science and Engineering Senior Design Project | 3 |
**Technical Elective**

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**2151 Engineering Elective**

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<td>CE 215</td>
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<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
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<td>ISE 311</td>
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**GEP Courses**

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<td>GEP Global Knowledge (p. 1419)</td>
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<td>Foreign Language Proficiency (p. 1417)</td>
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**Total Hours** 17

**Engineering Electives**

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<td>MAE 485</td>
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<td>NE 509</td>
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<td>MSE 445</td>
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<td>MSE 556</td>
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**Total Hours** 109

- A grade of C or higher is required.
- A grade of C- or higher is required.
### MSE Processing Electives

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<td>MSE 456</td>
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### Ethics Electives

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<td>PHI 214</td>
<td>Issues in Business Ethics</td>
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<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
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<td>PHI 375</td>
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<td>Contemporary Science, Technology and Human Values</td>
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<td>Ethical Dimensions of Progress</td>
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<td>STS 325</td>
<td>Bio-Medical Ethics</td>
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### Notes

- Only 1 advisor approved MSE 490 Special Topics in Materials Engineering course may be used to fulfill an engineering or technical elective.

### Semester Sequence

#### This is a sample.

#### Course    Title                                Hours

**First Year**

**Fall Semester**

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<td>Introduction to Engineering &amp; Problem Solving ¹,²</td>
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<td>Introduction to Computing Environments ¹,²</td>
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<td>Academic Writing and Research ¹,²</td>
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**Spring Semester**

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**Second Year**

**Fall Semester**

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**Spring Semester**

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<td>Applied Differential Equations I</td>
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**GEP Requirement (p. 1417)** | 3

**Hours** | 15

**Third Year**

**Fall Semester**

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**Technical Elective** | 3

**GEP Requirement (p. 1417)** | 3

**Hours** | 17

**Spring Semester**

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<td>Kinetic Processes in Materials</td>
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<td>MSE 370</td>
<td>Microstructure of Inorganic Materials</td>
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**Hours** | 15

**Fourth Year**

**Fall Semester**

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**Hours** | 15
ENG 331 or ENG 333  Communication for Engineering and Technology or Communication for Science and Research 3

MSE Processing Elective 3
Technical Elective 3
GEP Requirement (p. 1417) 3

Hours 16

Spring Semester
MSE 470 Materials Science and Engineering Senior Design Project 3
MSE 480 Materials Forensics and Degradation 3
Technical Elective 3
GEP Requirement (p. 1417) 3
GEP Requirement (p. 1417) 3

Hours 15
Total Hours 126

1 Courses required for Change of Degree Audit (CODA). A grade of C or higher is required.
2 A grade of C- or higher is required, E 115 requires satisfactory completion (S).

Career Opportunities
An MSE degree is interdisciplinary and, upon graduation, will qualify you for a variety of jobs with an average starting salary of $60-70k per year.

Example Job Titles
Materials Engineer, Product Engineer, Metallurgist Engineer, Quality Control Engineer, Failure Analysis Engineer, Renewable Energy Materials Engineer, Biomaterial Engineer, Polymer Materials Engineer, Project Manager

Example Job Description
• Identify and produce a diverse range of materials for applications of interest
• Develop and improve methods for the analysis of complex materials
• Assist in the selection of materials for product application, the calculation of design parameters, the performance of material properties testing
• Apply scientific methods to resolve technical challenges related to materials and their use in products and processes

Materials Science and Engineering (BS): Biomaterials Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Plan Requirements
Materials Science and Engineering (BS): Biomaterials Concentration: 126 Total Units
MSE 335  Experimental Methods for Analysis of Material Properties  2

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**Spring Semester**

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**Fourth Year**

**Fall Semester**

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**Spring Semester**

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Notes

• Only 1 advisor approved MSE 490 Special Topics in Materials Engineering course may be used to fulfill a biomaterials concentration elective.

Semester Sequence

This is a sample.

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ST 302 Contemporary Science, Technology and Human Values (Ethics Elective (GEP Requirement (p. 1417)))

ST 304 Ethical Dimensions of Progress (Ethics Elective (GEP Requirement (p. 1417)))

ST 325 Bio-Medical Ethics

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Total Hours 126-128

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Career Opportunities

An MSE degree is interdisciplinary and, upon graduation, will qualify you for a variety of jobs with an average starting salary of $60-70k per year.

Example Job Titles

Materials Engineer, Product Engineer, Metallurgist Engineer, Quality Control Engineer, Failure Analysis Engineer, Renewable Energy Materials Engineer, Biomedical Engineer, Polymer Materials Engineer, Project Manager

Example Job Description

- Identify and produce a diverse range of materials for applications of interest
- Develop and improve methods for the analysis of complex materials
- Assist in the selection of materials for product application, the calculation of design parameters, the performance of material properties testing
- Apply scientific methods to resolve technical challenges related to materials and their use in products and processes

Materials Science and Engineering (BS): Nanomaterials Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Plan Requirements

Materials Science and Engineering (BS): Nanomaterials Concentration: 126 Total Units

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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MSE 300</td>
<td>Structure of Materials at the Nanoscale</td>
<td>3</td>
</tr>
<tr>
<td>MSE 301</td>
<td>Introduction to Thermodynamics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 320</td>
<td>Introduction to Defects in Solids</td>
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<tr>
<td>MSE 335</td>
<td>Experimental Methods for Analysis of Material Properties</td>
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Fall Semester

<table>
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<tr>
<th>Course</th>
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<tr>
<td>MSE 355</td>
<td>Electrical, Magnetic and Optical Properties of Materials</td>
<td>3</td>
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<td>MSE 360</td>
<td>Kinetic Processes in Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 370</td>
<td>Microstructure of Inorganic Materials</td>
<td>3</td>
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<tr>
<td>MSE 380</td>
<td>Microstructure of Organic Materials</td>
<td>3</td>
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<td>MSE 465</td>
<td>Introduction to Nanomaterials</td>
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Winter Semester

<table>
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<td></td>
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**Fourth Year**

**Fall Semester**

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<tr>
<td>MSE 420</td>
<td>Mechanical Properties of Materials</td>
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<td>MSE 423</td>
<td>Introduction to Materials Engineering Design</td>
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<td>ENG 331 or ENG 333</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
<td>3</td>
</tr>
<tr>
<td>MSE Processing Elective (p. 549)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Nanomaterials Elective (p. 549)</td>
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**Spring Semester**

<table>
<thead>
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<tr>
<td>MSE 470</td>
<td>Materials Science and Engineering Senior Design Project</td>
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<td>MSE 480</td>
<td>Materials Forensics and Degradation</td>
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</table>

| Ethics Elective (verify requirement) (p. 549) | 3 |
| Technical Elective (p. 549) | 3 |

**Total Hours** 13

1 A grade of C or higher is required.

2 A grade of C- or higher is required.

**Code**  
**Title**  
**Hours**

**GEP Courses**

<table>
<thead>
<tr>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Total Hours** 19

**Nanomaterials Electives**

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CH 435</td>
<td>Introduction to Quantum Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHE 460</td>
<td>Nano-Electronic Materials</td>
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</tr>
<tr>
<td>CHE 465</td>
<td>Colloidal and Nanoscale Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHE 468</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
<td>3</td>
</tr>
<tr>
<td>CHE 568</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
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</tr>
<tr>
<td>E 304</td>
<td>Introduction to Nano Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ECE 468</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
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**MSE Processing Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MSE 440</td>
<td>Processing of Metallic Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 445</td>
<td>Ceramic Processing</td>
<td>3</td>
</tr>
<tr>
<td>MSE 455</td>
<td>Polymer Technology and Engineering</td>
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<tr>
<td>MSE 456</td>
<td>Composite Materials</td>
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</tr>
<tr>
<td>MSE 460</td>
<td>Microelectronic Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 454</td>
<td>Ceramic Processing</td>
<td>3</td>
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<tr>
<td>MSE 456</td>
<td>Processing of Metallic Materials</td>
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<tr>
<td>MSE 460</td>
<td>Microelectronic Materials</td>
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**Ethics Electives**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>PHI 214</td>
<td>Issues in Business Ethics</td>
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<tr>
<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<tr>
<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
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<tr>
<td>PHI 375</td>
<td>Ethics</td>
<td>3</td>
</tr>
<tr>
<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<tr>
<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
<td>3</td>
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<tr>
<td>STS 325</td>
<td>Bio-Medical Ethics</td>
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**Technical Electives**

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CHE 468</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
<td>3</td>
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<tr>
<td>CHE 568</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
<td>3</td>
</tr>
<tr>
<td>E 304</td>
<td>Introduction to Nano Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ECE 468</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
<td>3</td>
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<tr>
<td>ECE 568</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
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<tr>
<td>PY 407</td>
<td>Introduction to Modern Physics</td>
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**MSE Processing Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
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<td>Processing of Metallic Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 445</td>
<td>Ceramic Processing</td>
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<tr>
<td>MSE 455</td>
<td>Polymer Technology and Engineering</td>
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<tr>
<td>MSE 456</td>
<td>Composite Materials</td>
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<tr>
<td>MSE 460</td>
<td>Microelectronic Materials</td>
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Materials Science and Engineering (BS): Nanomaterials Concentration

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MSE 540</td>
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<tr>
<td>MSE 545</td>
<td>Ceramic Processing</td>
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<td>MSE 556</td>
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**Engineering Electives**

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<tbody>
<tr>
<td>CE 214</td>
<td>Engineering Mechanics-Statics</td>
<td>3</td>
</tr>
<tr>
<td>CE 215</td>
<td>Engineering Mechanics-Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
<td>3</td>
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<tr>
<td>MAE 206</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 208</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 214</td>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MSE 409</td>
<td>Nuclear Materials</td>
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<td>MSE 485</td>
<td>Biomaterials</td>
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<td>MSE 509</td>
<td>Nuclear Materials</td>
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</tr>
<tr>
<td>NE 202</td>
<td>Radiation Sources, Interaction and Detection</td>
<td>4</td>
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<tr>
<td>NE 409</td>
<td>Nuclear Materials</td>
<td>3</td>
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<tr>
<td>NE 509</td>
<td>Nuclear Materials</td>
<td>3</td>
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<tr>
<td>TE 205</td>
<td>Analog and Digital Circuits</td>
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**Technical Electives**

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<td>CH 223</td>
<td>Organic Chemistry II</td>
<td>3</td>
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<td>CH 315</td>
<td>Quantitative Analysis</td>
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<tr>
<td>CH 401</td>
<td>Systematic Inorganic Chemistry I</td>
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<td>CH 437</td>
<td>Physical Chemistry for Engineers</td>
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<tr>
<td>MA 305</td>
<td>Introductory Linear Algebra and Matrices</td>
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<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models</td>
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<tr>
<td>MA 401</td>
<td>Applied Differential Equations II</td>
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<tr>
<td>MA 402</td>
<td>Mathematics of Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>MA 405</td>
<td>Introduction to Linear Algebra</td>
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<td>MEA 463</td>
<td>Fluid Physics</td>
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<tr>
<td>PY 328</td>
<td>Stellar and Galactic Astrophysics</td>
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<tr>
<td>PY 407</td>
<td>Introduction to Modern Physics</td>
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<tr>
<td>PY 411</td>
<td>Mechanics I</td>
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<tr>
<td>PY 412</td>
<td>Mechanics II</td>
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<td>Electromagnetism I</td>
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<td>PY 415</td>
<td>Electromagnetism II</td>
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<td>PY 511</td>
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<td>PY 512</td>
<td>Mechanics II</td>
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<td>PY 515</td>
<td>Electromagnetism II</td>
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**Notes**

- Only 1 advisor-approved MSE 490 Special Topics in Materials Engineering course may be used to fulfill a Nanomaterials Concentration elective or technical elective.

**Semester Sequence**

This is a sample.

**First Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science (^1)</td>
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**Second Year**

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<tbody>
<tr>
<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials (^1)</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<tr>
<td>MA 242</td>
<td>Calculus III (^2)</td>
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<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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<td>Physics for Engineers and Scientists II</td>
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<td>Health and Exercise Studies (p. 1422)</td>
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**Third Year**

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<td>Structure of Materials at the Nanoscale</td>
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<td>MSE 301</td>
<td>Introduction to Thermodynamics of Materials</td>
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<td>MSE 320</td>
<td>Introduction to Defects in Solids</td>
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<td>MSE 335</td>
<td>Experimental Methods for Analysis of Material Properties</td>
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**Technical or Nanomaterials Elective**

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<tr>
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GEP Requirement (p. 1417)  3

Spring Semester

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<th>Course Title</th>
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<td>Kinetic Processes in Materials</td>
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<td>MSE 370</td>
<td>Microstructure of Inorganic Materials</td>
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<td>MSE 380</td>
<td>Microstructure of Organic Materials</td>
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<td>MSE 465</td>
<td>Introduction to Nanomaterials</td>
<td>3</td>
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<tr>
<td>MSE 423</td>
<td>Mechanical Properties of Materials</td>
<td>3</td>
</tr>
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<td>ENG 331 or ENG 333</td>
<td>Communication for Engineering and Technology or Communication for Science and Research</td>
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Fall Semester

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<th>Course Title</th>
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<td>Materials Science and Engineering Senior Design Project</td>
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<td>MSE 480</td>
<td>Materials Forensics and Degradation</td>
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</tr>
<tr>
<td>Technical or Nanomaterials Elective</td>
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<tr>
<td>Ethics Elective (GEP Requirement (p. 1417))</td>
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</table>

| Hours       | 16

| Total Hours | 126-127 |

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Career Opportunities

An MSE degree is interdisciplinary and, upon graduation, will qualify you for a variety of jobs with an average starting salary of $60-70k per year.

Example Job Titles

Materials Engineer, Product Engineer, Metallurgist Engineer, Quality Control Engineer, Failure Analysis Engineer, Renewable Energy Materials Engineer, Biomaterial Engineer, Polymer Materials Engineer, Project Manager

Example Job Description

- Identify and produce a diverse range of materials for applications of interest
- Develop and improve methods for the analysis of complex materials
- Assist in the selection of materials for product application, the calculation of design parameters, the performance of material properties testing
- Apply scientific methods to resolve technical challenges related to materials and their use in products and processes

Materials Science and Engineering (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All engineering disciplines are becoming more dependent upon newer materials or more efficient utilization of existing materials. The Minor in Materials Science and Engineering is designed to provide students with the fundamentals necessary for advanced study in Materials Science and Engineering and/or employment in materials related fields. This Minor is available to and useful for students in any engineering discipline, as well as students from chemistry, physics, and textiles. It also provides non-MSE majors planning to attend graduate school in Materials Science and Engineering a meaningful and useful way to prepare themselves.

Admissions

Visit the office of the Director of Undergraduate Programs in the MSE department to apply for the Minor and to prepare a plan of study. Admission to the Minor shall be governed by the same academic criteria used to transfer into the MSE curriculum. Students who have been denied admission to the MSE curriculum will also be denied admission to the MSE Minor. A C- or better grade in MSE 200 Mechanical Properties of Structural Materials, MSE 201 Structure and Properties of Engineering Materials or BME 203 Introduction to the Materials Science of Biomaterials is required, and a cumulative GPA of 2.0 or higher is required for all courses in the minor.

Certification

Successful completion of the Minor will be verified by the Director of Undergraduate Programs in the MSE department, as listed below. Paperwork for certification can be obtained in the MSE Office for Undergraduate Programs and should be completed during the pre-registration period for the student’s final semester at NC State.

Contact Person

Dr. Cheryl Cass
3002B Engineering Building 1, Centennial Campus
919.515.2479
cheryl_cass@ncsu.edu

Effective Date: 1/2013
SIS Code: 14MTM

Plan Requirements

The Materials Science and Engineering Minor includes a three-hour introductory course, six hours of required courses and six hours of electives selected from a list of courses covering a wide variety of materials science and engineering topics. To apply for the MSE Minor, a minimum overall GPA of 2.9 is required. A grade of C or better is required in MSE 200 Mechanical Properties of Structural Materials, MSE 201 Structure and Properties of Engineering Materials or MSE 203 Introduction to the Materials Science of Biomaterials/BME 203 Introduction to the Materials Science of Biomaterials and a minimum cumulative GPA of 2.0 must be maintained in the Minor courses.
Aerospace engineering applies science and engineering principles to design, development, manufacture, and operation of aerospace systems and vehicles. Aerospace vehicles include aircraft such as low-speed propeller-powered aircraft, remotely autonomously piloted vehicles, micro air vehicles, hovercraft, and helicopters and spacecrafts such as rockets, space stations, and planetary rovers. Aerospace engineering not only involves design, development, manufacture, and operation but also considers environmental, economical, ethical, and social issues.

The undergraduate curriculum provides the student with knowledge of aerodynamics, aerospace materials, structures, propulsion, flight mechanics, and vehicle stability and control plus knowledge of selected topics in orbital mechanics, space environment, altitude determination and control, telecommunications, and space structures. The program educates students to define, formulate, and solve aerospace engineering problems, to function in multi-disciplinary teams, and to communicate effectively.

Aerospace engineering students gain experience with low-speed and high-speed wind tunnels and structural and material facilities for testing prototype models. A prominent feature of the program is the year-long senior design experience in which students choose from two possibilities:

1. design, construct, and flight-test a fly-by-wire aircraft; a unique 40-year tradition of the aerospace engineering program, or
2. design a prototype spacecraft, like a rocket, satellite or a planetary rover.

Many of the students are involved in the department’s student clubs, such as the Aerial Robotics and Rocketry clubs that compete regionally and regularly place in the top 3.

Aerospace engineering undergraduates are employed by the aerospace industries and other industries with similar technical problems. Many of our students enter graduate school after which they are employed by these same industries and by government laboratories such as NASA, NAVAIR, and the Air Force.

### Mechanical

Mechanical engineering applies mechanical, thermal, and fluid principles to research, design, development, testing, manufacture, and operation of products and systems. Mechanical engineering is the broadest of the engineering programs, providing a technological foundation that serves societal needs in energy, health, safety, and all walks of life. Mechanical engineers solve problems dealing with energy and environmental systems (alternative fuels and renewable technologies), advanced materials and manufacturing (precision metrology, smart materials, and auto-adaptive materials), robotics and sensor technologies (opto-mechanical systems, MEMS, energy harvesting, human-centric and bio-inspired intelligent systems), and transportation (automotive and high speed rail).

In addition to taking strong foundational courses, mechanical engineering students gain experience in experimental laboratories for measurement and data analysis, performance evaluation of thermal systems, and testing and analysis of mechanical components. The senior design experience is a distinctive joint departmental-industry effort in which students solve industry-sponsored problems through design, building, and testing prototype machines with the support of facilities for machining and electronics. Many of the students are involved in the department’s student clubs, such as its Eco car and SAE car clubs that compete internationally and regularly place in the top 10.

Because of the discipline’s wide breadth, mechanical engineering students have a wide variety of employment opportunities.

Undergraduate students enter engineering fields that deal with, to varying extents...
levels, design, development, manufacturing, plant operation, testing and experimentation, consulting, sales and service. The employers come from industry, government and service organizations. Many of the undergraduate students go on to graduate school to pursue advanced degrees in engineering, science or business, as well as professional degree programs such as medicine, accounting and law.

Faculty

Department Head
S. V. Ekkad

Associate Department Head
K. Peters
J.R. Edwards

Director of Graduate Programs
K. Peters

Director of Undergraduate Programs
J.R. Edwards

Director of Undergraduate Student Affairs
J.W. Eischen

Alumni Distinguished Graduate Professor
F.R. DeJarnette

Duncan Distinguished University Professor
T.A. Dow

R. J. Reynolds Professor
S. V. Ekkad

Samuel P. Langley Distinguished Professor
F.-G. Yuan

Zan Prevost Smith Professor
M. A. Zikry

Angel Family Professor
J. R. Edwards

Professor Emeriti
J. Bailey
M. A. Boles
F. DeJarnette
H. M. Eckerlin
F. J. Hale
F. D. Hart
T. H. Hodgson
R. R. Johnson
J. W. Leach
C. J. Maday
D. S. McRae
J. C. Mulligan
R. T. Nagel
F. Y. Sorrell
C. F. Zorowski

Professors
G. D. Buckner
T. A. Dow
T. Echekki
J. Edwards
S. V. Ekkad
T. Fang
A. Gopalarathnam
R. Gould
X. Jiang
R. F. Keltie
C. Kleinstreuer
A. V. Kuznetsov
H. Luo
K. M. Lyons
G. Ngaile
K. Peters
A. Rabiei
L. M. Silverberg
J. S. Strenkowski
J. S. Tu
Aerospace Engineering (BS)

F. Wu
F.G. Yuan
Y. Zhu
M. Zikry

Associate Professor
C.-H. Chang
J.W. Eischen
S. Ferguson
C. Hall
H.-Y. Huang
Y. Jing
A. Mazzoleni
V. Narayanaswamy
B.T. O'Connor
K. Saul
A. Saveliev
C. Vermillion
C. Xu

Assistant Professor
M. Bryant
L. Grace
K. Granlund
J. Liu
M. Muller
M. Pankow
J. Ryu
P. Subbareddy

Research Assistant Professor
S.D. Terry

Teaching Assistant Professor
F. Ewere
B. Fortney
S. Hollar
N. Moore
S. Narsipur

Adjunct Associate Professor
P. Corson

Director of Undergraduate Advising and Outreach
C. H. Tran

Lecturer
C. H. Tran

Eastern Regional Director for Engineering
B. Fortney

Adjunct professor
M. Reyhanoglu

Plans

- Aerospace Engineering (BS) (p. 554)
- Mechanical Engineering (BS) (p. 557)

Honors Program in Mechanical and Aerospace Engineering

Students enter the mechanical and aerospace honors program by invitation. Students in these programs participate in special educational experiences involving deeper investigations into subjects and research projects.

Aerospace Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Plan Requirements

Aerospace Engineering (BS): 127 Total Units

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<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
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E 101  Introduction to Engineering & Problem Solving  2  1
E 115  Introduction to Computing Environments  1
MA 141  Calculus I  1  4
ENG 101  Academic Writing and Research  2  4
Select one of the following:
ARE 201  Introduction to Agricultural & Resource Economics  3
ARE 201A  Introduction to Agricultural & Resource Economics  3
EC 201  Principles of Microeconomics  3
EC 205  Fundamentals of Economics  3

Spring Semester
CSC 113  Introduction to Computing - MATLAB  3
GC 120  Foundations of Graphics  3
MA 241  Calculus II  1  4
PY 205 & PY 206  Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory  4
E 102  Engineering in the 21st Century  2

Hours  17

Second Year
Fall Semester
MA 242  Calculus III  4
MAE 206  Engineering Statics  3
MAE 250  Introduction to Aerospace Engineering  1
MAE 251  Aerospace Vehicle Performance  2  3
PY 208 & PY 209  Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory  4

Hours  16

Spring Semester
MA 341  Applied Differential Equations I  3
MAE 208  Engineering Dynamics  2  3
MAE 214  Solid Mechanics  2  3
MAE 252  Aerodynamics I  3
MAE 253  Experimental Aerosdynamics I  1

Hours  15

Third Year
Fall Semester
MAE 201  Engineering Thermodynamics I  2  3
MAE 361  Dynamics & Controls  3
MAE 371  Aerospace Structures I  3
MAE 372  Aerospace Vehicle Structures Lab  1
ENG 331  Communication for Engineering and Technology  3

Hours  13

Spring Semester
MAE 351  Aerodynamics II  3
MAE 352  Experimental Aerodynamics II  1
MAE 457 or MAE 467  Flight Vehicle Stability and Control or Introduction to Space Flight  3

AE Guided Technical Elective I (p. 555)  3
Math Elective (p. 555)  3

Hours  13

Fourth Year
Fall Semester
MAE 405  Controls Lab  1
MAE 435  Principles of Automatic Control  3
MAE 451  Experimental Aerodynamics III  1
MAE 480  Aerospace Vehicle Design I  3
AE Guided Technical Elective II (p. 556)  3
Technical Elective  3

Hours  14

Spring Semester
MAE 481  Aerospace Vehicle Design II  3
Ethics Elective (verify requirement) (p. 556)  3
MAE 457 or MAE 467  Flight Vehicle Stability and Control or Introduction to Space Flight  3
Technical Elective  3

Hours  9

Total Hours  110

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Code  Title  Hours

GEP Courses
GEP Humanities (p. 1423)  6
GEP Social Sciences (p. 1430)  3
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP Interdisciplinary Perspectives (p. 1426)  3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours  17

AE Guided Technical Electives I
Code  Title  Hours

Structures Elective
MAE 430  Applied Finite Element Analysis  3
MAE 472  Aerospace Structures II  3

Propulsion Elective
MAE 458  Propulsion  3
MAE 459  Rocket Propulsion  3

Math Electives
Code  Title  Hours

MA 305  Introductory Linear Algebra and Matrices  3
MA 405  Introduction to Linear Algebra  3
ST 305  Statistical Methods  4
ST 312  Introduction to Statistics II  3
ST 370  Probability and Statistics for Engineers  3
AE Guided Technical Electives II

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<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
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<td>Structure and Properties of Engineering Materials</td>
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<td>MAE 403</td>
<td>Air Conditioning</td>
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<td>MAE 407</td>
<td>Steam and Gas Turbines</td>
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<td>Internal Combustion Engine Fundamentals</td>
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<td>Modern Manufacturing Processes</td>
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<td>Design of Solar Thermal Systems</td>
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MAE 500 Level Courses

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<td>FB 534</td>
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<td>MAE 420</td>
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<td>Fluid Dynamics Of Combustion I</td>
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<td>MAE 505</td>
<td>Heat Transfer Theory and Applications</td>
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<td>MAE 511</td>
<td>Advanced Dynamics with Applications to Aerospace Systems</td>
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<td>Principles of Structural Vibration</td>
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<td>Advanced Automotive Vehicle Dynamics</td>
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<td>MAE 517</td>
<td>Advanced Precision Manufacturing for Products, Systems and Processes</td>
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<td>MAE 518</td>
<td>Acoustic Radiation I</td>
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<td>Non Linear System Analysis and Control</td>
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<td>Experimental Flight Testing</td>
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<td>Engineering Design Optimization</td>
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<td>Micro/Nano Electromechanical Systems</td>
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<td>Mechanics Of Composite Structures</td>
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<td>MAE 538</td>
<td>Smart Structures and Materials</td>
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<td>Advanced Air Conditioning Design</td>
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<td>Compressible Fluid Flow</td>
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<td>Hypersonic Aerodynamics</td>
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<td>Applications of Acoustic and Elastic Wave Propagation</td>
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<td>Microfluids and Nanofluidics</td>
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<td>Physical Gas Dynamics</td>
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<td>MAE 573</td>
<td>Hydrodynamic Stability and Transition</td>
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<td>MAE 577</td>
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<td>PHI 214</td>
<td>Issues in Business Ethics</td>
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<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
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<td>PHI 375</td>
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<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<td>Ethical Dimensions of Progress</td>
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**Semester Sequence**

This is a sample.

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1. A grade of C or higher is required.
2. A grade of C- or higher is required.
3. A 2.5 GPA is required to enroll

**Mechanical Engineering (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Plan Requirements**

Mechanical Engineering (BS): 126 Total Units
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1 A grade of C or higher is required.
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**Transfer Sequence**

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<td>CH 101</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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| Hours       | 18 |

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1. Courses required for Change of Degree Audit (CODA). A grade of C or higher is required.
2. A grade of C- or higher is required. E 115 requires satisfactory completion (S).
3. Students must have a 2.5 GPA to enroll in this course.

**Department of Nuclear Engineering**

For more information about this department, including contact information, visit the department (http://www.ne.ncsu.edu).

Burlington Engineering Laboratories, Room 3140 Phone: (919) 515-2301
Visit the Nuclear Engineering website (http://www.ne.ncsu.edu)!

Nuclear engineering is concerned with the engineering aspects of the control, release, and utilization of nuclear energy from both fission and fusion nuclear reactors. Nuclear reactors serve many functions: they serve as heat sources for electric power plants and are used in the production of radioactive isotopes for a variety of peaceful applications. Nuclear methods are applied in medical diagnosis and treatment, scientific research, and the search for new resources. The nuclear engineering program educates individuals in scientific and engineering principles essential for effective and productive contributions in industrial, university and government service. The Department of Nuclear Engineering has a national graduate ranking of #3 among all nuclear engineering programs. The undergraduate program continues to be highly respected by the nuclear industry.

**Scholarships and Awards**

Several special scholarships exist for NC State nuclear engineering students, including the Duke Energy, Institute for Nuclear Power Operations, American Nuclear Society, U.S. Department of Energy and the U.S. Nuclear Regulatory Commission scholarships. A special department fund supports scholarships for exceptional upperclassmen. NC State nuclear engineering students have received special recognition awards at the Undergraduate Research Symposium and have gained national recognition by several times receiving the Student Design Award of the American Nuclear Society. NC State nuclear engineering students are also frequent recipients of nationally awarded fellowships.

**Facilities**

Facilities for nuclear education include a nuclear research reactor (PULSTAR), which can be operated at a steady state power of 1 MW; radiation detection laboratories; nuclear materials laboratory; thermal hydraulic laboratory; prompt gamma facility; neutron activation analysis laboratory; radio-chemistry laboratories; nuclear simulation laboratory; neutron radiography unit; positron facility; ultra cold neutron source; neutron diffractometer; numerous computer facilities including, departmental computer workstations, College of Engineering EOS engineering workstations, microcomputers; reactor simulation laboratory; plasma generation and diagnostics laboratory, atmospheric plasma science laboratory, and plasma launchers laboratory.
Mission
The Department of Nuclear Engineering has four primary missions:

1. Provide a quality education at both the undergraduate and graduate levels to students who desire to pursue careers in nuclear science and engineering.
2. Develop research programs in areas of emphasis related to applications of nuclear science and engineering.
3. Assist industries and government in North Carolina, nationally and internationally in their efforts to apply these nuclear technologies to the betterment of the economy and the environment - in a safe, effective, and innovative manner.
4. Enhance, promote, and utilize the PULSTAR research reactor and associated facilities in an exemplary manner, leading to national recognition as a premier 1 MW Nuclear Reactor Program dedicated to research, teaching, and extension.

Program Educational Objectives
Consistent with the Department of Nuclear Engineering’s mission, the department has developed the following objectives for undergraduate education.

The Nuclear Engineering program is preparing its graduates for:

1. A track record of solving technical challenges facing the field of nuclear engineering through the detailed process of engineering design and the advance of nuclear engineering practice and research;
2. A reputation of adhering to the highest professional standards in the field, holding both the societal and environmental impact of their field's practices in the highest regard;
3. Written and oral communication skills that are highly effective in a diverse, cross-disciplinary, and global community of colleagues and stakeholders; and
4. The professional responsibility of continued self-improvement and education through professional licensing, graduate and professional education, and continued lifelong learning.

Faculty

Head
K.N. Ivanov, Department Head, Professor

Director of Undergraduate Program
J.M. Doster, Director of Undergraduate Program, Alumni Distinguished Undergraduate Professor, Director of CASL Education Program

Director of Graduate Programs
S.C. Shannon, Director of Graduate Program, Professor

Director of Outreach, Retention & Engagement - Lecturer - Adviser
L.M. Marshall, Director of Outreach, Retention & Engagement, Lecturer, Adviser, Educational Director of CNEC

Assistant Director, Graduate Student Activities
M. Milev, Assistant Director of Graduate Support Activities

Professors
Y.Y. Azmy, Distinguished Professor of Nuclear Engineering, Director of CNEC
M.A. Bourham, Alumni Distinguished Graduate Professor, Director for College of Engineering Master of Engineering Program
N. Dinh, Professor, Joint Appointment with ORNL
J.G. Gilligan, Distinguished University Professor, Executive Associate Dean, Director of NEUP Integration Office for the U.S. Department of Energy
K.L. Murty, Progress Energy Distinguished Professor

Professor and Director of Nuclear Reactor Programs
A.I. Hawari, Distinguished University Professor, Director of Nuclear Reactor Program

Research professors
S.P. Palmtag, Research Professor, CASL Chief Technologist
B.W. Wehring, Research Professor

Professor emeriti
D.J. Dudziak, Professor Emeritus
R. Gardner, Alumni Distinguished Graduate Professor
P.J. Turinsky, Professor Emeritus
K. Verghese, Professor Emeritus

Adjunct professors
S.M. Bragg-Sitton, Adjunct Professor
J.A. Favorite, Adjunct Professor
D. Kropaczek, Adjunct Professor
R.R. Pamper, Adjunct Professor
C.L. Smith, Adjunct Professor
G. Tryggvason, Adjunct Professor
R.W. Youngblood III, Adjunct Professor

Associate professors
D.Y. Anistratov, Associate Professor
A.N. Avramova, Associate Professor, Director of Reactor Dynamics & Fuel Modeling Group, Coordinator of CTF Users’ Group, Director of Consortium for Nuclear Power

I.A. Bolotnov, Associate Professor, Joint Appointment with ORNL

J. Eapen, Associate Professor

R.B. Hayes, Associate Professor, Joint Appointment with ORNL

D. Kaoumi, Associate Professor

J. Mattingly, Associate Professor, University Faculty Scholar, CNEC PI & Chief Scientist

Teaching associate professor

E. Loewen, Teaching Associate Professor

Adjunct associate professors

D. Archer, Adjunct Associate Professor

E.M. Brubaker, Adjunct Associate Professor

W.K. Cope, Adjunct Associate Professor

D.L. Green, Adjunct Associate Professor

P.A. Hausladen, Adjunct Associate Professor

V.J. Jodoin, Adjunct Associate Professor

P.A. Kraus, Adjunct Associate Professor

V.N. Kucukbogaci, Adjunct Associate Professor

J.W. Lane, Adjunct Associate Professor

E.H. Martin, Adjunct Associate Professor

W.D. Pointer, Adjunct Associate Professor

A. Ranjan, Adjunct Associate Professor

M.F. Simpson, Adjunct Associate Professor

M.L. Zerkle, Adjunct Associate Professor

Assistant professors

M. Diaconeasa, Assistant Professor

J. Hou, Assistant Professor

K. Stapelmann, Assistant Professor

X. Wu, Assistant Professor

G. Yang, Assistant Professor

Adjunct assistant professors

J. Dahl, Adjunct Assistant Professor

J. Li, Adjunct Assistant Professor

N. Kumar, Adjunct Assistant Professor

R.C. Sit, Adjunct Assistant Professor

L.G. Worrall, Adjunct Assistant Professor

R.J. Zerr, Adjunct Assistant Professor

Health Physicist - Lecturer

G.D. Wicks, Reactor Health Physicist, Lecturer

Nuclear Services Manager - Lecturer

S. Lassell, Manager of Nuclear Services, Lecturer

Plans

- Health Physics (Minor) (p. 562)
- Nuclear Engineering (BS) (p. 563)
- Nuclear Engineering (Minor) (p. 566)

Health Physics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oip.ncsu.edu/pgas/).

The minor will enable students to understand the fundamentals of ionizing radiation safety, radiological control and the dosimetric consequences of nuclear activity to workers, the public and environment. The breadth and depth of the minor is designed to enable students to become a Certified Health Physicist by the American Board of Health Physics during the course of their professional career.

Admissions and Certification of Minor

Students are to contact Dr. Robert Hayes (2101 Burlington Engineering Laboratories, 919-515-2321, rbhayes@ncsu.edu) to discuss their plan of study. Dr. Hayes will also certify completion of the student’s minor program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Robert Hayes
2101 Burlington Engineering Laboratories
919-515-2321
rbhayes@ncsu.edu

SIS Code: 14HPM

Plan Requirements

- Completion of the designated HP courses with all courses completed with a C- or better
- NE 290 Introduction to Health Physics must be completed with a B or better
- NE 431 Nuclear Waste Management/NE 531 Nuclear Waste Management and NE 490 Health Physics and Radiological Emergency Response/NE 590 Health Physics and Radiological Emergency Response must be completed with a B- or better
Nuclear Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Nuclear engineers work in nuclear systems research, design, development, testing, operation, environmental protection, and marketing. The Bachelor of Science program prepares graduates for positions in industry, national laboratories, or for graduate study (consult the Graduate Catalog (http://www.ncsu.edu/grad/catalog/)). The curriculum incorporates basic sciences and engineering, with emphasis on mathematics and physics, followed by course work in nuclear science and technology. Design concepts are introduced in numerous nuclear engineering courses throughout the curriculum to provide an integrated educational experience, cap-stoned by senior nuclear projects involving reactors and radiation systems. Attention is also given to the efficient utilization of energy resources and to the environmental aspects of nuclear energy. Computers are widely used throughout the curriculum.

The nuclear engineering program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org, and leads to the degree of Bachelor of Science in Nuclear Engineering. Advanced undergraduates who desire to attend graduate school at NC State may enter a combined 5-year BS/MNE professional program or BS/MS bachelor/master degree program during their senior year which will culminate at the end of their fifth year with both the Bachelor of Science in Nuclear Engineering and the Master of Nuclear Engineering or the Master of Science degrees, respectively.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php). Information on health physics and nuclear engineering minors are available here (https://oucc.dasa.ncsu.edu/undergraduate-academic-programs/academic-minors/).

Plan Requirements

Nuclear Engineering (BS): 123 Total Units

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<td>Introduction to Environmental Regulations</td>
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<td>NE 202</td>
<td>Radiation Sources, Interaction and Detection</td>
<td>4</td>
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<tr>
<td>NE 290</td>
<td>Introduction to Health Physics</td>
<td>3</td>
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<tr>
<td>MEA 215</td>
<td>Introduction to Atmospheric Sciences</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>BAET 323</td>
<td>Water Management</td>
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<td>NE 404/504</td>
<td>Radiation Safety and Shielding</td>
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<td>Atmospheric Physics</td>
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<td>NR 484</td>
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<td>NE 490/590</td>
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Total Hours 34

Spring Semester

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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>E 102</td>
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Hours 16

Second Year

Fall Semester

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Hours 16

Spring Semester

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Hours 10

Third Year

Fall Semester

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<td>Applied Differential Equations II</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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Hours 12

Spring Semester

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<td>Structure and Properties of Engineering Materials</td>
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<td>NE 400</td>
<td>Nuclear Reactor Energy Conversion</td>
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<td>NE 401</td>
<td>Reactor Analysis and Design</td>
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<td>NE 403</td>
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Hours 15
Fourth Year

Fall Semester

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<td>NE 404</td>
<td>Radiation Safety and Shielding</td>
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<td>NE 406</td>
<td>Nuclear Engineering Senior Design Preparation</td>
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Spring Semester

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<td>NE 408</td>
<td>Nuclear Engineering Design Project</td>
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Total Hours 106

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

Code Title Hours

GEP Courses

GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 3
GEP U.S. Diversity (p. 1431) (verify requirement) 3
GEP Global Knowledge (p. 1419) (verify requirement) 3
Foreign Language Proficiency (p. 1417) (verify requirement) 3

Total Hours 17

Advanced Communication Elective

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<td>COM 112</td>
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<td>COM 211</td>
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### Semester Sequence

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NC State University 565
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**Career Opportunities**

Nuclear power reactor operation continues with ninety-eight reactors operating in the nation, increasing our reliance upon nuclear energy as a substitute for energy from fossil fuels. Development of advanced fission and fusion reactors offers the potential of vast new energy sources. Industrial and medical applications of radiation continue to increase in diverse industries. Demand for nuclear engineers is on the rise within the electric power industry and national laboratories, naval reactors, and other industries. According to the National Society of Professional Engineers, nuclear engineers are among the top five best compensated of the engineering disciplines.

**Nuclear Engineering (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/).

The minor in Nuclear Engineering is intended to allow engineering students to develop an understanding of the fundamental concepts and practices of nuclear engineering. It is designed to provide students with the essentials necessary for employment in nuclear-related fields. Students considering advanced study should also benefit from the minor in nuclear engineering.

**Admissions and Certification of Minor**

Students are to contact Dr. J. Michael Doster, Director of Undergraduate Programs (2107 Burlington Engineering Laboratories, 911.515.3658, doster@ncsu.edu) to discuss their plan of study. Dr. Doster will also certify completion of the student’s minor program. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact Person**

J. Michael Doster  
2107 Burlington Engineering Laboratories  
919.515.3658  
doster@ncsu.edu
Plan Requirements

- Complete a minimum of 16 credit hours of NE designated courses.
- All courses must be completed with a grade of 'C-' or higher.

**Code** | **Title** | **Hours**
--- | --- | ---
NE 201 | Introduction to Nuclear Engineering | 2
NE 202 | Radiation Sources, Interaction and Detection | 4
NE 301 | Fundamentals of Nuclear Engineering | 3

**Elective Courses**<sup>1</sup>

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<th>Title</th>
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</thead>
<tbody>
<tr>
<td>NE 400</td>
<td>Nuclear Reactor Energy Conversion</td>
<td>2-4</td>
</tr>
<tr>
<td>NE 401</td>
<td>Reactor Analysis and Design</td>
<td>2</td>
</tr>
<tr>
<td>NE 402</td>
<td>Reactor Engineering</td>
<td></td>
</tr>
<tr>
<td>NE 404/504</td>
<td>Radiation Safety and Shielding</td>
<td>2</td>
</tr>
<tr>
<td>NE 409/509</td>
<td>Nuclear Materials</td>
<td></td>
</tr>
<tr>
<td>NE 412/512</td>
<td>Nuclear Fuel Cycles</td>
<td></td>
</tr>
<tr>
<td>NE 528</td>
<td>Introduction to Plasma Physics and Fusion Energy</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours** | **15-17**

<sup>1</sup> At the Director’s discretion, he can substitute a course for one of the electives listed.

<sup>2</sup> Mechanical Engineering majors may present MAE 310 Heat Transfer Fundamentals as the NE 400 Nuclear Reactor Energy Conversion prerequisite for NE 402 Reactor Engineering. The other prerequisite NE 401 Reactor Analysis and Design is still needed.

Edward P. Fitts Department of Industrial and Systems Engineering

For more information about this department, including contact information, visit the department (https://www.ise.ncsu.edu/).

Daniels Hall, Room 400
Phone: (919) 515-2362

Ranked in the top 10, the Edward P. Fitts Department of Industrial and Systems Engineering (ISE) offers an ABET accredited undergraduate program leading to a Bachelor of Science in Industrial Engineering.

What is Industrial & System Engineering?

Industrial engineers are problem solvers! We analyze processes and ask “how can we make these processes faster, better, and cheaper?” ISEs play a pivotal role in end to end business operations from product development to product and service delivery. It is this holistic view that makes ISE unique. We rely heavily on gathering and evaluating data to help make decisions that are based on statistical and engineering methods. Here are some of the tasks that ISEs lead in industry today:

- Assess the feasibility of manufacturing a new product with existing technologies, resources, and capacity or develop new ways to make products including automation
- Create and monitor quality plans that ensure that faulty products will not be shipped to the customer.
- Determine improved methods of scheduling patients for surgery that decreases patient wait time and surgeon’s overtime.
- Model a retail chain’s inventory and supply chain methods to improve on-time deliveries.
- Develop computer simulation models to design and control large complex manufacturing, supply chain, or service delivery systems.
- Design controls in an airplane cockpit that are Human-centered.

As you can see ISEs enjoy the freedom to explore almost any industry. The career paths that you can take with ISE are virtually limitless! Discover more about a career in ISE! (https://www.ise.ncsu.edu/what-is-industrial-engineering/#careers-in-ie)

Program Educational Objectives

The program educational objectives of the ISE department are to produce graduates capable of world-class performance in the following areas:

1. Applying the discipline's body of knowledge to the design and management of systems, products and processes by working effectively with multiple constraints, understanding the importance of time and cost;
2. Contributing meaningfully to team efforts in the workplace, understanding the economic, societal, and ethical impacts of their decisions, and communicate effectively with all stakeholders in the decisions; and
3. Adapting to changes in technology and our global society over the course of their professional lives by continuous learning through varied work assignments, advanced degrees, professional training programs and independent study.

The Bachelor of Science in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Specific curriculum requirements are available online (https://www.acs.ncsu.edu/php/coursecat/degree_requirements.php).

Curriculum

Throughout the curriculum students will develop a breadth of knowledge in all of the ISE focus areas resulting in a broad base of knowledge and skills. There is a pervasive thread throughout the curriculum on the measurement, design, and continuous improvement of production and service systems. The result is a data-driven, efficiency-focused engineer that is highly attractive in many industry segments. Our courses are designed to be hands-on whether that is in our state-of-the-art laboratories or using the latest software applications to solve real problems. The senior design capstone course is designed to give students an opportunity to apply what they have learned in the classroom to solve an industry-sponsored project. In addition to ISE courses, students take a wide variety of science, engineering, math, and statistics courses to form a well-rounded education.

Admissions and Certification of Minor

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification of the minor can be found here: https://studentservices.ncsu.edu/forms/Registrar/declare_minor.pdf.

The form should be completed no later than during the registration period for the student’s final semester at NC State and submitted to Registration & Records for processing.
Health Systems Engineering Certificate Program

This program is designed to provide you with a learning experience in preparation for a career in the healthcare field. After successful completion of the program, you will receive a Health Systems Engineering Certificate which sets you apart and makes you more marketable for a future career in the healthcare industry.

Requirements

• A minimum GPA of 3.3
• Your resume (maximum of 2 pages)
• A brief statement of why you are interested in a career in healthcare (no more than 1 page, please)
• One ISE faculty recommendation
• An unofficial transcript
• All materials should be submitted to healthsystems@ncsu.edu by the deadlines listed below:
  • Undergraduates – October 1st *(Must be eligible to graduate by Spring semester of the following year)
  • Graduate Students – December 20th

Accelerated Baccalaureate/Masters (ABM) Program

This program will allow exceptional undergraduate students to complete both undergraduate and graduate degrees at an accelerated pace. The student is allowed up to 12 credit hours to be counted towards both the undergraduate and graduate degrees. For more information contact Kanton Reynolds, Ph.D.: kreynolds@ncsu.edu or (919) 515-0605.

Requirements

• Students must have completed a minimum of 75 credit hours and up to a maximum of 96 credit hours by the end of the current semester (includes transfer credits).
• Students must have earned a GPA of at least 3.5 overall with a 3.5 for all Industrial Engineering courses.
• Students must have satisfied all prerequisite requirements for 400 level courses.
• A letter of recommendation from the undergraduate teaching adviser identifying the applicant as a participant in the ABM program should accompany the application as well as the course numbers and titles of the 12 credit hours to be used for both the bachelor’s and master’s degree programs.

Faculty

Department Head
Julie Swann, A. Doug Allison Distinguished Professor

Director, Graduate Programs
Y. Fathi, Professor

Director, Undergraduate Programs
Kanton Reynolds, Teaching Associate Professor

Edgar S. Woolard Distinguished Professor
P. H. Cohen

C.A. Anderson Professor
R. Uzsoy

Professors

S.C. Fang, University Alumni Distinguished Graduate Professor
O. Harrysson, Edward P. Fitts Distinguished Professor
J. Ivy
R. King, Foscue Distinguished Professor
Y.S. Lee
M. Mayorga
C.S. Nam
B. Starly

Professor Emeriti

M. A. Ayoub
R. Bernhard
T. Culbreath, Jr., Foscue Distinguished Professor Emeritus
T. Hodgson
H.L. Nuttle
R. Pearson
S. Roberts, A. Doug Allison Distinguished Professor Emeritus
J. Wilson
R.A. Wysk, Dopaco Distinguished Professor Emeritus
R. Young

Associate Professor

H. Wan
J. Dong
M.G. Kay
Y. Liu
C.S. Nam
R. Shirwaiker
Plan Requirements

Industrial Engineering (BS): 127 Total Units

Industrial Engineering (BS) (p. 569)
Industrial Engineering (Minor) (p. 572)
Supply Chain Engineering (Minor) (p. 572)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
ISE 361  Deterministic Models in Industrial Engineering  3  
Ethics Elective (p. 570)  3  

**Spring Semester**  
ISE 352  Fundamentals of Human-Machine Systems Design  3  
ISE 362  Stochastic Models in Industrial Engineering  3  
ISE 443  Quality Design and Control  3  
Technical Elective (p. 570)  3  
Engineering Sciences Elective (p. 570)  3  

**Hours**  
16

**Fourth Year**  

**Fall Semester**  
ISE 441  Introduction to Simulation  3  
ISE 398  3  
ISE 408  Design and Control of Production and Service Systems  3  
Select one of the following:  3  
ISE 520  Healthcare Systems Performance Improvement I  3  

**Technical Elective (p. 570)**  
ISE 453  Modeling and Analysis of Supply Chains  3  
ENG 331  Communication for Engineering and Technology  3  

**Hours**  
16

**Spring Semester**  
ISE 498  Senior Design Project or Healthcare Systems Performance Improvement II  3  
Technical Elective (p. 570)  3

**Hours**  
6

**Total Hours**  
110

1. A grade of C or higher is required.
2. A grade of C- or higher is required.

**Code**  
**Title**  
**Hours**  

**GEP Courses**  
GEP Humanities (p. 1423)  6  
GEP Social Sciences (p. 1430)  3  
GEP Health and Exercise Studies (p. 1422)  2  
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3  
GEP Interdisciplinary Perspectives (p. 1426)  3  
GEP U.S. Diversity (p. 1431) (verify requirement)  
GEP Global Knowledge (p. 1419) (verify requirement)  
Foreign Language Proficiency (p. 1417) (verify requirement)

**Total Hours**  
17

**Engineering Sciences Electives**  

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
<td>3</td>
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<tr>
<td>CE 282</td>
<td>Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>MA 201</td>
<td>Engineering Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>MA 208</td>
<td>Engineering Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MA 214</td>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MA 308</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MSE 335</td>
<td>Experimental Methods for Analysis of Material Properties</td>
<td>2</td>
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**Ethics Electives**  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>IDS 303</td>
<td>Humans and the Environment</td>
<td>3</td>
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<tr>
<td>NR 303</td>
<td>Humans and the Environment</td>
<td>3</td>
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<tr>
<td>PHI 214</td>
<td>Issues in Business Ethics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
</tr>
<tr>
<td>STS 214</td>
<td>Introduction to Science, Technology, and Society</td>
<td>3</td>
</tr>
<tr>
<td>STS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
<td>3</td>
</tr>
<tr>
<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
<td>3</td>
</tr>
<tr>
<td>STS 322</td>
<td>Technological Catastrophes</td>
<td>3</td>
</tr>
<tr>
<td>STS 325</td>
<td>Bio-Medical Ethics</td>
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**Technical Electives**  

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ISE 416</td>
<td>Manufacturing Engineering II - Automation</td>
<td>3</td>
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<tr>
<td>ISE 417</td>
<td>Database Applications in Industrial &amp; Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ISE 452</td>
<td>Advanced Human-Machine Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>ISE 462</td>
<td>Advanced Stochastic Models in Industrial Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ISE 495</td>
<td>Project Work in Industrial Engineering</td>
<td>1-3</td>
</tr>
<tr>
<td>MSE 445</td>
<td>Ceramic Processing</td>
<td>3</td>
</tr>
<tr>
<td>MSE 465</td>
<td>Introduction to Nanomaterials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 485</td>
<td>Biomaterials</td>
<td>3</td>
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<td>MSE 565</td>
<td>Introduction to Nanomaterials</td>
<td>3</td>
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<tr>
<td>ST 430</td>
<td>Introduction to Regression Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ST 431</td>
<td>Introduction to Experimental Design</td>
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</tr>
<tr>
<td>ST 432</td>
<td>Introduction to Survey Sampling</td>
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**Industrial Engineering (BS) (14IEBS)**

**Semester Sequence**  
This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>First Year</td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td></td>
</tr>
<tr>
<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
<td>2</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
<td>2</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>2</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus</td>
<td>3</td>
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1. A grade of C or higher is required.
2. A grade of C- or higher is required.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td></td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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</tr>
<tr>
<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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</tr>
<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
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<tr>
<td>E 102</td>
<td>Engineering in the 21st Century</td>
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<tr>
<td><strong>Second Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>MSE 200</td>
<td>Mechanical Properties of Structural Materials</td>
<td>3</td>
</tr>
<tr>
<td>ISE 135</td>
<td>Computer-Based Modeling for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
<td>4</td>
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<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
<td>3</td>
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<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
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</tr>
<tr>
<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ISE 215</td>
<td>Foundations of Design &amp; 3D Modeling for Engineers</td>
<td>1</td>
</tr>
<tr>
<td>ISE 216</td>
<td>Product Development and Rapid Prototyping</td>
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</tr>
<tr>
<td>MA 303</td>
<td>Linear Analysis</td>
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</tr>
<tr>
<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
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<td></td>
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<tr>
<td><strong>Third Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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</tr>
<tr>
<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ISE 316</td>
<td>Manufacturing Engineering I - Processes</td>
<td>3</td>
</tr>
<tr>
<td>ISE 315</td>
<td>Introduction to Computer-Aided Manufacturing</td>
<td>1</td>
</tr>
<tr>
<td>CE 214</td>
<td>Engineering Mechanics-Statics</td>
<td>3</td>
</tr>
<tr>
<td>ISE 361</td>
<td>Deterministic Models in Industrial Engineering (CP)</td>
<td>3</td>
</tr>
<tr>
<td>Ethics (GEP Requirement (p. 1417))</td>
<td>3</td>
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**Fourth Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ISE 352</td>
<td>Fundamentals of Human-Machine Systems Design</td>
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</tr>
<tr>
<td>ISE 362</td>
<td>Stochastic Models in Industrial Engineering (CP)</td>
<td>3</td>
</tr>
<tr>
<td>ISE 443</td>
<td>Quality Design and Control</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
<td></td>
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<tr>
<td>Engineering Science Elective</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>ISE 441</td>
<td>Introduction to Simulation (CP)</td>
<td>3</td>
</tr>
<tr>
<td>ISE 398</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>ISE 408</td>
<td>Design and Control of Production and Service Systems (CP)</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
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</tr>
<tr>
<td>ISE 520</td>
<td>Healthcare Systems Performance Improvement I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Technical Elective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISE 453</td>
<td>Modeling and Analysis of Supply Chains (CP)</td>
<td>3</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISE 498 or ISE 521</td>
<td>Senior Design Project (CP) or Healthcare Systems Performance Improvement II</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Fourth Semester</strong></td>
<td></td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
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</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>127</td>
<td></td>
</tr>
</tbody>
</table>

1 A grade of C or higher is required.
2 A grade of C- or higher is required, E 115 requires satisfactory completion (S).

**Career Opportunities**

Industrial and Systems engineers can be found everywhere! According to the Bureau of Labor Statistics, ISES will be highly sought after in the coming decade. This is not surprising given the cost and efficiency pressure on both manufacturing and service sectors. Industrial engineers are hired by virtually all segments of industry. They may work in hospitals and healthcare consulting firms to make healthcare delivery more cost effective as well as in high tech manufacturing industries. Another area in which ISES play a pivotal role, is in successful integration of global business partners. As companies continue to seek a global presence, industrial engineers will be involved in the design of new supply chain networks or qualification of manufacturing processes/facilities. Given the level of impact made by ISES in industry today it is not surprising that our current job placement rate is among the highest in the College of Engineering, above 90% within 3 months of graduation. Many ISES rise to the management ranks throughout the career and there have been
several ISEs who have become CEOs: Tim Cook (Apple Inc.), Mike Duke (Walmart) & Charles Holliday (Dupont) to name a few.

Industrial Engineering (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The minor in Industrial Engineering is designed to provide undergraduate engineering students and other science majors in curricula other than Industrial Engineering with the fundamentals of industrial engineering necessary for advanced study in the discipline and/or employment in industrial engineering related occupations. The minor in Industrial Engineering offers a structured program that allows students to acquire some level of expertise in areas common to all industrial engineers as well as a deeper knowledge in at least one specific area of interest.

Admissions and Certification of Minor

Students should contact Kanton Reynolds (441B Daniels Hall, 919.515.0605, kreyolds@ncsu.edu) for admission to and certification of the minor in Industrial Engineering. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Kanton Reynolds, Ph.D.
Daniels 441B
(919) 515-0605
kreyolds@ncsu.edu

Effective Date: 6/2011

SIS Code: 14IEM

Plan Requirements

- Complete a minimum of 15 credit hours of ISE designated courses.
- Students must complete 6 hours of required courses and 9 hours of elective courses.
- All courses must be completed with a grade of ‘C-’ or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
<td>6</td>
</tr>
<tr>
<td>ISE 4XX</td>
<td>Any 400-level ISE Course</td>
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</tr>
</tbody>
</table>

Elective Courses

- Complete a minimum of 15 credit hours of ISE designated courses.
- Students must complete 6 hours of required courses and 9 hours of elective courses.
- All courses must be completed with a grade of ‘C-’ or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ISE 135</td>
<td>Computer-Based Modeling for Engineers</td>
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<tr>
<td>ISE 216</td>
<td>Product Development and Rapid Prototyping</td>
<td>6</td>
</tr>
<tr>
<td>ISE 316</td>
<td>Manufacturing Engineering I - Processes</td>
<td>6</td>
</tr>
<tr>
<td>ISE 352</td>
<td>Fundamentals of Human-Machine Systems Design</td>
<td>6</td>
</tr>
<tr>
<td>ISE 361</td>
<td>Deterministic Models in Industrial Engineering</td>
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<tr>
<td>ISE 362</td>
<td>Stochastic Models in Industrial Engineering</td>
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<tr>
<td>ISE 408</td>
<td>Design and Control of Production and Service Systems</td>
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<td>ISE 416</td>
<td>Manufacturing Engineering II - Automation</td>
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<tr>
<td>ISE 417</td>
<td>Database Applications in Industrial &amp; Systems Engineering</td>
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ISE 441 Introduction to Simulation
ISE 443 Quality Design and Control
ISE 452 Advanced Human-Machine Systems Design
ISE 453 Modeling and Analysis of Supply Chains

Total Hours 15

Supply Chain Engineering (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The Supply Chain Engineering Minor allows students to develop skills associated with the networks and processes that move materials and supplies into production facilities, transforms them into finished goods and then distributes products to customer markets. This minor takes a multi-disciplinary approach to solving problems associated with logistics, operations, network design, systems and services optimization, planning/scheduling and alternatives analysis. Completion of this minor will prepare undergraduate students for the global marketplace by providing a strong foundation and integrated framework from which to navigate decisions, influence product planning, and impact time to market.

Administration of the Minor

Kanton Reynolds, Ph.D.
Director, Undergraduate Programs & Associate Teaching Professor
Edward P. Fitts Department of Industrial & Systems Engineering
919.515.0605
kreyolds@ncsu.edu

Jason DeRousie, Ph.D.
Director, Curriculum and Advising
College of Management
919.515.6937
jcoderous@ncsu.edu

Plan Requirements

- The program administrator will oversee admission to and certify completion of the minor program.
- Admission to the minor requires a minimum 3.25 GPA and completion of a short application form.
- Students shall then complete the minor form and create a plan of work detailing the courses to be taken in order to satisfy the requirements by semester.
- Students accepted to the program will be required to meet with program administrator or designee during the registration period for each semester to ensure satisfactory process toward the minor.
- Students are NOT allowed to double count any required course in Group A toward both departmental major and minor requirements.
- All courses must be completed at NC State University.
- All minor courses must be completed with a grade of C- or higher.
- All minor courses must be taken for a letter grade.
- The Program administrator will verify that all requirements have been met and certify the minor prior to graduation. The minor must be completed no later than the semester in which the students expects to graduate from their degree program. Paperwork for the certification should be completed no later than the end of the registration period for the student’s final semester at NC State University.
Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Plan Requirements

Engineering (BS): 122 Total Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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**Spring Semester**
Select one of the following: 3

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<td>Fundamentals of Economics</td>
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<td>MA 241</td>
<td>Calculus II</td>
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<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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**Second Year**

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**Third Year**

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<td>Engineering Elective 400 Level</td>
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**Spring Semester**

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<td>Engineering Elective 300 or 400 Level Elective 400-Level</td>
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**Total Hours** 103

1 A grade of C or higher is required.
2 A grade of C- or higher is required.
3 Students should consult their academic advisors to determine how to complete this requirement.

GEP Courses

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<tr>
<td>GEP Humanities (p. 1423)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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### Engineering Electives 200-Level

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<tbody>
<tr>
<td>BAE 200</td>
<td>Computer Methods in Biological Engineering</td>
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<td>BAE 202</td>
<td>Introduction to Biological and Agricultural Engineering Methods</td>
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<tr>
<td>BAE 203</td>
<td>Introduction to AutoCAD Civil 3D for Environmental &amp; Ecological Engineers</td>
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<td>BAE 204</td>
<td>Introduction to Environmental and Ecological Engineering</td>
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<td>BAET 201</td>
<td>Shop Processes and Management</td>
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<tr>
<td>BME 201</td>
<td>Computer Methods in Biomedical Engineering</td>
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<tr>
<td>BME 203</td>
<td>Introduction to the Materials Science of Biomaterials</td>
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<tr>
<td>BME 204</td>
<td>Biomedical Measurements</td>
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<td>BME 205</td>
<td>Introduction to Biomedical Mechanics</td>
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<tr>
<td>BME 207</td>
<td>Biomedical Electronics</td>
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<td>BME 209</td>
<td>Introduction to the Materials Science of Biomaterials</td>
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<tr>
<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials</td>
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### Engineering Topics Electives

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<td>CSC 112</td>
<td>Introduction to Computing-FORTRAN</td>
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<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
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<td>ECE 109</td>
<td>Introduction to Computer Systems</td>
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<td>GC 120</td>
<td>Foundations of Graphs</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<td>TE 110</td>
<td>Computer-Based Modeling for Engineers</td>
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### Engineering Topics II Electives

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<td>Engineering Mechanics-Statics</td>
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<tr>
<td>CE 215</td>
<td>Engineering Mechanics-Dynamics</td>
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<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
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<td>CE 282</td>
<td>Hydraulics</td>
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<tr>
<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
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<tr>
<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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<tr>
<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
<td>3</td>
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<tr>
<td>MAE 206</td>
<td>Engineering Statics</td>
<td>3</td>
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<tr>
<td>MAE 208</td>
<td>Engineering Dynamics</td>
<td>3</td>
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<tr>
<td>MAE 214</td>
<td>Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 308</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>MSE 200</td>
<td>Mechanical Properties of Structural Materials</td>
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<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials</td>
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### Engineering Electives 200-Level

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<td>BME 217</td>
<td>Biomedical Electronics Laboratory</td>
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<td>BME 219</td>
<td>Materials Science of Biomaterials Lab</td>
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<td>BME 295</td>
<td>Research in Biomedical Engineering for Undergraduates</td>
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<td>BME 298</td>
<td>Biomedical Engineering Design and Manufacturing I</td>
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<td>BME 299</td>
<td>BME Design and Manufacturing I Lab</td>
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<td>CE 214</td>
<td>Engineering Mechanics-Statics</td>
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<td>CE 215</td>
<td>Engineering Mechanics-Dynamics</td>
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<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
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<tr>
<td>CE 250</td>
<td>Introduction to Sustainable Infrastructure</td>
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<td>CE 263</td>
<td>Introduction to Construction Engineering</td>
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<td>CE 282</td>
<td>Hydraulics</td>
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<td>Current Topics in Civil Engineering</td>
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<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>CHE 225</td>
<td>Introduction to Chemical Engineering Analysis</td>
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<td>Introduction to Computers and Their Uses</td>
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<td>CSC 216</td>
<td>Software Development Fundamentals</td>
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<td>Software Development Fundamentals Lab</td>
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<td>CSC 226</td>
<td>Discrete Mathematics for Computer Scientists</td>
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<td>CSC 236</td>
<td>Computer Organization and Assembly Language for Computer Scientists</td>
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<td>CSC 246</td>
<td>Concepts and Facilities of Operating Systems for Computer Scientists</td>
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<td>CSC 251</td>
<td>Web Page Development</td>
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<td>String Processing Languages</td>
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<td>CSC 281</td>
<td>Foundations of Interactive Game Design</td>
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<td>Special Topics in Computer Science</td>
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<td>Engineering Transfer to Success</td>
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<td>ECE 200</td>
<td>Introduction to Signals, Circuits and Systems</td>
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<td>Computer Systems Programming</td>
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<td>Electric Circuits</td>
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<td>ECE 212</td>
<td>Fundamentals of Logic Design</td>
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<td>ECE 220</td>
<td>Analytical Foundations of Electrical and Computer Engineering</td>
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<td>ISE 215</td>
<td>Foundations of Design &amp; 3D Modeling for Engineers</td>
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<td>ISE 216</td>
<td>Product Development and Rapid Prototyping</td>
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<td>MAE 200</td>
<td>Introduction to Mechanical Engineering Design</td>
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<td>Engineering Thermodynamics I</td>
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<td>Aerospace Vehicle Performance</td>
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<td>Structure and Properties of Engineering Materials</td>
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MSE 203 Introduction to the Materials Science of Biomaterials 3
MSE 255 Experimental Methods for Structural Analysis of Materials 2
MSE 260 Mathematical Methods for Materials Engineers 3
MSE 270 Materials Science and Engineering Seminar 1
NE 201 Introduction to Nuclear Engineering 2
NE 202 Radiation Sources, Interaction and Detection 4
NE 235 Nuclear Reactor Operations Training 2
NE 290 Introduction to Health Physics 3
PSE 201 Pulping and Papermaking Technology 3
PSE 211 Pulp and Paper Internship 1
PSE 212 Paper Properties 4
PSE 220 From Papyrus to Plasma Screens: Paper and Society 2
PSE 293 Independent Study in Paper Science & Engineering 1-6
PSE 294 Independent Study in Paper Science & Engineering 1-6
PSE 295 Special Topics in Paper Science & Engineering 1-3
TE 200 Introduction to Polymer Science and Engineering 3
TE 201 Fiber Science 4
TE 205 Analog and Digital Circuits 4

Basic Science Electives

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<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<td>Quantitative Chemistry Laboratory</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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Engineering Topics III Elective

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<td>Biological Engineering Circuits</td>
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<td>BAE 321</td>
<td>Bioprocessing Engineering Fundamentals</td>
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<td>BAE 322</td>
<td>Introduction to Food Process Engineering</td>
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<td>BAE 325</td>
<td>Introductory Geomatics</td>
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<td>BAE 361</td>
<td>Analytical Methods in Engineering Design</td>
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<td>BAE 371</td>
<td>Fundamentals of Hydrology for Engineers</td>
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<td>BAE 376</td>
<td>Watershed Assessment and Water Quality Protection</td>
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<td>BAE 401</td>
<td>Sensors and Controls</td>
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<td>BAE 425</td>
<td>Industrial Microbiology and Bioprocessing</td>
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<td>BAE 435</td>
<td>Precision Agriculture Technology</td>
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<td>Engineering Design I</td>
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<td>BAE 462</td>
<td>Machinery Design and Applications</td>
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<td>Irrigation and Drainage</td>
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<td>Introduction to Hydrologic and Water Quality Modeling</td>
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<td>Principles and Applications of Ecological Engineering</td>
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<td>BAE 481</td>
<td>Structures &amp; Environment</td>
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<td>Postharvest Engineering</td>
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<td>External Learning Experience</td>
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<td>Special Problems in Biological and Agricultural Engineering</td>
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**Engineering Electives 300- or 400-Level**

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**Code**

- BAE 302: Transport Phenomena
- BAE 305: Biological Engineering Circuits
- BAE 321: Bioprocessing Engineering Fundamentals
- BAE 322: Introduction to Food Process Engineering
- BAE 325: Introductory Geometrics
- BAE 361: Analytical Methods in Engineering Design
- BAE 371: Fundamentals of Hydrology for Engineers
- BAE 376: Watershed Assessment and Water Quality Protection
- BAE 401: Sensors and Controls
- BAE 425: Industrial Microbiology and Bioprocessing
- BAE 435: Precision Agriculture Technology
- BAE 451: Engineering Design I
- BAE 452: Engineering Design II
- BAE 462: Machinery Design and Applications
- BAE 472: Irrigation and Drainage
- BAE 473: Introduction to Hydrologic and Water Quality Modeling
- BAE 474: Principles and Applications of Ecological Engineering
- BAE 478: Agricultural Waste Management
- BAE 481: Structures & Environment
- BAE 488: Postharvest Engineering
- BAE 492: External Learning Experience
- BAE 493: Special Problems in Biological and Agricultural Engineering
- BAE 495: Special Topics in Biological and Agricultural Engineering
- BAE 501: Sensors and Controls
- BAE 535: Precision Agriculture Technology
- BAE 572: Irrigation and Drainage
- BAE 573: Introduction to Hydrologic and Water Quality Modeling
- BAE 578: Agricultural Waste Management
- BAET 323: Water Management
- BAET 332: Management of Animal Environments
- BAET 333: Processing Agricultural Products

**Title**

- Textile Engineering Design I
- Textile Engineering Design II
- Textile Engineering Quality Improvement Laboratory
- Process Systems Analysis and Control
- Textile Information Systems Design
- Polymer Engineering
- Polymeric Biomaterials Engineering
- Mechanics of Tissues & Implants Requirements
- Special Topics in Textile Engineering
- Textile Information Systems Design
- Polymeric Biomaterials Engineering
- Management of Agricultural Products
- Management of Animal Environments
- Processing Agricultural Products

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<td>ISE 453</td>
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<td>Python Programming for Industrial &amp; Systems Engineers</td>
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<td>ISE 547</td>
<td>Applications of Data Science in Healthcare</td>
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<td>MAE 413</td>
<td>Design of Mechanical Systems</td>
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<td>MAE 415</td>
<td>Mechanical Engineering Design I</td>
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<td>MAE 457</td>
<td>Flight Vehicle Stability and Control</td>
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<td>MAE 458</td>
<td>Propulsion</td>
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<td>MAE 480</td>
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<td>MA 141</td>
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**Semester Sequence**

This is a sample.

### First Year

#### Fall Semester

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<td>Academic Writing and Research</td>
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#### Spring Semester

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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>MA 241</td>
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### Engineering Topics Elective

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<td>GEP 402</td>
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### Semester Hours

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<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>E 115</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>MA 141</td>
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**Second Year**

**Fall Semester**

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**Spring Semester**

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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>MA 405</td>
<td>Introduction to Linear Algebra</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Hours** 17

**Third Year**

**Fall Semester**

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**Hours** 15

**Spring Semester**

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<td>Engineering Topics III Elective</td>
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<td>Engineering Elective 300- or 400-Level</td>
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**Fourth Year**

**Fall Semester**

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**Hours** 14-15

**Spring Semester**

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<td>Engineering Elective 400-Level</td>
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<td>BSE Topic Elective</td>
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**GEP Requirement (p. 1417)** 3

**Hours** 15

**Total Hours** 122-123

1. A grade of C or higher is required.
2. A grade of C- or higher is required.

**Engineering (BS): Mechanical Engineering Systems Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The NC State Mechanical Engineering Systems (MES) BSE program is a site-based program located on the campus of Craven Community College in Havelock, North Carolina. Students in the program earn a Bachelor of Science in Engineering with a concentration in Mechanical Engineering Systems. Upon graduation from the MES program, students have the qualifications to apply for any job seeking mechanical engineering applicants.

**Curriculum**

MES students are drawn from a diverse population that includes not only the traditional college student, but also military personnel and civilian staff of FRC-East.

The 10 mechanical engineering courses in the MES program are taught by the nationally recognized NC State MAE faculty in Raleigh and delivered to the MES students in Havelock via interactive high-definition video teleconference.

Local NC State faculty teach the Systems Engineering content, conduct all laboratory experiences, and direct students in the two-semester capstone design experience where they are partnered with an industry sponsor to design and build a solution to a real-world problem. Hands-on laboratory exercises allow students to explore and experience theoretical concepts learned in their courses and practice important modern skills such as manual and computerized measurement techniques, data analysis, design of experiments and technical communications.

The MES program is located within a short distance of the Naval Air Systems Command’s Fleet Readiness Center-East, Cherry Point (FRC-East). FRC-East is North Carolina’s largest industrial employer east of interstate highway I-95 and the MES program takes advantage of the synergies afforded by its close location and relationship with the more than 900 engineers working at FRC-East.

The MES program is evaluated under the criteria for Mechanical Engineering Programs and is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

**Admissions**

Students in the MES program typically begin by taking their general education courses such as physics, chemistry, calculus, and the humanities at one of North Carolina’s Community Colleges or from another approved university program. Once students satisfy all transfer requirements, they apply for acceptance into the College of Engineering at NC State as a transfer student majoring in the MES program. Current NCSU engineering students can pursue the MES program if they
are willing to relocate to the Havelock area. For more information on admissions, click here ([https://www.engr.ncsu.edu/mes/programs/mechanical-engineering-systems-bachelor-of-science-in-engineering-program](https://www.engr.ncsu.edu/mes/programs/mechanical-engineering-systems-bachelor-of-science-in-engineering-program)) or go to engr.ncsu.edu/mes ([https://www.engr.ncsu.edu/mes/](https://www.engr.ncsu.edu/mes/)).

**Program Educational Objectives**

Alumni of the BSE with a concentration in mechanical engineering systems will attain the following objectives within 3-5 years of graduating:

1. Be engaged in the professional practice of engineering or be enrolled in graduate school.
2. Establish themselves as problem solvers in the workplace through the practical application of engineering and systems knowledge and skills.
3. Function effectively in a professional environment by utilizing written and oral communication, teamwork, project management, and leadership skills and their ability to view their own work in a broader context.
4. Continuously improve and expand their technical and professional skills through formal study, as well as through informal means.

**Plan Requirements**

**Engineering (BS): Mechanical Engineering Systems Concentration:**

**125 Total Units**

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<td>CH 102</td>
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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>Academic Writing and Research</td>
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1 A grade of C or higher is required.
2 A grade of C- or higher is required.

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GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Total Hours 16

Semester Sequence
This is a sample.

Course | Title | Hours
--- | --- | ---
**First Year**

**Fall Semester**

CH 101 | Chemistry - A Molecular Science | 3
CH 102 | General Chemistry Laboratory | 1
E 101 | Introduction to Engineering & Problem Solving | 1
ENG 101 | Academic Writing and Research | 3
MA 141 | Calculus I | 4
GC 120 | Foundations of Graphics | 3

**Spring Semester**

CSC 112 | Introduction to Computing-FORTRAN | 3
MA 241 | Calculus II | 4
PY 206 | Physics for Engineers and Scientists | 3
PY 206 | Physics for Engineers and Scientists Laboratory | 1
GEP Health & Exercise Studies | 2
EC 205 | Fundamentals of Economics | 3

**Hours** 16

**Second Year**

**Fall Semester**

MAE 206 | Engineering Statics | 3
MSE 201 | Structure and Properties of Engineering Materials | 3
MA 242 | Calculus III | 4
PY 208 | Physics for Engineers and Scientists | 3
PY 209 | Physics for Engineers and Scientists Laboratory | 1
MES 200 | Introduction to Mechanical Engineering Systems | 2

**Hours** 16

**Spring Semester**

MAE 208 | Engineering Dynamics | 3
MAE 214 | Solid Mechanics | 3
MA 341 | Applied Differential Equations I | 3
ST 370 | Probability and Statistics for Engineers | 3
MES 201 | Mechanical Engineering Systems Lab I | 2

Select one of the following:

PHI 375 | Ethics | 3

**Third Year**

**Fall Semester**

MAE 201 | Engineering Thermodynamics I | 3
MAE 308 | Fluid Mechanics | 3
MAE 315 | Dynamics of Machines | 3
MES 300 | Systems Engineering | 4
MES 301 | Mechanical Engineering Systems Lab II | 2

**Hours** 15

**Spring Semester**

MAE 316 | Strength of Mechanical Components | 3
ECE 331 | Principles of Electrical Engineering | 3
ENG 331 | Communication for Engineering and Technology | 3
MAE 435 | Principles of Automatic Control | 3
MES 302 | Mechanical Engineering Systems Lab III | 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3

**Hours** 17

**Fourth Year**

**Fall Semester**

MAE 415 | Mechanical Engineering Design I | 3
MAE 310 | Heat Transfer Fundamentals | 3
MES 401 | MES Capstone Design I | 3
MES 400 | Mechanical Engineering Systems Lab IV | 2
GEP Humanities (p. 1423) | 3

**Hours** 14

**Spring Semester**

MAE 412 | Design of Thermal System | 3
MES 403 | MES Capstone Design II | 3
GEP Interdisciplinary Perspectives (p. 1426) | 3
GEP Interdisciplinary Perspectives (p. 1426) | 3
GEP Social Sciences (p. 1430) | 1-2

**Hours** 14-15

**Total Hours** 125-126

1 Grade of C (2.0) or higher required.
2 Students must have a 2.5 to enroll in this course
3 Minimum grade of C-

**Career Opportunities**

In the MES program, you will receive a solid foundation in mechanical engineering principles including structural mechanics, materials, fluid mechanics, dynamics, vibrations, controls, thermal sciences, mechanical design, and thermal design. You will also receive training in the formal systems engineering approach to the design and realization of integrated systems. Your training in formal systems engineering gives you the ability to understand and work through the broad complex issues involved with integrated systems. Your training in mechanical engineering principles gives you the skill and confidence required to understand and solve detailed technical problems. The unique combination of these skills allows you to be well prepared to meet the technical and non-technical challenges of today's engineering workplace.
Engineering (BS): Mechatronics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

For more information about this department, including contact information, visit the department (https://engineering.unca.edu/).

The Joint Mechatronics Engineering curriculum (JEM) combines the best that two nationally recognized universities have to offer. From NC State University comes the engineering component comprising course work from the Departments of Mechanical and Aerospace Engineering (MAE), Electrical and Computer Engineering (ECE), and mechatronics courses taught by NC State University faculty on the campus of the University of North Carolina at Asheville. From the University of North Carolina at Asheville comes a Humanities and Social Science component with a rich liberal arts foundation and mechatronics courses taught by UNC Asheville faculty and staff. Hands-on laboratories are integral to the engineering course work. As an NC State site-based engineering program, students must attend classes on the campus of UNC Asheville. Transfer students should contact the program office in Asheville for information about the transfer of courses from other educational institutions.

Mechatronics engineering focuses on the precision control of mechanical and machine systems. In today's modern engineering systems, control is achieved electronically through sensors, actuators and microprocessors. The marriage of modern control systems with mechanical devices is key to the design and development of high-performance engineering systems. Just a few examples of computer-controlled mechanical systems are robots, engine-fuel systems, hybrid automobiles, autonomous aerospace vehicles, stair-climbing wheelchairs, garage door openers and alternative power generation systems. Through modern mechatronics engineering, new avenues of thinking and design can greatly enhance the utility, performance, and efficiency of modern machinery.

Program Educational Objectives

Within a few years of graduation, successful alumni of the Joint NC State - UNC Asheville BSE - Mechatronics Concentration degree should:

1. Attain productive professional careers in mechatronics engineering or related fields.
2. Function in the workplace with appropriate professional and ethical responsibilities.
3. Make decisions with accountability for the social and environmental impact of their engineering practices.
4. Interact effectively with a diversity of individuals while viewing their own work in the broader context of our global society.
5. Attain technical excellence by engaging in life-long learning.


Specific curriculum requirements are available on the Mechatronics webpage (https://www.engr.ncsu.edu/mechatronics/joint/).

Plan Requirements

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**Notes:**

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**Notes:**

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Fourth Year

Fall Semester

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Spring Semester

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Total Hours: 126

1 A grade of C- or higher is required.

Code | Title | Hours
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**Humanities/Social Sciences**

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**Philosophy**

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- Early Modern Philosophy
- Hours: 3

### PHI 302
- 19th Century Philosophy
- Hours: 3

### PHI 305
- Philosophy of Religion
- Hours: 3

### PHI 310
- Existentialism
- Hours: 3

### PHI 312
- Philosophy of Law
- Hours: 3

### PHI 313
- Ethical Problems in the Law
- Hours: 3

### PHI 325
- Philosophy of Science
- Hours: 3

### PHI 340
- Philosophy of Science
- Hours: 3

### PHI 375
- Ethical Problems in the Law
- Hours: 3

### PHI 376
- History of Ethics
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### PHI 403
- Continental Philosophy After 1900
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### STS 325
- Bio-Medical Ethics
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### Religion

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### History/Visual Performing Arts Electives

Science, Technology & Society Electives

Semester Sequence

This is a sample.

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### CH 132
- Introduction to Engineering & Problem Solving
- Hours: 3

### E 101
- Introduction to Computer Aided Design for Mechatronics Engineering
- Hours: 1

### JEM 123
- Introduction to Computer Aided Design for Mechatronics Engineering
- Hours: 1

### Dept 178 LAC: First Year Seminar
- Hours: 3

#### Spring Semester

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<td>Fundamentals of Logic Design</td>
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### Soil Science Electives
Engineering (BS): Nuclear Power Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Plan Requirements

Engineering (BS): Nuclear Power Concentration: 120 Total Units

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¹ A grade of C- or higher is required.

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¹ Students should consult their academic advisors to determine which courses fill this requirement.

### History/Literature Electives

### Philosophy/Religion/Art Electives

### Science, Tech & Society Electives

### Non-English Culture

### Semester Sequence

This is a sample.
<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>MA 141</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>MA 341</td>
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<td>Radiation Sources, Interaction and Detection (^2)</td>
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<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials</td>
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<td><strong>Total Hours</strong></td>
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</table>

1 A grade of C or higher is required.
2 A grade of C- or higher is required.

**Joint Department of Biomedical Engineering**

Biomedical Engineering (BME) is a fast-growing, interdisciplinary field that integrates engineering, mathematics, medicine, and science to improve human health and quality of life. In the Joint Department of BME, students are given access to state-of-the-art equipment and facilities at both NC State University and UNC-Chapel Hill. This unique relationship offers students a wealth of opportunities for research, group collaboration, coursework, and exposure to experts in medicine and engineering. While all of the classes undergraduate students need to complete their degree are available on their home campus, students may choose to take courses at either campus. Students never have to travel to the partner campus; the joint program simply offers additional opportunities.

After completing core courses and being admitted through a competitive process to the program, students are effectively admitted to the partner campus. Students have full standing at both NC State and UNC. Upon graduation, the diploma bears the seals and signatures of both universities, and students receive an ABET-accredited degree in Biomedical Health Sciences Engineering.

Department Highlights:

- Students interested in Biomedical Engineering can join any of several student organizations including the Biomedical Engineering Society Student Chapter (https://getinvolved.ncsu.edu/organization/bmes/), The Helping Hand Project (https://getinvolved.ncsu.edu/organization/helpinghandproject/), and the Engineering World Health Club (https://getinvolved.ncsu.edu/organization/ewh-ncsu/).
- Students have the opportunity to study abroad (https://honorscarolina.unc.edu/global-honors/scotland/) in Edinburgh, Scotland studying the process of innovation in the context of healthcare delivery and technology.
- Students gain skills in manufacturing processes and biological synthesis while following the guidelines for FDA approval for a medical device.
• Students in this degree program are eligible for The Abrams Scholarship Program (https://www.bme.unc.edu/congratulations-to-the-2017-2018-abrams-scholars/) and The Lucas Scholar Fellowship (https://www.bme.unc.edu/lucas-scholar-fellowship/).

For more information about our department, including contact information, visit our website (https://www.bme.unc.edu/).

Joint Department of Biomedical Engineering
North Carolina State University
4310 Engineering Building III
Campus Box 7115
Raleigh, NC 27695-7115

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Professor and Interim Department Head
North Carolina State University
4012 Engineering Building III
Raleigh, NC 27695
Phone: 919-843-9521
Email: padayton@email.unc.edu

Faculty
Head
Nancy L. Albritton

Associate Head/Chair
Paul Dayton

Director of Undergraduate Studies
Lianne Cartee

Professors
Nancy Albritton
Ted Bateman
Rahima Benhabbour
Ashley Brown
Yevgeny Brudno
Lianne Cartee
Ke Cheng
Jacqueline Cole
Michael Daniele
Paul Dayton
Bob Dennis
Brian Diekman
Kenneth Donnelly
Matthew Fisher
Jason Franz
Donald Freytes
Caterina Gallippi
Michael Gamcsik
Andrea Giovannucci
Shawn Gomez
Edward Grant
Alon Greenbaum
Xiaogang Hu
Helen Huang
Devin Hubbard
Naji Husseini
Derek Kamper
David Lalush
Wesley Legant
Frances Ligler
George Ligler
Jeffrey Macdonald
Scott Magness
Troy Nagle
Roger Narayan
Hatice Ozturk
Gianmarco Pinton
William Polacheck
Mark Ramsey
Imran Rizvi
Mike Sano
Koji Sode
Anne Taylor
Mark Tommerdahl
David Zaharoff

Plans
• Biomedical and Health Sciences Engineering (BS) (p. 600)
• Tissue Engineering (Minor) (p. 602)
Biomedical and Health Sciences Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

Students studying biomedical engineering at NC State and UNC-Chapel Hill are challenged with a curriculum at the interface of engineering and medicine. During the first year, students are introduced to the fundamentals of engineering. These courses include calculus, physics, chemistry and biology. All of which provide the foundation for future engineering courses. Once accepted into the program, students take engineering courses in mechanics, circuits and materials followed by specialized courses in biomedical engineering. The design process is woven throughout the curriculum. Students take courses that familiarize them with manufacturing processes while preparing them for the capstone senior design course that use a Design Control Process based on the FDA's Quality System Regulations. Computers are used throughout the program. Graduates will be prepared for professional employment in research, design, engineering and the life sciences. First year students interested in this curriculum should enroll in the Engineering First Year program and select BME as their intention.

Plan Requirements

Biomedical and Health Sciences Engineering (BS): 124 Total Units

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<tr>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving ²</td>
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<td>MA 241</td>
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<td>BIO 183</td>
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<td>Introduction to Biomedical Mechanics</td>
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<td>Biomedical Electronics</td>
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<td>BME 301</td>
<td>Human Physiology : Electrical Analysis</td>
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¹ A grade of C or higher is required.
² A grade of C- or higher is required.
Students should consult their academic advisors to determine how to complete this requirement.

**Code** | **Title** | **Hours**
---|---|---
**GEP Courses**
GEP Humanities (p. 1423) | 6
GEP Social Sciences (p. 1430) | 3
GEP Health and Exercise Studies (p. 1422) | 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3
GEP Interdisciplinary Perspectives (p. 1426) | 3
GEP U.S. Diversity (p. 1431) (verify requirement) |
GEP Global Knowledge (p. 1419) (verify requirement) |
Foreign Language Proficiency (p. 1417) (verify requirement) |
**Total Hours** | 17

**BME 3x5 Gateway Electives**

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<td><strong>BME 345</strong></td>
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<td>Biocontrols</td>
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<td>BME 365</td>
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<td>BME 375</td>
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**BME Specialty Electives**

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<td>Animal Cell Culture Techniques</td>
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<td>BME 462</td>
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<td>BME 484</td>
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<td>MAE 308</td>
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<td>Introduction to Thermodynamics of Materials</td>
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<td>TE 467</td>
<td>Mechanics of Tissues &amp; Implants Requirements</td>
<td>3</td>
</tr>
<tr>
<td><strong>Biosignals and Imaging</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME 412</td>
<td>Biomedical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>ECE 455</td>
<td>Industrial Robotic Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECE 456</td>
<td>Mechatronics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 461</td>
<td>Embedded System Design</td>
<td>3</td>
</tr>
<tr>
<td>ECE 556</td>
<td>Mechatronics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 561</td>
<td>Embedded System Design</td>
<td>3</td>
</tr>
<tr>
<td><strong>Medical Microdevices</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BME 412</td>
<td>Biomedical Signal Processing</td>
<td>3</td>
</tr>
<tr>
<td>BME 522</td>
<td>Medical Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>CE 282</td>
<td>Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>E 304</td>
<td>Introduction to Nano Science and Technology</td>
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</tr>
<tr>
<td>ECE 436</td>
<td>Digital Control Systems</td>
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</tr>
<tr>
<td>ECE 505</td>
<td>Neural Interface Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECE 522</td>
<td>Medical Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>MAE 308</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>MSE 301</td>
<td>Introduction to Thermodynamics of Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

**Semester Sequence**

This is a sample.

**Critical Path Courses** – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving (CP)</td>
<td>1</td>
</tr>
<tr>
<td><strong>E 115</strong></td>
<td>Introduction to Computing Environments (CP)</td>
<td>1</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (CP)</td>
<td>2</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I (CP)</td>
<td>4</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II (CP)</td>
<td>4</td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I (CP)</td>
<td>3</td>
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</tbody>
</table>
### Second Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME/BMME 201</td>
<td>Computer Methods in Biomedical Engineering (CP)</td>
<td>3</td>
</tr>
<tr>
<td>BME/BMME 209</td>
<td>Introduction to the Materials Science of Biomaterials (CP)</td>
<td>4</td>
</tr>
<tr>
<td>BME/BMME 298</td>
<td>Biomedical Engineering Design and Manufacturing I (CP)</td>
<td>2</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II (CP)</td>
<td>3</td>
</tr>
<tr>
<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory (CP)</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Spring Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BME/BMME 205</td>
<td>Introduction to Biomedical Mechanics (CP)</td>
<td>4</td>
</tr>
<tr>
<td>BME/BMME 207</td>
<td>Biomedical Electronics (CP)</td>
<td>4</td>
</tr>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
<td>1</td>
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### Hours
17

### Third Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME/BMME 301</td>
<td>Human Physiology : Electrical Analysis</td>
<td>4</td>
</tr>
<tr>
<td>MA 341 or MA 331</td>
<td>Applied Differential Equations I or Differential Equations for the Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>BME 3x5 Gateway Elective (p. 601)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Engineering Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
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</table>

#### Spring Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME/BMME 302</td>
<td>Human Physiology: Mechanical Analysis</td>
<td>4</td>
</tr>
<tr>
<td>BME 3x5 Gateway Elective (p. 601)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>BME 3x5 Gateway Elective (p. 601)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>BME/BMME 398</td>
<td>Biomedical Engineering Design and Manufacturing II</td>
<td>2</td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

#### Hours
16

### Fourth Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BME 451 or BMME 697</td>
<td>Biomedical Engineering Senior Design I or BMME 697</td>
<td>3</td>
</tr>
<tr>
<td>BME Specialty Elective (p. 601)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

#### Hours
15

### Total Hours
124

1. A grade of C or higher is required.
2. A grade of C- or higher is required.

### Career Opportunities

Biomedical engineers are employed by hospitals, pharmaceutical companies, medical device and testing companies, government agencies, universities, and medical schools. With so many areas of specialization within the field, graduates are encouraged to further their education by attending graduate or professional school after graduation. Graduates from this program have attended graduate programs in biomedical engineering, physical therapy, mechanical engineering, industrial engineering, microbiology, virology, public health, and sports physiology, among others, at many different institutions. Graduates who have taken additional courses to satisfy entrance requirements have also been accepted by medical, dental and pharmacy schools.

### Tissue Engineering (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Tissue Engineering is intended to provide graduates with the knowledge base and practical skills that will prepare them to quickly contribute to research and manufacturing of devices designed for repair and replacement of tissues and organs. Interested students should contact the BME Student Services Coordinator for information and application materials.

### Admissions and Certification of Minor

The BME staff will hold primary responsibility for administration of the Minor in Tissue Engineering. Information about the minor and application materials will be handled by the BME student services coordinator. BME faculty members will serve as advisors for the minor.

### Contact Person

Lesley Hubbard  
Engineering Building 3  
Room 4014  
919.515.6732  
Lesley_hubbard@ncsu.edu

### Effective Date

Effective Date: 6/2009

### SIS Code

SIS Code: 14TISSEGRM
Plan Requirements

- Complete a minimum of 22 credit hours of designated courses. All courses required for the minor must be completed with a C- or better.
- To be admitted to the minor in Tissue Engineering, they will need to complete two prerequisite courses, CH 223 Organic Chemistry II and BIO 183 Introductory Biology: Cellular and Molecular Biology with a C- or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
<td>3</td>
</tr>
<tr>
<td>BIT 466</td>
<td>Animal Cell Culture Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BME/BEC 483</td>
<td>Tissue Engineering Technologies</td>
<td>3</td>
</tr>
<tr>
<td>BME 484</td>
<td>Fundamentals of Tissue Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BME 498</td>
<td>Undergraduate Research in Biomedical Engineering</td>
<td>3</td>
</tr>
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</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
</tr>
<tr>
<td>CE 282</td>
<td>Hydraulics</td>
</tr>
<tr>
<td>CHE 311</td>
<td>Transport Processes I</td>
</tr>
<tr>
<td>CHE 315</td>
<td>Chemical Process Thermodynamics</td>
</tr>
<tr>
<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
</tr>
<tr>
<td>MAE 214</td>
<td>Solid Mechanics</td>
</tr>
<tr>
<td>MAE 308</td>
<td>Fluid Mechanics</td>
</tr>
<tr>
<td>MSE 301</td>
<td>Introduction to Thermodynamics of Materials</td>
</tr>
<tr>
<td>TE 303</td>
<td>Thermodynamics for Textile Engineers</td>
</tr>
</tbody>
</table>

Total Hours 22

Nano-Science and Technology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

The Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) is offering a minor in Nano-Science and Technology for any student enrolled in an engineering curriculum. Students will be trained in the fundamentals of nano-scale materials, devices, and systems for a broad variety of applications. This is a multidisciplinary program consisting of courses from a variety of engineering disciplines. Completion of this minor will prepare undergraduate students for the global workforce by combining technical training in nano-science and technology with diversity awareness, engineering ethics, and an understanding of global issues in science and technology.

Admissions and Certification of Minor

Students must complete the Application for Nano-science and Technology Minor form available from the minor program administrator prior to enrolling in the minor. The program administrator will oversee admission to, and certify completion of the minor program. Prior to admission, qualified students will meet with the program administrator. During this meeting a plan of work for the minor detailing which courses will be taken each semester will be designed and signed by the student. Students will then be required to consult with the program administrator during each registration period to ensure satisfactory progress. All courses counted for the minor must be completed with a grade of "C-" or better. Students may not take minor coursework on a credit only (pass/fail) or S/U basis. The program administrator will verify that all requirements have been met, and certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at N.C. State.

Contact Person

Mehmet C. Ozturk
Monteith Engineering Res. Ctr. 322-C
919.515.5245, mco@ncsu.edu

Elena Nicolescu Veety
Monteith Engineering Res. Ctr. 449
Campus Box 7911
919.513.0178, enicole@ncsu.edu

Effective date: 1/2013
SIS Code: 14NSTM

Plan Requirements

- Completion of the minor requires a minimum of 18 credit hours. This includes one required introductory course, three technical elective courses, and two general education elective courses.
- All courses counted for the minor must be completed with a grade of "C-" or better. Students may not take minor coursework on a credit-only (S/U) basis.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>E 304</td>
<td>Introduction to Nano Science and Technology</td>
<td>3</td>
</tr>
</tbody>
</table>

Technical Electives

Select three of the following: 1,2

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHE 465</td>
<td>Colloidal and Nanoscale Engineering</td>
</tr>
<tr>
<td>CHE 460</td>
<td>Nano-Electronic Materials</td>
</tr>
<tr>
<td>BEC/CHE 462</td>
<td>Fundamentals of Bio-Nanotechnology</td>
</tr>
<tr>
<td>BME 385</td>
<td>Bioinstrumentation</td>
</tr>
<tr>
<td>BME 425</td>
<td>Bioelectricity</td>
</tr>
<tr>
<td>BME 412</td>
<td>Biomedical Signal Processing</td>
</tr>
<tr>
<td>TE/BME 466</td>
<td>Polymeric Biomaterials Engineering</td>
</tr>
<tr>
<td>MAE 495</td>
<td>Special Topics in Mechanical and Aerospace Engineering</td>
</tr>
<tr>
<td>MSE 460</td>
<td>Microelectronic Materials</td>
</tr>
<tr>
<td>MSE 465</td>
<td>Introduction to Nanomaterials</td>
</tr>
<tr>
<td>ECE 404</td>
<td>Introduction to Solid-State Devices</td>
</tr>
<tr>
<td>ECE 442</td>
<td>Integrated Circuit Technology and Fabrication</td>
</tr>
<tr>
<td>ECE/CHE 468</td>
<td>Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems</td>
</tr>
</tbody>
</table>

General Education Electives
Textile engineering students develop a unique background, through undergraduate research, summer intern experiences, and design projects ranging from artificial blood vessel development to the design of novel high-tech sporting equipment. Textile engineers also design computer information systems that can integrate a worldwide distribution program eliminating a company’s reliance on regional stockpiles or streamline an industrial process using Six Sigma quality saving a company millions of dollars. The program offers small class sizes with personal attention from faculty. With the focus on interdisciplinary research, the opportunities for textile engineers have never been brighter.

Opportunities
Textile engineers, teaming with chemists, physicists, materials scientists, and other engineers are designing new polymers, fibers, and textile structures to revolutionize the future of materials. Whether it be for personal protective garments such as bullet proof vests and Gore-tex® or materials used in the next generation space shuttle and the stealth bomber, textile engineers are developing products that are stronger, lighter, and more durable than current materials. Textile engineers are employed in a wide variety of industries that include aerospace, automotive, chemical, composites, management consulting, fiber processing, medical devices, manufacturing and retail, and textile processing.

The TE Program provides a fundamental engineering degree with a working knowledge of the very large textile industry as well as its allied industries. We have our own career planning and placement center to assist students in identifying and selecting internships and permanent careers. Historically, TE graduates have had nearly 100% placement into graduate school or full time employment with starting salaries among the highest at N.C. State University. Compared to the rest of North Carolina State University, the College of Textiles has the highest percentage of students participating in scholarship programs. Indeed, over 50% of all Textile Engineering students receive scholarship support! Owing to the size of the program, many of our undergraduate students participate in research with our world renowned faculty further providing financial assistance as well as professional growth. Almost all of our textile engineering students participate in summer internships. Most of our graduates select jobs that are located in the Southeast, but others who desire to work in other regions of the country have opportunities to do so. Our graduates work in the biomedical industries on the east and west coasts and in Chicago, the automotive industry in Michigan, the aerospace industry in Texas, as well as large apparel and retail companies in Oregon, Maryland, California, Utah, Ohio and North Carolina.

Curriculum
The TE program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. The TE program has three concentrations allowing a customized curriculum that fits your specific educational goals. The concentrations emphasize Information Systems Design, Chemical Processing and Product Engineering. Minors in associated engineering fields (e.g., Computer Science, Industrial Engineering, and Materials Science) as well as foreign language minors are strongly encouraged as part of the academic plan. For exceptional students, dual degree programs with Chemical and Biomolecular Engineering, Biomedical Engineering, and Materials Science and Engineering provide a bachelor degree in two engineering majors with one additional semester of course work.

Educational Objectives
The Textile Engineering Program of the Department of Textile Engineering, Chemistry and Science is committed to instill a strong academic program whereby graduates, within the first few years after graduation are prepared for the following accomplishments:

1. Recognized contributions in the workplace that involve creative and critical thinking in applying the discipline’s body of knowledge and for tackling contemporary issues and engineering challenges that face our global society;
2. A reputation of problem solving in a professional, ethical and safe manner;
3. Established communication and teaming skills in a professional environment; and
4. Evidence of continuous learning through seeking educational and developmental opportunities and by adapting to ever-changing economic, social, and technological environments.

**Faculty**

**Head, Department of Textile Engineering, Chemistry and Science**
J.A. Joines

**Associate Head**
R.E. Gorga
M.A. Pasquinelli

**Director of Undergraduate Programs**
R.E. Gorga

**Director of Graduate Programs**
M.A. Pasquinelli

**Burlington Chair in Textile Technology**
R.L. Barker

**William A. Klopman Distinguished Professor**
B. Pourdeyhimi

**Professors**
A. El-Shafei
T.K. Ghosh
R.E. Gorga
D. Hinks
S.M. Hudson
W.J. Jasper
J.A. Joines
M. King
S. Michielsen
M.A. Pasquinelli
J.P. Rust
X. Zhang

**Teaching Professor**
H. Hamouda

**Associate Professor**
P. Banks-Lee
P.D. Bradford
E.A. DenHartog
G.L. Hodge
J.S. Jur
R. Kotek
W.E. Krause
J.P. Lavelle
S. Salmon

**Adjunct professor**
D. Griffis

**Professors Emeriti**
K.R. Beck
P.L. Grady
B.S. Gupta
G.N. Mock
M.H. Mohamed
C.B. Smith
M.H. Theil

**Adjunct Associate Professor**
R.G. Kuehni
B. Oliver

**Adjunct Assistant Professor**
H.A. Boyter
J.A. Willoughby
B.Y. Yeom

**Research Assistant Professor**
B. Ormond
Adjunct Lecturer
S. Dunning
G. Knight

College of Humanities and Social Sciences

For more information about this college, including contact information, visit the college (http://www.chass.ncsu.edu).

Box 8101
Raleigh, NC 27695-8101

The College of Humanities and Social Sciences offers programs of study that lead to baccalaureate and advanced degrees in the disciplines of the humanities and social sciences. The college also offers courses in these disciplines that are required in all undergraduate programs. In this way the university provides its students the opportunity to prepare for a full life in the professions and occupations that require intellectual flexibility, broad knowledge, and a basic comprehension of human beings and their problems.

The college is comprised of nine departments or schools:
Communication, English, Foreign Languages and Literatures, History, Philosophy and Religious Studies, School of Public and International Affairs, Psychology, Social Work, and Sociology and Anthropology. Interdisciplinary programs are administered through Academic Affairs in the college Dean’s Office.

Cross-College Programs

Alexander Hamilton Scholars Program

The Alexander Hamilton Scholars Program permits students to simultaneously earn a B.A. in International Studies and either a B.S. in Accounting, a B.S. in Business Management, or a B.S or B.A. in Economics.

Key elements of the Alexander Hamilton Program include foreign language study to at least the 300-level, a Management capstone course (economics seminar or business policy and strategy) with a strong global orientation, a senior thesis in International Studies, and several additional courses on topics such as international economics or marketing, global politics, and intercultural communication. Each Hamilton scholar is required to complete at least one study abroad program.

Hamilton scholars participate in special programs throughout their enrollment that are designed to increase their exposure to leading-edge management practices, international businesses, and foreign cultures. These programs will include activities such as special lectures and networking events with international corporate partners, field trips to international companies with a local presence, charity fund-raising and community service projects, mentoring of foreign business students, and Scholars banquets. For additional information about the Alexander Hamilton Scholars Program, contact Mr. Robert Sandruck, robert_sandruck@ncsu.edu, 515-5565, Director of Global Programs, Poole College of Management, 2178 Nelson Hall, or Dr. Seth Murray, seth_murray@ncsu.edu, 515-0450, International Studies, College of Humanities and Social Sciences, Room 106 in the 1911 Building. Visit the Hamilton Scholars Homepage (https://poole.ncsu.edu/undergraduate/global/hamilton-scholars/) for more information.

Benjamin Franklin Scholars Program

The Benjamin Franklin Scholars program, sponsored jointly by the College of Engineering and the College of Humanities and Social Sciences, allows a select group of highly motivated students to simultaneously pursue bachelor’s degrees in both engineering and humanities or social sciences, producing students with a broad training uniquely equipping them for the challenges of today’s world. Students in this program can combine any major in the College of Humanities and Social Sciences (plus economics) with any major in the College of Engineering. This program, now entering its thirtieth year, has produced individuals who use their engineering training in a broad range of settings and jobs: in industry, in academia, in government, working as engineers, lawyers, physicians, and policy analysts, among others.

There are three entry points into the program. A limited number of newly admitted freshmen are invited to apply to join the program in the April of their senior year of high school, based on SAT scores. During New Student Orientation the summer before the freshman year, all new entering freshmen in the College of Engineering are invited to attend an information session about the program and apply to join. Thereafter interested students can seek admission through an individual consultation with the director.

The program has dedicated scholarship money associated with it, and students who have completed the Franklin intro course, have CODA’d into their Engineering and Humanities and Social Sciences majors and who have a 3.0 or above GPA are generally eligible for scholarship support. The time required to complete both degrees depends on a variety of factors, including incoming AP credit, semester course load, use of summer school, and Humanities and Social Sciences degree sought. The program can be completed in 4-5 years, with five years being typical.

The student led section of the program, the Franklin Council, arranges a wide variety of social, service, and academic events throughout the year.

For more information, contact the director of the program, Dr. Ross Bassett, Department of History, College of Humanities and Social Sciences, ross@ncsu.edu, 919-515-2231, 478 Withers Hall, or visit the Franklin Scholars Program homepage (https://ids.chass.ncsu.edu/dual/franklin.php).

Thomas Jefferson Scholars Program

The Thomas Jefferson Scholars Program is a joint program of the College of Agriculture and Life Sciences and the College of Humanities and Social Sciences. Participants earn two bachelor’s degrees: one concentrating in an area of agriculture or life science and one in an area of humanities or social science. Students can choose any major in each college, to meet individual interests and career goals. The purpose of the program is to produce potential leaders in agriculture and the life sciences who have not only technical expertise but also an appreciation for the social, political, and cultural issues that affect decision-making. The program includes special classes and guest lecturers for Jefferson Scholars, travel and other enrichment experiences, and a variety of social and service activities.

Once a student applying for admission to NC State has been accepted, the Program invites students of high achievement to apply for the Jefferson Scholars. Applicants come for an interview in March, and a small number of entering students are selected to participate in the
Jefferson Scholars Program. Successful participants receive scholarship support after the sophomore year.

If you have questions about Thomas Jefferson Scholars or the application process, please call (919) 515-2614 or email jeffersonscholars@ncsu.edu. Visit the Jefferson Scholars website (http://harvest.cals.ncsu.edu/jefferson-scholars/) for details about our activities, students, and courses.

Honors Program
Each department in the college offers an honors program designed to encourage outstanding students to develop their intellectual potential to the fullest extent possible through individualized study, special seminars, and close association with faculty members in their major field.

Scholarships
In addition to the university-wide awards available, the College of Humanities and Social Sciences offers a limited number of merit and need-based scholarships. For further information contact Dara Leeder, Director of Student Recruitment and Retention, College of Humanities and Social Sciences, (919) 515-3638.

Folger Institute
North Carolina State University is a member of the Folger Institute of Renaissance and Eighteenth-Century Studies, a unique collaborative enterprise sponsored by the Folger Shakespeare Library in Washington, D.C., and 20 universities in the Middle Atlantic region. Each year the institute offers an interdisciplinary program in the humanities—seminars, workshops, symposia, colloquia, and lectures. Admission is open to faculty and students of North Carolina State University, and a limited number of fellowships are available through the campus Folger Institute Committee.

Faculty
Dean
Jeffery Braden

Associate Dean for Academic Affairs
Deanna Dannels

Associate Dean for Research, Engagement, Extension, and Economic Development
Thomas A. Birkland

Assistant Dean for Academic Affairs and Director of Undergraduate Programs
Karen R. Young

Assistant Dean, Finance and Administration
Betty Byrum

Assistant Dean for Diversity
Juliana Makuchi Nfah-Abbenyi

Departments
- Department of Communication (p. 608)
- Department of English (p. 640)
- Department of Foreign Language and Literatures (p. 698)
- Department of History (p. 805)
- Department of Philosophy and Religious Studies (p. 837)
- Department of Psychology (p. 904)
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- Arts Studies (BA): Film Studies Concentration (p. 978)
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- Communication (BA): Communication Media Concentration (p. 610)
- Communication (BA): Interpersonal, Organizational, and Rhetorical Communication (p. 620)
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- English (BA): Film Concentration (p. 652)
- English (BA): Language, Writing and Rhetoric Concentration (p. 660)
- English (BA): Linguistics Concentration (p. 669)
- English (BA): Literature Concentration (p. 677)
- English (BA): Teacher Education Concentration (p. 686)
- Foreign Languages and Literatures (BA): Arabic Language and Culture Concentration (p. 704)
- Foreign Languages and Literatures (BA): Asian Language Concentration (p. 712)
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- Foreign Languages and Literatures (BA): Foreign Language French Education Concentration (p. 730)
- Foreign Languages and Literatures (BA): Foreign Language German Education Concentration (p. 738)
- Foreign Languages and Literatures (BA): Foreign Language Spanish Education Concentration (p. 745)
- Foreign Languages and Literatures (BA): French Studies Concentration (p. 753)
- Foreign Languages and Literatures (BA): German Studies Concentration (p. 760)
- Foreign Languages and Literatures (BA): German Studies International Economics Concentration (p. 767)
- Foreign Languages and Literatures (BA): German Studies Science and Technology Concentration (p. 774)
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• History (BS) (p. 826)
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• Interdisciplinary Studies (BA): Women’s and Gender Studies Concentration (p. 1131)
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• International Studies (BA): Africa Concentration (p. 1031)
• International Studies (BA): East and Southeast Asia Concentration (p. 1040)
• International Studies (BA): Europe Concentration (p. 1049)
• International Studies (BA): Global Cultural Studies Concentration (p. 1059)
• International Studies (BA): Global Relations Concentration (p. 1069)
• International Studies (BA): Global Sustainability and Development Concentration (p. 1079)
• International Studies (BA): Latin America Concentration (p. 1088)
• International Studies (BA): South Asia and Middle East Concentration (p. 1097)
• Jewish Studies (Minor) (p. 1109)
• Leadership in the Public Sector (BA): Distance Education (p. 1143)
• Philosophy (BA) (p. 842)
• Philosophy (BA): Philosophy Ethics Concentration (p. 852)
• Philosophy (BA): Philosophy of Law Concentration (p. 861)
• Philosophy (BS) (p. 870)
• Philosophy (BS): Logic, Representation and Reasoning Concentration (p. 882)
• Political Science (BA) (p. 1153)
• Political Science (BA): American Politics Concentration (p. 1161)
• Political Science (BA): International Politics Concentration (p. 1170)
• Political Science (BA): Law and Justice Concentration (p. 1180)
• Political Science (BA): Public Policy Concentration (p. 1190)
• Political Science (BS) (p. 1199)
• Psychology (BA): General Psychology Concentration (p. 906)
• Religious Studies (BA) (p. 895)
• Science, Technology and Society (BA) (p. 1112)
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• Social Work (Bachelor) (p. 1214)
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• Africana Studies (Minor) (p. 958)
• American Literature (Minor) (p. 643)
• Anthropology (Minor) (p. 928)
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• Chinese Studies (Minor) (p. 701)
• Classical Studies (Minor) (p. 701)
• Cognitive Science (Minor) (p. 839)
• Creative Writing (Minor) (p. 643)
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• French (Minor) (p. 797)
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• Social Work (Minor) (p. 1222)
• Sociology (Minor) (p. 956)
• Spanish (Minor) (p. 804)
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• Women’s and Gender Studies (Minor) (p. 1141)
• World Cultural Literacy (Minor) (p. 697)

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Department of Communication

The Bachelor of Arts in Communication program provides opportunities for study and training in human communication for professionals entering business, industry, media, non-profit organizations, or government service. Communication students practice NC State’s think and do axiom each day. As a student here, you’ll test – and improve – your interpersonal communication skills. You’ll study and put into practice the theories and methods that lead to meaningful results. You’ll conduct research and engage with faculty and fellow students on projects, some
with local impact, others that could change the world. And along the way, you’ll gain invaluable experiences and knowledge that will prepare you for a career as a proficient communication professional.

Department Highlights:

- Undergraduates can choose from three areas of concentration: public relations; communication media; and interpersonal, organizational and rhetorical communication.
- Students interested in Communication can take advantage of several student groups, including Lambda Pi Eta & Public Relations Student Society of America.
- Communication students have the opportunity to study abroad, learning about communication across multiple cultures in Africa & Europe.
- Students in our programs may utilize numerous internships in communication occupations.
- Undergraduates may also take advantage of our accelerated bachelor/master of science program that allows advanced students to complete their MS in one year after completing their BA in our Department.
- Master’s level students gain advanced, intensive training in communication theories and methods that you can apply from day one.
- Doctoral students in our interdisciplinary Communication, Rhetoric and Digital Media (CRDM) program analyze the social, cultural, rhetorical, philosophical and political dimensions of information technologies, media and texts and graduate ready to apply their expertise in government, corporate or educational settings.

For more information about our department, including contact information, visit our website (https://communication.chass.ncsu.edu/academics/ba/).

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Campus Box 8104
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Faculty
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J. Jameson

Associate Head, Director of Undergraduate Program
R.J. Hurley

Undergraduate Head of Advising
C. Zuckerman Hyman

COM 110 Director
E. Atwood Nelson

Director of Graduate Programs
J. Kiwanuka-Tondo

Director of Communication, Rhetoric, and Digital Media Doctoral Program
N. Taylor

Director of Graduate Certificate in Professional Com Program
M.A. Johnson

Graduate Internship Program Coordinator
J. Keyton

Undergraduate Internship Program Coordinator
D.S. Phillips

Undergraduate Advisors
J. Alchediak
F.D. Hamilton
J.E. Mayberry

Professors
D. Berube
D. Dannels
V.J. Gallagher
J. Goodwin
J. Jameson
M. Johnson
J. Keyton
A. de Souza e Silva
K. Zagacki
Communication (BA): Communication Media Concentration

Professors emeriti
W.J. Kinsella
R.L. Schrag

Associate professors
A. Binder
G. Bollmer
E. Craig
R. Hurley
J. Kiwanuka-Tondo
K.A. Kosenko
L. Romo
S. Stein
N. Taylor
S. Wiley

Associate Professor Emeritus
S.R. Stein

Assistant Professor
Y. Cheng
N.M. Lee

Associate Teaching Professor
E.A. Nelson

Teaching Assistant Professor
N.B. Brown

Senior Lecturer
J. Alchediak
R. Larson
J. Mayberry
D. Phillips
C. Zuckerman Hyman

Lecturers
M. Charbonneau
A. G. Croasmun
R.M. Friedensen
F.D. Hamilton
L.D. Harris
K. Hayes
C. Nabuzale
B.K. Nandurkar
N.J. Pekarek
J. Wahba

Plans
• Communication (BA): Communication Media Concentration (p. 610)
• Communication (BA): Interpersonal, Organizational, and Rhetorical Communication (p. 620)
• Communication (BA): Public Relations Concentration (p. 630)
• Science Communication (Minor) (p. 639)

Communication (BA): Communication Media Concentration

The Communication Media Concentration (LCM) focuses on the role of media as the infrastructure that makes communication possible. Media technologies, media practices, and mediated discourses shape how we understand the world around us. Historical changes in media technologies and networks alter how media can be used socially, culturally, politically, and economically to form communities and exercise power. The Communication Media curriculum approaches media historically, theoretically, analytically, critically, empirically, and creatively.

You will combine theoretical and critical understanding of media technologies and discourses with practical skills in media production and critical media-making in areas such as audiovisual production, games, mobile media, and computational media. And you’ll participate in rewarding internships that allow you to put this knowledge and new skills to good use.

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Contact Person
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Phone: 919.515.9737
Email: jameson@ncsu.edu

Plan Requirements
Communication (BA): Communication Media Concentration: 120 Total Units
Code   Title                               Hours
COM 257 Media History and Theory 1          3
COM 327 Critical Analysis of Communication Media 1     3
COM Media Concentration Option II (p. 611) 1    6
COM Media Concentration Option I (p. 611) 1    12

Departmental Requirements
COM 230 Introduction to Communication Theory 1 3
COM 240 Communication Inquiry 1             3
COM 250 Communication and Technology 1       3
COM 110 Public Speaking 1                   3
   or COM 112 Interpersonal Communication

Departmental Elective (p. 612) 1         3

Humanities & Social Sciences
ENG 101   Academic Writing and Research 1       4
History I (p. 613)                         3
History II (p. 613)                        3
Literature I (p. 613)                     3
Literature II (p. 613)                    3
Philosophy                               3
   Any PHI course on the approved GEP-Humanities list.
   Arts and Letters (p. 615)                3
   Social Science (3 Different) (p. 616)  9
   Additional Social Science               3
   Foreign Language 200 Level (p. 619)     3

General Education Program (GEP) Courses
GEP Mathematical Sciences (p. 1428)          6
GEP Natural Sciences (p. 1429)              7
GEP Health and Exercise Studies (p. 1422)    2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives                             21
   Free Electives (12 Hr S/U Lmt) 2         21

Total Hours                               120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

COM Media Concentration Option II

Code   Title                               Hours
COM 437 Advanced Digital Video              3
COM 441 Ethical Issues in Communication       3
COM 444 Film Production                        3
COM 447 Communication and Globalization       3
COM 451 Visual Rhetoric                        3
COM 456 Organizational Communication           3
COM 457 Media and the Family                  3
COM 467 Advanced Topics in Gender and Communication 3
COM 477 Mobile Communication                   3
COM 484 Advanced Television Production        3
COM 487 Internet and Society                  3
COM 496 Communication Internship              3
COM 498 Advanced Topic in Communication       1-3
COM 499 Advanced Independent Research         1-3

COM Media Concentration Option I

Code   Title                               Hours
COM 267 Electronic Media Writing: Theory and Practice 3
COM 307 Digital Audio Production              3
COM 317 Television Production                 3
COM 342 Qualitative Research Methods in Communication 3
COM 346 Case Studies in Public Relations       3
COM 357 Digital Video Production              3
COM/ENG 364 History of Film to 1940            3
COM 367 Multimedia Production and Digital Culture 3
COM/ENG 374 History of Film From 1940          3
COM 386 Quantitative Communication Research Methods 3
COM/HSS 392 International and Crosscultural Communication 3
COM/ENG 395 Studies in Rhetoric and Digital Media 3
COM 402 Advanced Group Communication          3
COM 407 Advanced Digital Audio                3
COM/ENG 411 Rhetorical Criticism              3
COM 417 Advanced Topics in Communication and Race 3
COM 421 Communication Law                     3
COM 427 Game Studies                          3
COM 431 Communication in Political Campaigns  3
COM 436 Environmental Communication           3
COM 437 Advanced Digital Video                3
COM 441 Ethical Issues in Communication       3
COM 444 Film Production                        3
COM 447 Communication and Globalization       3
COM 451 Visual Rhetoric                        3
COM 456 Organizational Communication           3
COM 457 Media and the Family                  3
COM 467 Advanced Topics in Gender and Communication 3
COM 477 Mobile Communication                   3
COM 484 Advanced Television Production        3
COM 487 Internet and Society                  3
COM 496 Communication Internship              3
COM 498 Advanced Topic in Communication       1-3
COM 499 Advanced Independent Research         1-3
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<td>COM 110</td>
<td>Public Speaking</td>
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<td>Interpersonal Communication</td>
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<td>COM 200</td>
<td>Communication Media in a Changing World</td>
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<td>Introduction to Persuasion Theory</td>
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<td>Small Group Communication</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>COM 226</td>
<td>Introduction to Public Relations</td>
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<td>Introduction to Communication Theory</td>
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<td>Media History and Theory</td>
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<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
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<td>Language, Communication, and Culture</td>
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<td>Survey of Rhetorical Theory</td>
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<td>Digital Video Production</td>
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<td>Communication and Gender</td>
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<td>History of Film to 1940</td>
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<td>History of Film From 1940</td>
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<td>Communication and Conflict Management</td>
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<td>Media and the Family</td>
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<td>COM 458</td>
<td>Nonprofit Leadership &amp; Development</td>
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<td>Mobile Communication</td>
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<td>COM 479/579</td>
<td>Climate Change Communication</td>
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<td>COM/ENG 506</td>
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<td>Emerging Technologies and Society</td>
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<td>History Of Rhetoric</td>
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<td>Rhetorical Criticism: Theory and Practice</td>
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<td>Communication and Globalization</td>
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<td>Critical Approaches to Organizational Communication</td>
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<td>International and Intercultural Communication</td>
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<td>COM 525</td>
<td>Group/Team Communication</td>
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<td>Media Economics</td>
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<td>Communication Culture and Technology</td>
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<td>Interpersonal Communication in Science and Technology Organizations</td>
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<td>Communication Consulting</td>
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### Agricultural Economics

- **ARE 121** Agricultural Finance 3
- **ARE 201** Introduction to Agricultural & Resource Economics 3
- **ARE 201A** Introduction to Agricultural & Resource Economics 3
- **ARE 215** Small Business Accounting 3
- **ARE 260** Marketing and Risk Management in the Pork Industry 1
- **ARE 270** Principles of Agribusiness Entrepreneurship 3
- **ARE 290** Professional Development in Agricultural Business Management 3
- **ARE 295** Special Topics in Agricultural & Resource Economics (200 Level) 1-6
- **ARE 301** Intermediate Microeconomics 3
- **ARE 303** Farm Management 3
- **ARE 304** Agribusiness Management 3
- **ARE 306** Agricultural Law 3
- **ARE 309** Environmental Law & Economic Policy 3
- **ARE 311** Agricultural Markets 3
- **ARE 312** Agribusiness Marketing 3
- **ARE 321** Agricultural Financial Management 3
- **ARE 323** Agribusiness Finance 3
- **ARE 332** Human Resource Management for Agribusiness 3
- **ARE 336** Introduction to Resource and Environmental Economics 3
- **ARE 345** Global Agribusiness Management 3
- **ARE 370** Agribusiness New Venture Development 3
- **ARE 395** Special Topics in Agricultural and Resource Economics (300 level) 1-6
- **ARE 404** Advanced Agribusiness Management 3
- **ARE 412** Advanced Agribusiness Marketing 3
- **ARE 413** Applied Agribusiness Marketing 3
- **ARE 415** Introduction to Commodity Futures Markets 3
- **ARE 420** Taxation in Agriculture, Production, and Agribusiness 3
- **ARE 425** Contracts and Organizations in Agriculture 3
- **ARE 433** U.S. Agricultural Policy 3
- **ARE 444** Ethics in Agribusiness 3
- **ARE 448** International Agricultural Trade 3
- **ARE 455** Agribusiness Analytics 3
- **ARE 470** Agribusiness Entrepreneurship Clinical Skills Development 3
- **ARE 475** Food Policy 3
- **ARE 490** Career Seminar in Agriculture & Resource Economics 1
- **ARE 492** External Learning Experience 1-6
- **ARE 493** Special Problems/Research Exploration 1-6
- **ARE 494** Agribusiness Study Abroad 1-6
- **ARE 495** Special Topics in Agricultural and Resource Economics 1-6
- **ARE 590** Special Topics in ARE 1-99
- **EC 301** Intermediate Microeconomics 3
- **EC 336** Introduction to Resource and Environmental Economics 3

### Economics

- **ARE 301** Intermediate Microeconomics 3
- **ARE 336** Introduction to Resource and Environmental Economics 3
- **EC 201** Principles of Microeconomics 3
- **EC 202** Principles of Macroeconomics 3
- **EC 205** Fundamentals of Economics 3
- **EC 302** Intermediate Macroeconomics 3
- **EC 305** A Closer Look at Capitalism 3
- **EC 348** Introduction to International Economics 3
- **EC 351** Econometrics I 3
- **EC 404** Money, Financial Markets, and the Economy 3
- **EC 410** Public Finance 3
- **EC 413** Industrial Organization 3
- **EC 431** Labor Economics 3
- **EC 437** Health Economics 3
- **EC 449** International Finance 3
- **EC 451** Econometrics II 3
- **EC 468** Game Theory 3
- **EC 474** Economics of Financial Institutions and Markets 3
- **EC 480** Introduction to Economic Research 3
- **EC 490** Research Seminar in Economics 3
- **EC 495** Special Topics in Economics 1-6
- **EC 498** Independent Study in Economics 1-6

### Political Science

- **AFS 409** Black Political Participation in America 3
- **LPS 315** Public Leadership 3
- **PS 101** Internet Research 1
- **PS 102** Data Analysis 1
- **PS 103** Designing Political Web Pages 1
- **PS 201** American Politics and Government 3
- **PS 202** State and Local Government 3
- **PS 203** Introduction to Nonprofits 3
- **PS 204** Problems of American Democracy 3
- **PS 231** Introduction to International Relations 3
- **PS 236** Issues in Global Politics 3
- **PS 241** Introduction to Comparative Politics 3
- **PS 298** Special Topics in Political Science 1-6
- **PS 301** The Presidency and Congress 3
- **PS 302** Campaigns and Elections in the US Political System 3
- **PS 303** Race in U.S. Politics 3
- **PS 305** The Justice System in the American Political Process 3
- **PS 306** Gender and Politics in the United States 3
- **PS 307** Introduction to Criminal Law in the United States 3
- **PS 308** Supreme Court and Public Policy 3
- **PS 309** Equality and Justice in United States Law 3
- **PS 310** Public Policy 3
- **PS 312** Introduction to Public Administration 3
- **PS 313** Criminal Justice Policy 3
- **PS 314** Science, Technology and Public Policy 3
- **PS 320** U.S. Environmental Law and Politics 3
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PSY 504 Evolutionary Psychology 3
PSY 508 Cognitive Processes 3
PSY 510 Advanced Problems In Psychology 1-3
PSY 511 Advanced Social Psychology 3
PSY 525 Introduction To Cognitive Science 3
PSY 535 Tests and Measurements 3
PSY 540 Human Factors In Systems Design 3
PSY 541 Overview of Human Factors Psychology 3
PSY 558 Psychology and the African Experience 3
PSY 582 Adolescent Development 3
PSY 584 Advanced Developmental Psychology 3
PSY 590 Special Topics in Psychology 3
PSY 591 History and Systems Of Psychology 1-3
WGS 406 Psychology of Gender 3

Sociology

AFS 305 Racial and Ethnic Relations 3
ANT 261 Technology in Society and Culture 3
ANT 428 Human Paleopathology 3
ANT 528 Human Paleopathology 3
GEO 220 Cultural Geography 3
PS 432 Violence, Terrorism, and Public Policy 3
REL 309 Religion and Society 3
SOC 202 Principles of Sociology 3
SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 211 Community and Health 3
SOC 212 Race in America 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 309 Religion and Society 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
SOC 400 Theories of Social Structure 3
SOC 401 Theories of Social Interaction 3
SOC 402 Urban Sociology 3
SOC 404 Families and Work 3
SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
SOC 413 Criminal Justice Field Work 4
SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics In Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

Multidisciplinary

ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Foreign Language 200 Level

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Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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| **Fourth Year**   |                                            |       |
| **Fall Semester** |                                            |       |
| COM Media Concentration Elective I | 3     |
| COM Media Concentration Elective II | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) | 3     |
| Free Elective     |                                            | 3     |
| Department Elective|                                        | 3     |
| **Spring Semester**|                                            | 12    |
| COM Media Concentration Elective II | 3     |
| Free Elective     |                                            | 9     |

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1 A grade of C- or higher is required.

Communication (BA): Interpersonal, Organizational, and Rhetorical Communication

(Formerly Public and Interpersonal Communication)

Learn theories about human communication processes and problems within interpersonal relationships, organizations, groups and teams, and public and political interactions. As you begin to understand how communication influences close relationships, families, co-workers, and employees, you’ll develop important argumentation and conflict management skills for personal and public environments.

For more information about this program, visit our website.

Department of Communication
North Carolina State University
Campus Box 8104
Raleigh, NC 27695-8104

Contact Person
Dr. Jessica Jameson
Professor and Department Head
North Carolina State University
Winston Hall 201E, Box 8104
Raleigh, NC 27695-8104
Phone: 919-515-9737
Email: jameson@ncsu.edu

Plan Requirements
Communication (BA): Interpersonal, Organizational, and Rhetorical Communication: 120 Total Units
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**History II**

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**Literature I**

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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>Literature of the Western World I</td>
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<td>Major British Writers</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.
## Literature II

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### IORC Research Methods

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<td>COM/ENG 411</td>
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### IORC Concentration Competency

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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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### Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.
### Plan Requirements

**Communication (BA), Public Relations Concentration: 120 Total Units**

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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>History I (p. 630)</td>
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<td><strong>Social Science (3 Different) (p. 634)</strong></td>
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**Public Relations Concentration**

- COM 226  Introduction to Public Relations ¹ 3
- ENG 316  Introduction to News and Article Writing ¹ 3
- COM 316  Public Relations Writing ¹ 3
- COM 346  Case Studies in Public Relations ¹ 3
- COM 476  Public Relations Campaigns ¹ 3
- COM 386  Quantitative Communication Research Methods ¹ 3
- COM 496  Communication Internship 3
- Public Relations Elective (p. 637) ¹ 3

**Departmental Requirements**

- COM 230  Introduction to Communication Theory ¹ 3
- COM 240  Communication Inquiry ¹ 3
- COM 250  Communication and Technology ¹ 3
- COM 110  Public Speaking ¹ 3
- Departmental Elective (p. 638) ¹ 3

**General Education Program (GEP) Courses**

- GEP Mathematical Sciences (p. 1428) 6
- GEP Natural Sciences (p. 1429) 7
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

**Free Electives**

- Free Electives (12 Hr S/U Lmt) ² 21

**Total Hours** 120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

### Contact Person

Dr. Jessica Jameson  
Professor and Department Head  
North Carolina State University  
Winston Hall 201E, Box 8104  
Raleigh, NC 27695-8104

**Email**: jameson@ncsu.edu

### History I

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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Masterpieces of Classical Lit</td>
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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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Social Science

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| ANT 252 | Cultural Anthropology  | 3     |
| ANT 253 | Unearthing the Past: Introduction to World Archaeology | 3 |
| ANT 254 | Language and Culture  | 3     |
| ANT 261 | Technology in Society and Culture                      | 3     |
| ANT 295 | Special Topics in Anthropology                           | 1-3   |
| ANT 310 | Native Peoples and Cultures of North America            | 3     |
| ANT 315 | The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica | 3 |
| ANT 325 | Andean South America                                     | 3     |
| ANT 330 | Peoples and Cultures of Africa                          | 3     |
| ANT 345 | Anthropology of the Middle East                         | 3     |
| ANT 346 | Peoples and Cultures of Southeast Asia                  | 3     |
| ANT 351 | Contemporary Culture in Japan                           | 3     |
| ANT 354 | Peoples and Cultures of the Pacific                     | 3     |
| ANT 370 | Introduction to Forensic Anthropology                   | 3     |
| ANT 371 | Human Variation                                         | 3     |
| ANT 374 | Disease and Society                                     | 3     |
| ANT 389 | Fundamentals of Archaeological Research                 | 3     |
| ANT 395 | Special Topics in Anthropology                           | 1-3   |
| ANT 411 | Overview of Anthropological Theory                      | 3     |
| ANT 412 | Applied Anthropology                                    | 3     |
| ANT 416 | Research Methods in Cultural Anthropology                | 3     |
| ANT 419 | Ethnographic Field Methods                              | 3     |
| ANT 421 | Human Osteology                                         | 3     |
| ANT 422 | Forensic Anthropology Crime Scene Investigation Field Methods | 3 |
| ANT 424 | Bioarchaeology                                           | 3     |
| ANT 427 | Bioarchaeological Fieldwork                             | 3     |
| ANT 428 | Human Paleopathology                                    | 3     |
| ANT 431 | Tourism, Culture and Anthropology                       | 3     |
| ANT 433 | Anthropology of Ecotourism and Heritage Conservation    | 3     |
| ANT 444 | Cross-Cultural Perspectives on Women                    | 3     |
| ANT 450 | Culture, Ecology, and Sustainable Living                | 3     |
| ANT 460 | Urban Anthropology                                      | 3     |
| ANT 461 | Wealth, Poverty and International Aid                   | 3     |
| ANT 464 | Anthropology of Religion                                | 3     |
| ANT 471 | Understanding Latino Migration                          | 3     |
| ANT 475 | Environmental Archaeology                               | 3     |
| ANT 483 | Theories of Archaeological Research                     | 3     |
| ANT 495 | Special Topics in Anthropology                          | 3     |
| ANT 496 | Anthropology Internship                                 | 6     |
| ANT 498 | Independent Study in Anthropology                       | 1-6   |
| ANT 501 | Proseminar: Introduction to Graduate Studies in Anthropology | 3 |
| ANT 511 | Overview of Anthropological Theory                      | 3     |
| ANT 512 | Applied Anthropology                                    | 3     |
| ANT 516 | Research Methods in Cultural Anthropology               | 3     |
| ANT 521 | Human Osteology                                         | 3     |
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| ANT 524 | Bioarchaeology                                           | 3     |
| ANT 528 | Human Paleopathology                                    | 3     |
| ANT 529 | Advanced Methods in Forensic Anthropology               | 4     |
| ANT 531 | Tourism, Culture and Anthropology                       | 3     |
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| ANT 550 | Culture, Ecology, and Sustainable Living                | 3     |
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| ANT 564 | Anthropology of Religion                                | 3     |
| ANT 571 | Understanding Latino Migration                          | 3     |
| ANT 575 | Environmental Archaeology                               | 3     |
| ANT 583 | Theories of Archaeological Research                     | 3     |
| ANT 585 | Skeletal Biology in Anthropology                        | 3     |
| ANT 587 | Cultural Resource Management                            | 3     |
| ANT 595 | Special Topics in Anthropology                          | 1-6   |
| ANT 598 | Independent Study in ANT                                | 1-3   |
| FLJ 351 | Contemporary Culture in Japan                           | 3     |
| HI 587  | Cultural Resource Management                            | 3     |
| IS 471  | Understanding Latino Migration                          | 3     |
| IS 571  | Understanding Latino Migration                          | 3     |
| SOC 261 | Technology in Society and Culture                        | 3     |
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| ARE 201 | Introduction to Agricultural & Resource Economics     | 3     |
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| ARE 215 | Small Business Accounting                              | 3     |
## ARE 260 Marketing and Risk Management in the Pork Industry
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## ARE 270 Principles of Agribusiness Entrepreneurship
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## ARE 290 Professional Development in Agricultural Business Management
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## ARE 295 Special Topics in Agricultural & Resource Economics (200 Level)
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## ARE 301 Intermediate Microeconomics
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## ARE 303 Farm Management
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## ARE 304 Agribusiness Management
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## ARE 306 Agricultural Law
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## ARE 309 Environmental Law & Economic Policy
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## ARE 311 Agricultural Markets
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## ARE 312 Agribusiness Marketing
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## ARE 321 Agricultural Financial Management
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## ARE 323 Agribusiness Finance
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## ARE 332 Human Resource Management for Agribusiness
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## ARE 336 Introduction to Resource and Environmental Economics
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## ARE 345 Global Agribusiness Management
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## ARE 370 Agribusiness New Venture Development
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## ARE 395 Special Topics in Agricultural and Resource Economics (300 level)
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## ARE 404 Advanced Agribusiness Management
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## ARE 412 Advanced Agribusiness Marketing
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## ARE 413 Applied Agribusiness Marketing
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## ARE 415 Introduction to Commodity Futures Markets
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## ARE 420 Taxation in Agriculture, Production, and Agribusiness
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## ARE 425 Contracts and Organizations in Agriculture
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## ARE 433 U.S. Agricultural Policy
3

## ARE 444 Ethics in Agribusiness
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## ARE 448 International Agricultural Trade
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## ARE 455 Agribusiness Analytics
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## ARE 470 Agribusiness Entrepreneurship Clinical Skills Development
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## ARE 475 Food Policy
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## ARE 490 Career Seminar in Agriculture & Resource Economics
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## ARE 492 External Learning Experience
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## ARE 493 Special Problems/Research Exploration
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## ARE 494 Agribusiness Study Abroad
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## ARE 495 Special Topics in Agricultural and Resource Economics
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## EC 336 Introduction to Resource and Environmental Economics
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## EC 201 Principles of Microeconomics
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## EC 202 Principles of Macroeconomics
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## EC 205 Fundamentals of Economics
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## EC 302 Intermediate Macroeconomics
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## EC 305 A Closer Look at Capitalism
3

## EC 348 Introduction to International Economics
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## EC 351 Econometrics I
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## EC 404 Money, Financial Markets, and the Economy
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## EC 410 Public Finance
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## EC 413 Industrial Organization
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## EC 431 Labor Economics
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## EC 437 Health Economics
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## EC 449 International Finance
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## EC 451 Econometrics II
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## EC 468 Game Theory
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## EC 474 Economics of Financial Institutions and Markets
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## EC 480 Introduction to Economic Research
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## EC 490 Research Seminar in Economics
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## EC 495 Special Topics in Economics
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## EC 498 Independent Study in Economics
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### Political Science

## AFS 409 Black Political Participation in America
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## LPS 315 Public Leadership
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## PS 101 Internet Research
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## PS 102 Data Analysis
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## PS 103 Designing Political Web Pages
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## PS 201 American Politics and Government
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## PS 202 State and Local Government
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## PS 203 Introduction to Nonprofits
3

## PS 204 Problems of American Democracy
3

## PS 231 Introduction to International Relations
3

## PS 236 Issues in Global Politics
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## PS 241 Introduction to Comparative Politics
3

## PS 298 Special Topics in Political Science
1-6

## PS 301 The Presidency and Congress
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## PS 302 Campaigns and Elections in the US Political System
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## PS 303 Race in U.S. Politics
3

## PS 305 The Justice System in the American Political Process
3

## PS 306 Gender and Politics in the United States
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## PS 307 Introduction to Criminal Law in the United States
3

## PS 308 Supreme Court and Public Policy
3

## PS 309 Equality and Justice in United States Law
3

## PS 310 Public Policy
3

## PS 312 Introduction to Public Administration
3

## PS 313 Criminal Justice Policy
3

## PS 314 Science, Technology and Public Policy
3

## PS 320 U.S. Environmental Law and Politics
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## PS 331 U.S. Foreign Policy
3

## PS 335 International Law
3

## PS 336 Global Environmental Politics
3

## PS 339 Politics of the World Economy
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## PS 341 European Politics
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<td>Advanced Television Production</td>
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<td>Advanced Topics in Public Relations</td>
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<td>COM 498</td>
<td>Advanced Topic in Communication</td>
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<tr>
<td>HSS 392</td>
<td>International and Crosscultural Communication</td>
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**Departmental Elective**

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<td>Public Speaking</td>
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<td>COM 112</td>
<td>Interpersonal Communication</td>
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<td>COM 200</td>
<td>Communication Media in a Changing World</td>
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<td>COM 201</td>
<td>Introduction to Persuasion Theory</td>
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<td>Argumentation and Advocacy</td>
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<td>Introduction to Communication Theory</td>
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<td>Communication and Technology</td>
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<td>Media History and Theory</td>
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<td>COM 267</td>
<td>Electronic Media Writing: Theory and Practice</td>
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<td>Science Communication and Public Engagement</td>
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<td>COM 292</td>
<td>Language, Communication, and Culture</td>
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<td>COM 296</td>
<td>Communication Internship-Non-Local</td>
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<td>Special Projects in Communication</td>
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<td>COM 317</td>
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<td>COM/ENG 321</td>
<td>Survey of Rhetorical Theory</td>
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<td>Newsletter Writing and Production</td>
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<td>COM 357</td>
<td>Digital Video Production</td>
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<tr>
<td>COM/ENG 362</td>
<td>Communication and Gender</td>
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<td>COM/ENG 364</td>
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<td>Multimedia Production and Digital Culture</td>
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<td>COM/ENG 374</td>
<td>History of Film from 1940</td>
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<td>COM 386</td>
<td>Quantitative Communication Research Methods</td>
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<td>COM/HSS 392</td>
<td>International and Crosscultural Communication</td>
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<td>COM/ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<td>Advanced Group Communication</td>
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<td>COM 407</td>
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<td>COM/ENG 411</td>
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<td>Communication Law</td>
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<td>Game Studies</td>
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<td>COM 431</td>
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<td>COM 436</td>
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<td>COM 457</td>
<td>Media and the Family</td>
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<td>Nonprofit Leadership &amp; Development</td>
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<td>Advanced Topics in Gender and Communication</td>
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<td>COM 477</td>
<td>Mobile Communication</td>
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<td>COM/ENG 506</td>
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<td>Critical Approaches to Organizational Communication</td>
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<td>International and Intercultural Communication</td>
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<td>COM 525</td>
<td>Group/Team Communication</td>
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<td>Media Economics</td>
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<td>Seminar in Organizational Conflict Management</td>
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<td>Communication Culture and Technology</td>
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<td>Interpersonal Communication in Science and Technology Organizations</td>
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<td>COM 532</td>
<td>Communication Consulting</td>
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<td>Environmental Communication</td>
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<td>COM 537</td>
<td>Gaming and Social Networks</td>
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<td>COM 538</td>
<td>Risk Communication</td>
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<td>COM/PA 539</td>
<td>Fund Development</td>
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<td>Critical and Interpretive Inquiry in Communication</td>
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<td>COM 541</td>
<td>Quantitative Research Methods in Applied Communication</td>
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<td>COM 543</td>
<td>Visual Content Analysis</td>
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<td>Nonprofit Marketing and Public Relations</td>
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<td>COM 547</td>
<td>Mobile Media and Communication</td>
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<td>COM/ENG 554</td>
<td>Contemporary Rhetorical Theory</td>
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<td>Seminar In Organizational Communication</td>
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<td>COM 561</td>
<td>Human Communication Theory</td>
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<td>COM 562</td>
<td>Communication and Social Change</td>
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<td>COM 563</td>
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<td>COM 566</td>
<td>Seminar In Crisis Communication</td>
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COM 579  Climate Change Communication  3
COM/ENG 581  Visual Rhetoric: Theory and Criticism  3
COM 585  Teaching College Communication  3
COM 587  Internet & Society  3
COM 598  Special Topics In Communication  1-6
ENG 220  Studies in Great Works of Western Literature  3
ENG 338  Speech Science  3
THE 103  Introduction to the Theater  3
THE 203  Theory and Practice of Acting  3
THE 223  Stagecraft  3
THE 293  Theater Practicum  1-6
THE 303  Stage Directing  3
THE 334  Advanced Acting  3
THE 340  African American Theatre  3
THE 398  Special Topics in University Theatre  1-3
THE 433  Period Styles in Acting  3

Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<tr>
<th>Course</th>
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<th>Hours</th>
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<td>Math</td>
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<td>COM 230</td>
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<td>GEP Health Exercise Studies (p. 1422)</td>
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<td><strong>Spring Semester</strong></td>
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<td>COM 240</td>
<td>Communication Inquiry 1</td>
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<td>Math</td>
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<td>Free Elective</td>
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<td><strong>Second Year</strong></td>
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<td>COM 250</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>Literature I</td>
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<td>History II</td>
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<td>COM 316</td>
<td>Public Relations Writing 1</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/ Engineering)</td>
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<td>Literature II</td>
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<td>COM 346</td>
<td>Case Studies in Public Relations 1</td>
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<td>COM 386</td>
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<td>Arts &amp; Letters</td>
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<td><strong>Total Hours</strong></td>
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</table>

1 A grade of C- or higher is required.

Science Communication (Minor)

The minor in Science Communication offered by the Department of Communication is available to undergraduate students interested in developing their understanding of and abilities in communication science to public audiences. It is open to students in all undergraduate majors on campus who want to deepen and broaden their knowledge of how citizens make sense of science and technology in their everyday lives. Required coursework includes 15 credit hours, including (1) an overview course that introduces major issues in contemporary debates about science communication and public engagement, (2) electives that allow students to develop further understanding of communication processes and practices, and (3) a capstone course that engages students on more advanced topics such as climate change, risk communication, environmental communication, and others.
Admissions

Students interested in the Science Communication minor must contact the minor advisor before their junior year and/or before the completion of 90 credits toward undergraduate degree.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record no later than during the registration period for the student’s final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Andrew R. Binder
Associate Professor of Communication
201 Winston Hall, Campus Box 8104
919-515-9750
Email: arbinder@ncsu.edu

SIS Code: 16SCM

Plan Requirements

• Completion of 15 credit hours.
• A maximum of TWO (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
• A maximum of TWO (2) courses may be used (double-counted) towards any additional minor(s) requirements.
• No more than six (6) transfer credits may be counted towards the minor.
• A grade of ‘C’ (2.0) or better will be required for all courses taken to fulfill minor requirements.
• No coursework may be taken for S/U credit.

Required Courses (6 credit hours)

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
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<td>Capstone Course: Advised 400-level COM elective</td>
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Elective Courses (9 credit hours) ²

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<th>Title</th>
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| Group I - Foundational Communication Skills
| COM 110 | Public Speaking                                  | 3     |
| COM 211 | Argumentation and Advocacy                      | 3     |
| COM 301 | Presentational Speaking                         | 3     |
| ENG 316 | Introduction to News and Article Writing        | 3     |
| ENG 323 | Writing in the Rhetorical Tradition             | 3     |
| ENG 333 | Communication for Science and Research          | 3     |
| ENG 426 | Analyzing Style                                  | 3     |
| Group II – Understanding Public Communication Processes and Practices
| COM 200 | Communication Media in a Changing World         | 3     |

1 Capstone course is recommended to be taken after at least 9 credits in the minor.
(For this elective, COM 436, 479, future risk communication or advanced science communication course can be taken by permission)

2 Choose 1 course from EACH Group (2 courses total) AND choose 1 additional course from either of the 2 Groups. At least 6 credits must be completed at 300-400 level.

Note: Students who have officially declared the minor and who wish to take a course on the elective list for which they do not currently meet the prerequisites should express their interest in the course to the minor adviser to discuss the possibility of applying for a waiver of the course prerequisite(s).

Department of English

The Department of English offers introductory and advanced courses in writing, language, literature, and film. The first-year course required of all undergraduate students develops skills in expository writing and in analytical reading. Advanced courses in writing available to all students cover a variety of areas, including journalism, technical and business writing, and creative writing. These courses give students opportunities to
pursue special personal and career interests, as do courses in literature, linguistics, rhetoric, and film.

The department offers a Bachelor of Arts major in English with six options:

1. Creative Writing
2. Film Studies
3. Language, Writing, and Rhetoric
4. Linguistics
5. Literature
6. Teacher Education

**English Honors Program**

The Honors Program in English provides courses that challenge and inspire English majors to pursue their scholarly interests at an advanced level. Honors students enjoy courses in small, seminar settings, engage in independent study, develop expertise in a variety of research practices, and earn recognition for excellent work beyond ordinary requirements.

For admission, students must have a minimum GPA of 3.25 and must have completed at least three English courses above the freshman level with a minimum GPA of 3.25.

**Internship Program**

Internships provide the opportunity for on-the-job experience in writing, editing, graphics, and publication under expert supervision in professional settings.

**Study Abroad**

English majors have the opportunity to study abroad in many foreign cities, including London, Oxford, and Prague. For more information, please visit the Study Abroad website (http://studyabroad.ncsu.edu/).

**Student Organizations**

**English Club** The English Club is a student-run organization that is open to all NC State students who have an interest in English.

**Sigma Tau Delta** The NCSU Chapter of Sigma Tau Delta, Alpha Pi Theta, recognizes high scholastic achievement and offers opportunities for leadership and service.

**Graduate Programs**

At the graduate level, the Department of English offers three graduate degrees: a Master of Arts in English, a Master of Science in Technical Communication, and a Master of Fine Arts in Creative Writing. In conjunction with the Department of Communication, the Department of English also offers an interdisciplinary Ph.D. program in Communication, Rhetoric, and Digital Media. For more information, please visit the Graduate School website (http://www.ncsu.edu/grad/). A five-course certificate program in Professional Writing, available to students not seeking a degree at NC State, offers preparation in practical writing and editing, including both journalism and technical writing.

**Faculty**

**Head**
Laura Severin, Department Head

**Associate Head**
Jason Swarts, Associate Head

**Faculty**

L.C. Andrews, Lecturer
C. Anson, Professor
K. Bagley, Senior Lecturer
A. Baker, Associate Professor
J. Balaban, Professor
E. Barksdale, Senior Lecturer
W. Barnhardt, Professor
R.J. Bateman, Senior Lecturer
Z. Beare, Assistant Professor
B. Bennett, Associate Professor
A. Berrier, Lecturer
B. Blackley, Teaching Associate Professor
B. Boggs, Assistant Professor
A. Bolonyai, Associate Professor
R. Browdy, Assistant Professor
P. A. Broyles, Lecturer
H. Burgess, Associate Professor
D. L. Campbell, Lecturer
G. Carrero, Lecturer
F. Cason, Assistant Professor
S. Cassim, Senior Lecturer
J. Clayton, Lecturer
P. Colby, Senior Lecturer
S. Cornett, Lecturer
E. Corral, Assistant Professor
C. Cranford, Lecturer
C. Crosbie, Associate Professor
D. Cullinan, Research Associate
D. Daemon, Senior Lecturer
A. N. Daughtridge, Lecturer
H. Ding, Associate Professor
R. Dodsworth, Associate Professor
M. Dudley, Associate Professor
K. Emerson, Lecturer
S. Emshwiller, Lecturer
C. Fedukovich, Associate Professor
P. Fyfe, Associate Professor
C. W. Gala, Lecturer
O. Gelley, Associate Professor
A. Gibson, Teaching Assistant Professor
J. Gonzalez, Lecturer
M. Gordon, Professor
M. Graham, Lecturer
J.M. Grimwood, Professor
R. De Haas, Lecturer
A.H. Harrison, Distinguished Professor
H. Hayes, Lecturer
Q. Hussain, Postdoctoral Research Scholar
N. Hutcheson, Senior Research Scholar
P. Isom, Lecturer
K. Jennings, Lecturer
K. Jicha, Lecturer
A. Johnston, Assistant Professor
P. R. Cockshutt, Jr., Emeritus Lecturer
H.D. Kellner, Professor
J.J. Kessel, Emeritus Professor
K. Kessler, Senior Lecturer
J. Knowels, Teaching Assistant Professor
R. Kochersberger, Emeritus Associate Professor
C. Krieg, Lecturer
J. Larsen, Senior Lecturer
D. Laux, Professor
W. Lawrence, Lecturer
C. Lewis, Lecturer
P. Link, Senior Lecturer
W. Lloyd, Senior Lecturer
C. Mainland, Senior Lecturer
G. Martin, Lecturer
L. May, Professor
J. McCorkle, Professor
H.G. Melton, Senior Lecturer
J. Mielke, Associate Professor
J. H. Millar, Assistant Professor
J. Miller, Professor
J. Morillo, Associate Professor
S.C. Mouvery, Lecturer
J. Mulholland, Associate Professor
B. C. Mulhollem, Senior Lecturer
B. Murphy, Lecturer
R. Nance, Lecturer
J. Nfah-Abbenyi, Professor
J. Nolan, Assistant Professor
M.E. Orr, Professor
A.M. Penrose, Professor
C. Phelps, Lecturer
T. Phillips, Lecturer
S. Pigg, Assistant Professor
B. Pittman, Lecturer
M. Porter, Senior Lecturer
J. Reaser, Associate Professor
D. Rieder, Associate Professor
A. Rodriguez, Lecturer
C. Saunders, Lecturer
S. Setzer, Professor
L.R. Severin, Professor
W. Shaw, Lecturer
M. Simon, Assistant Professor
M. Simon, Assistant Professor
J. P. Stadler, Lecturer
R. Stamper, Senior Lecturer
A. Stein, Professor
T. Stinson, Associate Professor
C. Stuckey, Lecturer
American Literature (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of English offers a minor in American literature to N.C. State students, except for English majors in the Literature concentration (16ENGLBA 16ENGLLT). The minor consists of any five courses in American literature, three of which must be at the 300 level or above, and one of which must be at the 400-level. Students may transfer in no more than six hours toward the minor. This minor will focus on the English-language literature of the United States and of the British colonies out of which the United States emerged. No courses for the minor may be taken for S/U credit.

Admissions and Certification of Minor

Students interested in declaring a minor in Technical and Scientific Communication should contact the minor coordinator listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Creative Writing (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

A minor in Creative Writing is available from the English Department for N.C. State students, except LCW English majors.

Admissions and Certification of Minor

Students may declare their intention to complete the Creative Writing minor at any time after completion of ENG 101 Academic Writing and Research. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.
Plan Requirements

• A minimum of 15 hours (5 courses) in creative writing and/or in writing theory.
• Of the five elective courses, no more than 2 may be at the 200 level. At least one must be at the 400 level or above.
• No more than 2 courses (6 hours) of transfer credit.
• Must have an overall GPA of 2.0 in the minor and may count no course grade lower than a 'C-'.
• No courses for the minor may be taken for S/U credit.
• A maximum of TWO (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

Elective Courses

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>ENG 281</td>
<td>Introduction to Creative Nonfiction</td>
<td>3</td>
</tr>
<tr>
<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 289</td>
<td>Poetry Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 381</td>
<td>Creative Nonfiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 388</td>
<td>Intermediate Fiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 389</td>
<td>Intermediate Poetry Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
<td>3</td>
</tr>
<tr>
<td>ENG 426</td>
<td>Analyzing Style</td>
<td>3</td>
</tr>
<tr>
<td>ENG 488</td>
<td>Advanced Fiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 489</td>
<td>Advanced Poetry Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 499</td>
<td>Special Topics in Creative Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours 39

English (BA): Creative Writing Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Core Curriculum The undergraduate major in English is built around an 18-hour core that includes one course from each of the following six categories: American Literature, British Literature, World Literature, Film, Linguistics, and Rhetoric. In addition to the 18-hour core, students take 21 hours of course work in one of the five following concentrations.

The concentration in creative writing (CRW) offers a background in literature and language with an emphasis on writing fiction, poetry, screenplays, and/or non-fiction. The 21-hour Creative Writing concentration includes four creative writing courses, two literature courses, and one English elective. Creative Writing graduates often go on to graduate school for an advanced degree in creative writing, such as the M.F.A. They also often pursue careers in writing, teaching, editing, business, and other fields.

Plan Requirements

English (BA): Creative Writing Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
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<tr>
<td>ENG 489</td>
<td>Advanced Poetry Writing Workshop</td>
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</tr>
<tr>
<td>ENG 499</td>
<td>Special Topics in Creative Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours 39

Core Curriculum

American Literature (p. 645) 3
British Literature (p. 645) 3
World Literature (p. 645) 3
Film (p. ) 1
Linguistics (p. ) 1
Rhetoric (p. ) 1

Creative Writing Concentration

LCW Electives (p. 646) 9
ENG 430 Advanced Screenwriting
ENG 488 Advanced Fiction Writing Workshop
ENG 489 Advanced Poetry Writing Workshop
ENG 499 Special Topics in Creative Writing

Literature Electives (p. ) 1
English Electives 1

Any 200-level or above ENG course, excluding ENG 209, ENG 331, ENG 332, ENG 333

Humanities & Social Sciences

ENG 101 Academic Writing and Research 1
History I (p. 646) 3
History II (p. 646) 3
Foreign Language 200 Level (p. 651) 3
Philosophy 3

Any PHI course on the approved GEP-Humanities list.

Social Science (3 Different) (p. 648) 9
Additional Social Science 3

General Education Program (GEP) Courses

GEP Mathematical Sciences (p. 1428) 6
GEP Natural Sciences (p. 1429) 7
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) 2

Total Hours 120
A grade of C- or higher is required.

Students should consult their academic advisors to determine which courses fill this requirement.

### American Literature

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>AFS/ENG 248</td>
<td>Survey of African-American Literature</td>
<td>3</td>
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<tr>
<td>AFS/ENG 448/AFS 548/ENG 548</td>
<td>African-American Literature</td>
<td>3</td>
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<tr>
<td>ENG 249</td>
<td>Native American Literature</td>
<td>3</td>
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<tr>
<td>ENG 252</td>
<td>Major American Writers</td>
<td>3</td>
</tr>
<tr>
<td>ENG 265</td>
<td>American Literature I</td>
<td>3</td>
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<tr>
<td>ENG 266</td>
<td>American Literature II</td>
<td>3</td>
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<tr>
<td>ENG 267</td>
<td>LGBTQI Literature in the U.S.</td>
<td>3</td>
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<tr>
<td>ENG/WGS 305</td>
<td>Women and Literature</td>
<td>3</td>
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<tr>
<td>ENG 369</td>
<td>The American Novel of the 19th Century</td>
<td>3</td>
</tr>
<tr>
<td>ENG 370</td>
<td>American Fiction, Twentieth Century and Beyond</td>
<td>3</td>
</tr>
<tr>
<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
<td>3</td>
</tr>
<tr>
<td>ENG 376</td>
<td>Science Fiction</td>
<td>3</td>
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<tr>
<td>ENG 399</td>
<td>Contemporary Literature</td>
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<tr>
<td>ENG/ECI 405</td>
<td>Literature for Adolescents</td>
<td>3</td>
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<tr>
<td>ENG 420</td>
<td>Major American Author</td>
<td>3</td>
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<tr>
<td>ENG 466</td>
<td>Transatlantic Literatures</td>
<td>3</td>
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<tr>
<td>ENG 467</td>
<td>American Colonial Literature</td>
<td>3</td>
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<tr>
<td>ENG 468</td>
<td>Studies in Nineteenth-Century American Literature</td>
<td>3</td>
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<tr>
<td>ENG 470</td>
<td>American Literature, Twentieth Century and Beyond</td>
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<td>ENG 476</td>
<td>Southern Literature</td>
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### British Literature

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<th>Code</th>
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<tbody>
<tr>
<td>ENG 251</td>
<td>Major British Writers</td>
<td>3</td>
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<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
<td>3</td>
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<tr>
<td>ENG 261</td>
<td>English Literature I</td>
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<tr>
<td>ENG 262</td>
<td>English Literature II</td>
<td>3</td>
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<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<tr>
<td>ENG 362</td>
<td>Studies in the British Novel</td>
<td>3</td>
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<tr>
<td>ENG 385</td>
<td>Biblical Backgrounds of English Literature</td>
<td>3</td>
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<tr>
<td>ENG 390</td>
<td>Classical Backgrounds of English Literature</td>
<td>3</td>
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<tr>
<td>ENG 439</td>
<td>Studies in English Renaissance Literature</td>
<td>3</td>
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<tr>
<td>ENG 451</td>
<td>Chaucer</td>
<td>3</td>
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<tr>
<td>ENG 452</td>
<td>Medieval British Literature</td>
<td>3</td>
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<tr>
<td>ENG 453</td>
<td>The Romantic Period</td>
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<tr>
<td>ENG 460</td>
<td>Major British Author</td>
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<td>ENG 462</td>
<td>18th-Century English Literature</td>
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<td>ENG 463</td>
<td>The Victorian Period</td>
<td>3</td>
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<td>ENG 464</td>
<td>British Literature and the Founding of Empire</td>
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<td>ENG 465</td>
<td>British Literature and the Dissolution of Empire</td>
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<tr>
<td>ENG 486</td>
<td>Shakespeare, The Earlier Plays</td>
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<td>ENG 487</td>
<td>Shakespeare, The Later Plays</td>
<td>3</td>
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<tr>
<td>ENG 490</td>
<td>Studies in Medieval Literature</td>
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### World Literature

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<tr>
<td>AFS/ENG 349</td>
<td>African Literature in English</td>
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<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG/FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG/FL 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG/FL 221</td>
<td>Literature of the Western World I</td>
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<td>ENG/FL 222</td>
<td>Literature of the Western World II</td>
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<td>ENG/FL 223</td>
<td>Contemporary World Literature I</td>
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<td>ENG/FL 224</td>
<td>Contemporary World Literature II</td>
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<tr>
<td>ENG/FL 246</td>
<td>Literature of the Holocaust</td>
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<td>ENG/FL 275</td>
<td>Literature and War</td>
<td>3</td>
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<td>ENG 349</td>
<td>African Literature in English</td>
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<td>ENG/FL 392</td>
<td>Major World Author</td>
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<td>ENG/FL 393</td>
<td>Studies in Literary Genre</td>
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<td>ENG/FL 394</td>
<td>Studies in World Literature</td>
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<td>ENG/FL 406</td>
<td>Modernism</td>
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<td>ENG/FL 407</td>
<td>Postmodernism</td>
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<td>ENG 466</td>
<td>Transatlantic Literatures</td>
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<td>FLF 301</td>
<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>Survey of French Literature from Romanticism to the Contemporary Period</td>
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<td>FLF 425</td>
<td>Literature, Cinema and Culture of the Francophone World</td>
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<td>FLF 525</td>
<td>Literature, Cinema and Culture of the Francophone World</td>
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<td>FLG 320</td>
<td>Introduction to German Literature</td>
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<td>Twentieth Century German Literature</td>
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<td>German Lyric Poetry</td>
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<td>FLJ 342</td>
<td>Classical Japanese Literature in Translation</td>
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<td>FLJ 344</td>
<td>Early Modern Japanese Literature in Translation</td>
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<td>FLJ 345</td>
<td>Modern Japanese Literature in Translation</td>
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<tr>
<td>FLN 301</td>
<td>Twentieth Century Hindi &amp; Urdu Fiction</td>
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<td>FLN 302</td>
<td>Modern Hindi &amp; Urdu Poetry</td>
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<td>FLN 401</td>
<td>Hindi Literature and South Asian Cultural Contexts</td>
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<td>FLR 303</td>
<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>FLR 304</td>
<td>Russian Literature in Translation: The Twentieth Century</td>
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<td>FLS 341</td>
<td>Literature and Culture of Spain I</td>
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<td>FLS 342</td>
<td>Literature and Culture of Spain II</td>
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<td>FLS 343</td>
<td>Literature and Culture of Spain III</td>
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<td>FLS 351</td>
<td>Literature and Culture of Latin America I</td>
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<td>FLS 352</td>
<td>Literature and Culture of Latin America II</td>
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<td>FLS 353</td>
<td>Literature and Culture of Latin America III</td>
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### Film

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<tbody>
<tr>
<td>AFS/ENG 375</td>
<td>African American Cinema</td>
<td>3</td>
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<tr>
<td>COM/ENG 364</td>
<td>History of Film to 1940</td>
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<tr>
<td>COM/ENG 374</td>
<td>History of Film From 1940</td>
<td>3</td>
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<tr>
<td>ENG 282</td>
<td>Introduction to Film</td>
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<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td>3</td>
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<tr>
<td>ENG 330</td>
<td>Screenwriting</td>
<td>3</td>
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<tr>
<td>ENG 359</td>
<td>Topics in Film Studies</td>
<td>3</td>
</tr>
<tr>
<td>ENG 378</td>
<td>Women &amp; Film</td>
<td>3</td>
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<tr>
<td>ENG 382</td>
<td>Film and Literature</td>
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<td>ENG 384</td>
<td>Introduction to Film Theory</td>
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<tr>
<td>ENG 430</td>
<td>Advanced Screenwriting</td>
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<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
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<td>IDS 496</td>
<td>Topics in Film and Interdisciplinary Studies</td>
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### Linguistics

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<tr>
<td>ENG 210</td>
<td>Introduction to Language and Linguistics</td>
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<tr>
<td>ENG 315</td>
<td>Phonetics</td>
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<tr>
<td>ENG 320</td>
<td>Anatomy and Physiology of Speech</td>
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<td>ENG 324</td>
<td>Modern English Syntax</td>
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<td>ENG 325</td>
<td>Spoken and Written Traditions of American English Dialects</td>
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<tr>
<td>ENG 326</td>
<td>History of the English Language</td>
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<td>ENG/WGS 327</td>
<td>Language and Gender</td>
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### Rhetoric

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<td>COM 451</td>
<td>Visual Rhetoric</td>
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<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
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<td>Analysis of Scientific and Technical Writing</td>
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### LCW Electives

**LCW 200-Level Electives**

Select a maximum of 6 units:

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<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
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**LCW 300-Level Electives**

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### LCW Advanced Electives

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<td>ENG 499</td>
<td>Special Topics in Creative Writing</td>
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### Literature Electives

Choose courses from this list and/or the list from American, British, or World Literature Lists

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<td>Literature and Technology</td>
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<td>ENG 340</td>
<td>Literature, Art, and Society</td>
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<td>Literature of Space and Place</td>
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### History I

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<td>The World from 1200 to 1750</td>
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<td>The World Since 1750</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>New German Cinema and Beyond</td>
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<td>Religious Cults, Sects, and Minority Faiths in America</td>
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**Political Science**

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| LPS 315 | Public Leadership | 3 |
| PS 101 | Internet Research | 1 |
| PS 102 | Data Analysis | 1 |
| PS 103 | Designing Political Web Pages | 1 |
| PS 201 | American Politics and Government | 3 |
| PS 202 | State and Local Government | 3 |
| PS 203 | Introduction to Nonprofits | 3 |
| PS 204 | Problems of American Democracy | 3 |
| PS 231 | Introduction to International Relations | 3 |
| PS 236 | Issues in Global Politics | 3 |
| PS 241 | Introduction to Comparative Politics | 3 |
| PS 298 | Special Topics in Political Science | 1-6 |
| PS 301 | The Presidency and Congress | 3 |
| PS 302 | Campaigns and Elections in the US Political System | 3 |
| PS 303 | Race in U.S. Politics | 3 |
| PS 305 | The Justice System in the American Political Process | 3 |
| PS 306 | Gender and Politics in the United States | 3 |
| PS 307 | Introduction to Criminal Law in the United States | 3 |
| PS 308 | Supreme Court and Public Policy | 3 |
| PS 309 | Equality and Justice in United States Law | 3 |
| PS 310 | Public Policy | 3 |
| PS 312 | Introduction to Public Administration | 3 |
| PS 313 | Criminal Justice Policy | 3 |
| PS 314 | Science, Technology and Public Policy | 3 |
| PS 320 | U.S. Environmental Law and Politics | 3 |
| PS 331 | U.S. Foreign Policy | 3 |
| PS 335 | International Law | 3 |
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<td>PSY 499</td>
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<td>PSY 504</td>
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<td>PSY 508</td>
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### Sociology
- AFS 305: Racial and Ethnic Relations (3)
- ANT 261: Technology in Society and Culture (3)
- ANT 428: Human Paleopathology (3)
- ANT 528: Human Paleopathology (3)
- GEO 220: Cultural Geography (3)
- PS 432: Violence, Terrorism, and Public Policy (3)
- REL 309: Religion and Society (3)
- SOC 202: Principles of Sociology (3)
- SOC 203: Current Social Problems (3)
- SOC 203A: Current Social Problems (3)
- SOC 204: Sociology of Family (3)
- SOC 205: Jobs and Work (3)
- SOC 206: Social Deviance (3)
- SOC 207: Language and Society (3)
- SOC 211: Community and Health (3)
- SOC 212: Race in America (3)
- SOC 220: Cultural Geography (3)
- SOC 241: Sociology of Agriculture and Rural Society (3)
- SOC 241A: Sociology of Agriculture and Rural Society (3)
- SOC 295: Special Topics in Sociology (1-3)
- SOC 300: Social Research Methods (4)
- SOC 301: Human Behavior (3)
- SOC 304: Gender and Society (3)
- SOC 305: Racial and Ethnic Relations (3)
- SOC 306: Criminology (3)
- SOC 309: Religion and Society (3)
- SOC 311: Community Relationships (3)
- SOC 342: International Development (3)
- SOC 350: Food and Society (3)
- SOC 351: Population and Planning (3)
- SOC 381: Sociology of Medicine (3)
- SOC 395: Special Topics in Sociology (1-3)
- SOC 400: Theories of Social Structure (3)
- SOC 401: Theories of Social Interaction (3)
- SOC 402: Urban Sociology (3)
- SOC 404: Families and Work (3)
- SOC 405: Racism in the U.S. (3)
- SOC 407: Sociology of Sexualities (3)
- SOC 410: Sociology of Organizations (3)
- SOC 413: Criminal Justice Field Work (4)
- SOC 414: Social Class (3)
- SOC 418: Sociology of Education (3)
- SOC 425: Juvenile Delinquency (3)
- SOC 427: Sociology of Law (3)
- SOC 428: Formal Institutions of Social Control (3)
- SOC 429: Quantitative Data Analysis in Sociology (3)
- SOC 430: Community and Crime (3)
- SOC 440: Social Change (3)
- SOC 445: Inequality, Ideology, and Social Justice (3)
- SOC 450: Environmental Sociology (3)
- SOC 457: Corporate Power in America (3)
- SOC 465: Social Aspects of Mental Health (3)
- SOC 492: External Learning Experience (1-6)
- SOC 493: Special Problems in Sociology (1-6)
- SOC 495: Special Topics in Sociology (1-3)
- SOC 498: Independent Study in Sociology (1-6)
- SOC 508: Social Organization (3)
- SOC 509: Population Problems (3)
- SOC 514: Developing Societies (3)
- SOC 533: The Community (3)
- SOC 591: Special Topics in Sociology (1-6)
- WGS 204: Sociology of Family (3)
- WGS 304: Gender and Society (3)
- WGS 407: Sociology of Sexualities (3)

### Multidisciplinary
- ENG 210: Introduction to Language and Linguistics (3)
- GEO 220: Cultural Geography (3)
- SOC 220: Cultural Geography (3)
- STS 402: Peace and War in the Nuclear Age (3)

### Foreign Language 200 Level

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<td>FLC 201</td>
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<td>FLG 201</td>
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<td>FLI 201</td>
<td>Intermediate Italian I</td>
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<td>Intermediate Japanese I</td>
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<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<td>FLP 201</td>
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### Semester Sequence
This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major
requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>History I</td>
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<tr>
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<td>Arts and Letters</td>
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<td>Health &amp; Exercise Studies Course</td>
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<td>Linguistics</td>
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<td>Film</td>
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<td><strong>Total Hours</strong></td>
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**Major Grade Point Average (MGPA) Requirements** Courses meeting departmental requirements must receive a grade of C- or better. A 2.0 MGPA and overall GPA is required for graduation.

**Career Opportunities**

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine and for those intending to do graduate work in literature, linguistics, film, or rhetoric.

**English (BA): Film Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

**Core Curriculum** The undergraduate major in English is built around an 18-hour core that includes one course from each of the following six categories: American Literature, British Literature, World Literature, Film, Linguistics, and Rhetoric. In addition to the 18-hour core, students take 21 hours of course work in one of the five following concentrations.

The concentration in film (FLM) trains students in the history, analysis, and interpretation of film. The 21-hour LFM concentration includes four film courses and three English electives. Through coursework in film studies, students acquire skills in interpretation, analysis, and criticism; situate films within historical periods; consider the relation of film to literary texts; and study important film genres, directors, and national traditions. They may also become involved in the creative work of screenwriting.

**Plan Requirements**

**English (BA): Film Concentration: 120 Total Units**

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<td>World Literature</td>
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<td>Film</td>
<td>(p. 654) ¹</td>
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<td>Linguistics</td>
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<td>Rhetoric</td>
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¹ Indicates a course that counts toward the concentration.
### American Literature

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<td>Survey of African-American Literature</td>
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<td>AFS/ENG 448/AFS 548/ENG 548</td>
<td>African-American Literature</td>
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<tr>
<td>ENG 249</td>
<td>Native American Literature</td>
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<td>ENG 252</td>
<td>Major American Writers</td>
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<tr>
<td>ENG 265</td>
<td>American Literature I</td>
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<tr>
<td>ENG 266</td>
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<td>ENG 267</td>
<td>LGBTQI Literature in the U.S.</td>
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<td>ENG/WGS 305</td>
<td>Women and Literature</td>
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<td>ENG 369</td>
<td>The American Novel of the 19th Century</td>
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<td>ENG 370</td>
<td>American Fiction, Twentieth Century and Beyond</td>
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<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Transatlantic Literatures</td>
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<td>American Colonial Literature</td>
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<td>Studies in Nineteenth-Century American Literature</td>
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<td>American Literature, Twentieth Century and Beyond</td>
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<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>Studies in British Poetry</td>
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<td>Studies in the British Novel</td>
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<td>Biblical Backgrounds of English Literature</td>
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<td>Studies in English Renaissance Literature</td>
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<td>British Literature and the Founding of Empire</td>
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### World Literature

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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.
English (BA): Film Concentration

**Film**

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**Rhetoric**

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**Film Elective**

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**History I**

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**Linguistics**

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### Arts and Letters

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<td>Arts, Ideas and Values</td>
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<td>Arts and Cross-Cultural Contacts</td>
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## Social Science

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**Sociology**

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SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics In Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

Multidisciplinary
ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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Health & Exercise Studies Course | 1

Third Year
Fall Semester
English Elective 3
Linguistics 3
Select one of the following:
ENG 364  History of Film to 1940 3
ENG 374  History of Film From 1940 3
GEP Interdisciplinary Perspectives (p. 1426) Requirement 3
Free Elective 3

Hours | 15

Spring Semester
Rhetoric 3
Film (Core) 3
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) Requirement 2
Free Elective 3

Hours | 14

Fourth Year
Fall Semester
Film Elective 3
English Elective 3
Free Elective 9

Hours | 15

Spring Semester
English Elective 3
Free Elective 9

Hours | 12
Total Hours 120

Major Grade Point Average (MGPA) Requirements
Courses meeting departmental requirements must receive a grade of C- or better. A 2.0 MGPA and overall cumulative GPA is required for graduation.

Career Opportunities

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine and for those intending to do graduate work in literature, linguistics, film, or rhetoric.

English (BA): Language, Writing and Rhetoric Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Core Curriculum
The undergraduate major in English is built around an 18-hour core that includes one course from each of the following six
The concentration in Language, Writing, and Rhetoric (LWR) emphasizes the study of written English in its theoretical, cultural, and practical applications. The 21-hour concentration includes one course in effective communication, one course in digital technology, three Language, Writing and Rhetoric electives, and two English electives. This curriculum can lead to a broad range of professions, with a special focus on careers that involve creating, designing, and producing documents: the news media, business and technical communication, the writing and publishing professions. Students may also focus their studies upon rhetoric, composition, and linguistics and prepare for graduate study in these areas or for law school, teaching, and other professions.

Plan Requirements

English (BA): Language, Writing and Rhetoric Concentration: 120 Total Units

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<td>Rhetoric (p. 662) ¹</td>
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<td>Digital Technology (p. 663) ¹</td>
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Humanities & Social Sciences

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<td>History II (p. 663)</td>
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<td>Foreign Language 200 Level (p. 663)</td>
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<td>Arts and Letters (p. 663)</td>
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<td>Social Science (3 Different) (p. 664)</td>
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General Education Program (GEP) Courses

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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Free Electives (12 Hr S/U Lmt) ²

Total Hours: 117

American Literature

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<td>Native American Literature</td>
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<tr>
<td>ENG 265</td>
<td>American Literature I</td>
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<tr>
<td>ENG 266</td>
<td>American Literature II</td>
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<td>LGBTQI Literature in the U.S.</td>
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<td>ENG/WGS 305</td>
<td>Women and Literature</td>
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<td>ENG 369</td>
<td>The American Novel of the 19th Century</td>
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<td>American Fiction, Twentieth Century and Beyond</td>
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<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
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<td>ENG 376</td>
<td>Science Fiction</td>
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<td>ENG 399</td>
<td>Contemporary Literature</td>
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<td>ENG/ECI 405</td>
<td>Literature for Adolescents</td>
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<td>ENG 420</td>
<td>Major American Author</td>
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<td>ENG 466</td>
<td>Transatlantic Literatures</td>
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<td>American Colonial Literature</td>
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<td>Studies in Nineteenth-Century American Literature</td>
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<td>American Literature, Twentieth Century and Beyond</td>
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<td>ENG 476</td>
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British Literature

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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>Biblical Backgrounds of English Literature</td>
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<td>ENG 390</td>
<td>Classical Backgrounds of English Literature</td>
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<td>Studies in English Renaissance Literature</td>
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<td>ENG 451</td>
<td>Chaucer</td>
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<td>ENG 452</td>
<td>Medieval British Literature</td>
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<td>The Romantic Period</td>
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<td>Major British Author</td>
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<td>18th-Century English Literature</td>
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<td>The Victorian Period</td>
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<td>British Literature and the Founding of Empire</td>
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<td>ENG 465</td>
<td>British Literature and the Dissolution of Empire</td>
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<td>ENG 486</td>
<td>Shakespeare, The Earlier Plays</td>
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<td>ENG 487</td>
<td>Shakespeare, The Later Plays</td>
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<td>ENG 490</td>
<td>Studies in Medieval Literature</td>
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### World Literature

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<td>Classical Mythology</td>
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<td>Masterpieces of Classical Lit</td>
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<td>ENG/FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Literature of the Holocaust</td>
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<td>Literature and War</td>
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<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>Survey of French Literature from Romanticism to the Contemporary Period</td>
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<td>Literature, Cinema and Culture of the Francophone World</td>
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<td>Early Modern Japanese Literature in Translation</td>
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<td>Twentieth Century Hindi &amp; Urdu Fiction</td>
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<td>Modern Hindi &amp; Urdu Poetry</td>
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<td>Hindi Literature and South Asian Cultural Contexts</td>
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<td>Russian Literature in Translation: The Nineteenth Century</td>
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### Linguistics

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<td>Phonetics</td>
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<td>Anatomy and Physiology of Speech</td>
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<td>ENG 324</td>
<td>Modern English Syntax</td>
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<td>Spoken and Written Traditions of American English Dialects</td>
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<td>ENG 326</td>
<td>History of the English Language</td>
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<td>Language and Gender</td>
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<td>Language and Globalization</td>
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<td>Language Development</td>
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<td>Speech Science</td>
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### Rhetoric

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<td>COM/ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<td>COM/ENG 411</td>
<td>Rhetorical Criticism</td>
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<td>Visual Rhetoric</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>Writing Theory and the Writing Process</td>
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<td>ENG 425</td>
<td>Analysis of Scientific and Technical Writing</td>
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<td>ENG 426</td>
<td>Analyzing Style</td>
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### Effective Communication

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<td>Writing About Film</td>
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<td>ENG 314</td>
<td>Technical Document Design and Editing</td>
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<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
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<td>ENG 317</td>
<td>Designing Networked Communications</td>
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<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
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<td>ENG 350</td>
<td>Professional Internships</td>
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<td>ENG 381</td>
<td>Creative Nonfiction Writing Workshop</td>
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<td>ENG 416</td>
<td>Advanced News and Article Writing</td>
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<td>ENG 417</td>
<td>Editorial and Opinion Writing</td>
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<td>Computer Documentation Design</td>
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<td>ENG 216</td>
<td>Technologies for Texts</td>
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<tr>
<td>ENG 314</td>
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<td>ENG 317</td>
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<tr>
<td>ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<tr>
<td>ENG 421</td>
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### LWR Electives

**Creative Writing/Screenwriting**

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<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
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<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
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<td>ENG 289</td>
<td>Poetry Writing</td>
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<td>ENG 330</td>
<td>Screenwriting</td>
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<td>ENG 488</td>
<td>Advanced Fiction Writing Workshop</td>
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<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
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### Agricultural Economics

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PS 539 International Political Economy 3
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PS 541 Political Islam 3
PS 542 European Politics 3
PS 543 Seminar in Latin American & Caribbean Politics 3
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PS 545 Comparative Systems of Law and Justice 3
PS 546 The Politics of East Asia 3
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PS 560 Nuclear Nonproliferation Policy & Process 3
PS 561 Nuclear Strategy and Nonproliferation 3
PS 571 Research Methods and Analysis 3
PS 585 Constitutional and Legal Principles for Police Supervisors 3
PS 590 Special Topics 1-6
PS 598 Special Topics in Political Science 1-6
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SOC 432 Violence, Terrorism, and Public Policy 3
WGS 306 Gender and Politics in the United States 3
WGS 418 Gender Law and Policies 3

Psychology
AFS 345 Psychology and the African American Experience 3
EDP 304 Educational Psychology 3
EDP 476 Psychology of Adolescent Development 3
EDP 582 Adolescent Development 3
ISE 540 Human Factors in Systems Design 3
PHI 425 Introduction to Cognitive Science 3
PHI 525 Introduction to Cognitive Science 3
PSY 200 Introduction to Psychology 3
PSY 208 Psychobiology of Success 3
PSY 230 Introduction to Psychological Research 3
PSY 240 Introduction to Behavioral Research I 3
PSY 241 Introduction to Behavioral Research I Lab 1
PSY 242 Introduction to Behavioral Research II 3
PSY 243 Introduction to Behavioral Research II Lab 2
PSY 307 Industrial and Organizational Psychology 3
PSY 311 Social Psychology 3
PSY 312 Applied Psychology 3
PSY 313 Positive Psychology 3
PSY 340 Ergonomics 3
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PSY 360 Community Psychology Principles and Practice 3
PSY 370 Personality 3
PSY 376 Developmental Psychology 3
PSY 400 Perception 3
PSY 406 Psychology of Gender 3
PSY 410 Learning and Motivation 3
PSY 411 The Psychology of Interdependence and Race 3
PSY 416 Psychology of Emotion 3
PSY 420 Cognitive Processes 3
PSY 425 Introduction to Cognitive Science 3
PSY 430 Biological Psychology 3
PSY 431 Health Psychology 3
PSY 436 Introduction to Psychological Measurement 3
PSY 465 Advanced Methods in Psychology 3
PSY 470 Abnormal Psychology 3
PSY 475 Child Psychology 3
PSY 476 Psychology of Adolescent Development 3
PSY 491 Special Topics in Psychology 3
PSY 495 Community-Based Applied Psychology 4
PSY 498 Psychology Honors Seminar 3
PSY 499 Individual Study in Psychology 1-6
PSY 500 Visual Perception 3
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PSY 525 Introduction to Cognitive Science 3
PSY 535 Tests and Measurements 3
PSY 540 Human Factors in Systems Design 3
PSY 541 Overview of Human Factors Psychology 3
PSY 558 Psychology and the African Experience 3
PSY 582 Adolescent Development 3
PSY 584 Advanced Developmental Psychology 3
PSY 590 Special Topics in Psychology 3
PSY 591 History and Systems of Psychology 1-3
WGS 406 Psychology of Gender 3

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AFS 305 Racial and Ethnic Relations 3
ANT 261 Technology in Society and Culture 3
ANT 428 Human Paleopathology 3
ANT 528 Human Paleopathology 3
GEO 220 Cultural Geography 3
PS 432 Violence, Terrorism, and Public Policy 3
REL 309 Religion and Society 3
SOC 202 Principles of Sociology 3
SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 211 Community and Health 3
SOC 212 Race in America 3
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SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
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SOC 342 International Development 3
SOC 350 Food and Society 3
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SOC 400 Theories of Social Structure 3
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SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics in Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

**Multidisciplinary**

ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

**Semester Sequence**

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>GEP Natural Sciences (p. 1429) with Lab</td>
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<td>Linguistics</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426) Requirement</td>
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<td>RPW Methods, Strategies, &amp; Context</td>
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<td>Film Core</td>
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</table>
The Linguistics concentration (LIN) compliments the skills learned in the English core classes by exposing students to scientific approaches to study language, communication, and culture. Students will take at least 18-hours in linguistics classes which will introduce them to quantities and qualitative analytical techniques and develop problem solving and critical thinking skills that are sought after in today's marketplace. Students who complete this concentration might find employment in diverse fields such as market research, advertising, publishing, artificial intelligence, natural language processing, speech and language pathology, and more. Graduates may also be competitive for graduate programs in linguistics, communications, speech and language pathology, or law school.

Plan Requirements

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<tr>
<th>English (BA): Linguistics Concentration: 120 Total Units</th>
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<td>American Literature (p. 669)¹</td>
<td>AFS/ENG 248</td>
<td>Survey of African-American Literature</td>
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<td>Major American Writers</td>
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<td>ENG 252</td>
<td>American Literature</td>
<td>3</td>
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<tr>
<td>American Literature</td>
<td>ENG 265</td>
<td>American Literature II</td>
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<td>ENG 266</td>
<td>LGBTQI Literature in the U.S.</td>
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<tr>
<td>American Fiction, Twentieth Century and Beyond</td>
<td>ENG 267</td>
<td>Women and Literature</td>
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<tr>
<td>American Poetry, Twentieth Century and Beyond</td>
<td>ENG/WGS 305</td>
<td>The American Novel of the 19th Century</td>
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¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

Career Opportunities

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine and for those intending to do graduate work in literature, linguistics, film, or rhetoric.

English (BA): Linguistics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
### World Literature

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<thead>
<tr>
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<td>ENG/ECI 405</td>
<td>Literature for Adolescents</td>
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<td>ENG 420</td>
<td>Major American Author</td>
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<td>ENG 466</td>
<td>Transatlantic Literatures</td>
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<tr>
<td>ENG 467</td>
<td>American Colonial Literature</td>
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<td>ENG 468</td>
<td>Studies in Nineteenth-Century American Literature</td>
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<tr>
<td>ENG 470</td>
<td>American Literature, Twentieth Century and Beyond</td>
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<td>ENG 476</td>
<td>Southern Literature</td>
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### British Literature

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<tr>
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<td>Major British Writers</td>
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<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the</td>
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<td>British Empire</td>
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<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG 262</td>
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<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>ENG 362</td>
<td>Studies in the British Novel</td>
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<td>ENG 385</td>
<td>Biblical Backgrounds of English Literature</td>
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<td>ENG 390</td>
<td>Classical Backgrounds of English Literature</td>
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<td>ENG 439</td>
<td>Studies in English Renaissance Literature</td>
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<td>ENG 451</td>
<td>Chaucer</td>
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<td>ENG 452</td>
<td>Medieval British Literature</td>
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<td>ENG 453</td>
<td>The Romantic Period</td>
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<td>ENG 460</td>
<td>Major British Author</td>
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<td>ENG 462</td>
<td>18th-Century English Literature</td>
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<td>ENG 463</td>
<td>The Victorian Period</td>
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<td>ENG 464</td>
<td>British Literature and the Founding of Empire</td>
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<td>British Literature and the Dissolution of Empire</td>
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<td>ENG 486</td>
<td>Shakespeare, The Earlier Plays</td>
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<td>ENG 487</td>
<td>Shakespeare, The Later Plays</td>
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### Film

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<td>AFS/ENG 375</td>
<td>African American Cinema</td>
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<td>COM/ENG 364</td>
<td>History of Film to 1940</td>
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<td>COM/ENG 374</td>
<td>History of Film From 1940</td>
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<td>ENG 282</td>
<td>Introduction to Film</td>
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<td>ENG 292</td>
<td>Writing About Film</td>
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<td>ENG 330</td>
<td>Screenwriting</td>
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<td>Topics in Film Studies</td>
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<td>ENG 378</td>
<td>Women &amp; Film</td>
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<td>ENG 382</td>
<td>Film and Literature</td>
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<td>ENG 384</td>
<td>Introduction to Film Theory</td>
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<td>ENG 430</td>
<td>Advanced Screenwriting</td>
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<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
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<td>Topics in Film and Interdisciplinary Studies</td>
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### Rhetoric

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<td>Survey of Rhetorical Theory</td>
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<td>Studies in Rhetoric and Digital Media</td>
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<td>COM/ENG 411</td>
<td>Rhetorical Criticism</td>
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<td>COM 451</td>
<td>Visual Rhetoric</td>
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<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
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<tr>
<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
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<td>ENG 425</td>
<td>Analysis of Scientific and Technical Writing</td>
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<td>ENG 426</td>
<td>Analyzing Style</td>
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<td>ENG 455</td>
<td>Literacy in the U.S.</td>
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**Linguistics Core**

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<tr>
<td>ENG 324</td>
<td>Modern English Syntax</td>
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<td>ENG 326</td>
<td>History of the English Language</td>
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**Linguistics Electives**

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<td>Studies in Great Works of Western Literature</td>
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<td>ENG 324</td>
<td>Modern English Syntax</td>
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<td>ENG 325</td>
<td>Spoken and Written Traditions of American English Dialects</td>
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<td>History of the English Language</td>
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<td>Language and Gender</td>
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<td>Language and Globalization</td>
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<td>ENG 335</td>
<td>Language Development</td>
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<td>FLS 333</td>
<td>The Sounds of Spanish</td>
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<td>Spanish-English Comparative Grammar</td>
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**History I**

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<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
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<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>Latin America to 1826</td>
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<td>HI 216</td>
<td>Latin America Since 1826</td>
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<td>Caribbean History</td>
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<td>The World from 1200 to 1750</td>
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<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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**History II**

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<td>Western Civilization Since 1400</td>
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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<td>American History I</td>
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**Foreign Language 200 Level**

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<td>Intermediate Japanese I</td>
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<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<td>Intermediate Portuguese I</td>
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<td>Intermediate Russian I</td>
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<td>Intermediate Spanish I</td>
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<td>Spanish: Language, Technology, Culture</td>
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<td>Intermediate Greek I</td>
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**Arts and Letters**

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<td>Introduction to African-American Music</td>
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<td>Experiencing Architecture</td>
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<td>Introduction to Architectural History</td>
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<td>History of World Architecture</td>
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<td>The Arts of a World Capital: London</td>
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<td>ARS 258</td>
<td>Mathematics and Models in Music</td>
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<td>The Arts and Politics</td>
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<td>Music Composition with Computers</td>
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<td>Arts, Ideas and Values</td>
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<td>Arts and Cross-Cultural Contacts</td>
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### Agricultural Economics

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English (BA): Linguistics Concentration

PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 203 Introduction to Nonprofits 3
PS 204 Problems of American Democracy 3

PS 231 Introduction to International Relations 3
PS 236 Issues in Global Politics 3
PS 241 Introduction to Comparative Politics 3
PS 298 Special Topics in Political Science 1-6
PS 301 The Presidency and Congress 3
PS 302 Campaigns and Elections in the US Political System 3
PS 303 Race in U.S. Politics 3
PS 305 The Justice System in the American Political Process 3
PS 306 Gender and Politics in the United States 3
PS 307 Introduction to Criminal Law in the United States 3
PS 308 Supreme Court and Public Policy 3
PS 309 Equality and Justice in United States Law 3
PS 310 Public Policy 3
PS 312 Introduction to Public Administration 3
PS 313 Criminal Justice Policy 3
PS 314 Science, Technology and Public Policy 3
PS 320 U.S. Environmental Law and Politics 3
PS 331 U.S. Foreign Policy 3
PS 335 International Law 3
PS 336 Global Environmental Politics 3
PS 339 Politics of the World Economy 3
PS 341 European Politics 3
PS 342 Politics of China and Japan 3
PS 343 Government and Politics in South Asia 3
PS 345 Governments and Politics in the Middle East 3
PS 353 Issues in Latin American and Caribbean Politics 3
PS 361 Introduction to Political Theory 3
PS 362 American Political Thought 3
PS 371 Research Methodology of Political Science 3
PS 391 Internship in Political Science 1-6
PS 398 Special Topics in Political Science 3
PS 401 American Political Parties 3
PS 409 Black Political Participation in America 3
PS 411 Public Opinion and the Media in American Politics 3
PS 415 Administration of Justice 3
PS 418 Gender Law and Policy 3
PS 431 The United Nations and Global Order 3
PS 432 Violence, Terrorism, and Public Policy 3
PS 433 Global Problems and Policies 3
PS 437 U.S. National Security Policy 3
PS 443 Seminar in Latin American & Caribbean Politics 3
PS 445 Comparative Systems of Law and Justice 3
PS 462 Seminar in Political Theory 3
PS 463 Public Choice and Political Institutions 3
PS 464 The Classical Liberal Tradition 3
PS 471 Public Opinion Research Methodology 3
PS 490 Readings and Research in Political Science 1-6
PS 492 Honors Readings and Thesis in Political Science 1-6
PS 498 Special Topics in Political Science 1-6
PS 502 The Legislative Process 3

ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 1
ARE 492 External Learning Experience 1-6
ARE 493 Special Problems/Research Exploration 1-6
ARE 494 Agribusiness Study Abroad 1-6
ARE 495 Special Topics in Agricultural and Resource Economics 1-6
ARE 590 Special Topics in ARE 1-99
EC 301 Intermediate Microeconomics 3
EC 336 Introduction to Resource and Environmental Economics 3

Economics

ARE 301 Intermediate Microeconomics 3
ARE 336 Introduction to Resource and Environmental Economics 3
EC 201 Principles of Microeconomics 3
EC 202 Principles of Macroeconomics 3
EC 205 Fundamentals of Economics 3
EC 302 Intermediate Macroeconomics 3
EC 305 A Closer Look at Capitalism 3
EC 348 Introduction to International Economics 3
EC 351 Econometrics I 3
EC 404 Money, Financial Markets, and the Economy 3
EC 410 Public Finance 3
EC 413 Industrial Organization 3
EC 431 Labor Economics 3
EC 437 Health Economics 3
EC 449 International Finance 3
EC 451 Econometrics II 3
EC 468 Game Theory 3
EC 474 Economics of Financial Institutions and Markets 3
EC 480 Introduction to Economic Research 3
EC 490 Research Seminar in Economics 3
EC 495 Special Topics in Economics 1-6
EC 498 Independent Study in Economics 1-6

Political Science

AFS 409 Black Political Participation in America 3
LPS 315 Public Leadership 3
PS 101 Internet Research 1
PS 102 Data Analysis 1
PS 103 Designing Political Web Pages 1
PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 203 Introduction to Nonprofits 3
PS 204 Problems of American Democracy 3

ARE 336 Introduction to Resource and Environmental Economics 3

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### Semester Sequence

This is a sample. Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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The Literature (LLT) concentration provides a strong general education with an emphasis on the study of literature through interdisciplinary approaches. Attentive to the roles played by new media, diversity, and globalization, this concentration is also informed by the emerging field of digital humanities. It leads to a broad range of careers in education, business, government, law, etc. The major includes 39 hours of English courses beyond freshman composition, seven courses that satisfy categorical requirements, and two literature electives.

### Plan Requirements

#### English (BA): Literature Concentration: 120 Total Units

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<td>Interdisciplinary Approaches (p. 679) ¹</td>
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¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.
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<td>American Fiction, Twentieth Century and Beyond</td>
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<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>ENG/ECI 405</td>
<td>Literature for Adolescents</td>
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<td>American Colonial Literature</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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## Major Author or Genre

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## Literature Elective

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English (BA): Literature Concentration

**Capstone: Theory, Media, Literature**

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**Pre-1800 Co-requisites**

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**History I**

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**History II**

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HI 251 American History I 3
HI 252 American History II 3
HI 253 Early American History 3
HI 254 Modern American History 3

**Arts and Letters**

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Social Science

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ANT 251 Physical Anthropology                        3
ANT 252 Cultural Anthropology                        3
ANT 253 Unearthing the Past: Introduction to World Archaeology 3
ANT 254 Language and Culture                         3
ANT 261 Technology in Society and Culture            3
ANT 295 Special Topics in Anthropology               1-3
ANT 310 Native Peoples and Cultures of North America 3
ANT 315 The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica 3
ANT 325 Andean South America                         3
ANT 330 Peoples and Cultures of Africa               3
ANT 345 Anthropology of the Middle East              3
ANT 346 Peoples and Cultures of Southeast Asia       3
ANT 351 Contemporary Culture in Japan                3
ANT 354 Peoples and Cultures of the Pacific          3
ANT 370 Introduction to Forensic Anthropology        3
ANT 371 Human Variation                              3
ANT 374 Disease and Society                          3
ANT 389 Fundamentals of Archaeological Research      3
ANT 395 Special Topics in Anthropology               1-3
ANT 411 Overview of Anthropological Theory           3
ANT 412 Applied Anthropology                         3
ANT 416 Research Methods in Cultural Anthropology    3
ANT 419 Ethnographic Field Methods                   3
ANT 421 Human Osteology                              3

ANT 422 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 424 Bioarchaeology                                3
ANT 427 Bioarchaeological Fieldwork                  3
ANT 428 Human Paleopathology                         3
ANT 431 Tourism, Culture and Anthropology            3
ANT 433 Anthropology of Ecotourism and Heritage Conservation 3
ANT 444 Cross-Cultural Perspectives on Women         3
ANT 450 Culture, Ecology, and Sustainable Living     3
ANT 460 Urban Anthropology                           3
ANT 461 Wealth, Poverty and International Aid         3
ANT 464 Anthropology of Religion                     3
ANT 471 Understanding Latino Migration               3
ANT 475 Environmental Archaeology                    3
ANT 483 Theories of Archaeological Research          3
ANT 495 Special Topics in Anthropology               3
ANT 496 Anthropology Internship                      6
ANT 498 Independent Study in Anthropology            1-6
ANT 501 Proseminar: Introduction to Graduate Studies in Anthropology 3
ANT 511 Overview of Anthropological Theory           3
ANT 512 Applied Anthropology                         3
ANT 516 Research Methods in Cultural Anthropology    3
ANT 521 Human Osteology                              3
ANT 522 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 524 Bioarchaeology                                3
ANT 528 Human Paleopathology                         3
ANT 529 Advanced Methods in Forensic Anthropology    4
ANT 531 Tourism, Culture and Anthropology            3
ANT 533 Anthropology of Ecotourism and Heritage Conservation 3
ANT 544 Cross-Cultural Perspectives on Women         3
ANT 550 Culture, Ecology, and Sustainable Living     3
ANT 560 Urban Anthropology                           3
ANT 561 Wealth, Poverty and International Aid         3
ANT 564 Anthropology of Religion                     3
ANT 571 Understanding Latino Migration               3
ANT 575 Environmental Archaeology                    3
ANT 583 Theories of Archaeological Research          3
ANT 585 Skeletal Biology in Anthropology             3
ANT 587 Cultural Resource Management                 3
ANT 595 Special Topics in Anthropology               1-6
ANT 598 Independent Study in ANT                     1-3
FLJ 351 Contemporary Culture in Japan                3
HI 587 Cultural Resource Management                  3
IS 471 Understanding Latino Migration                3
IS 571 Understanding Latino Migration                3
SOC 261 Technology in Society and Culture            3
WGS 444 Cross-Cultural Perspectives on Women         3
WGS 544 Cross-Cultural Perspectives on Women         3

Agricultural Economics
ARE 121 Agricultural Finance 3
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
ARE 215 Small Business Accounting 3
ARE 260 Marketing and Risk Management in the Pork Industry 1
ARE 270 Principles of Agribusiness Entrepreneurship 3
ARE 290 Professional Development in Agricultural Business Management 3
ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 1-6
ARE 301 Intermediate Microeconomics 3
ARE 303 Farm Management 3
ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
ARE 323 Agribusiness Finance 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 345 Global Agribusiness Management 3
ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 1
ARE 492 External Learning Experience 1-6
ARE 493 Special Problems/Research Exploration 1-6
ARE 494 Agribusiness Study Abroad 1-6
ARE 495 Special Topics in Agricultural and Resource Economics 1-6
ARE 590 Special Topics in ARE 1-99
EC 301 Intermediate Microeconomics 3
EC 336 Introduction to Resource and Environmental Economics 3

Economics

ARE 301 Intermediate Microeconomics 3
EC 201 Principles of Microeconomics 3
EC 202 Principles of Macroeconomics 3
EC 205 Fundamentals of Economics 3
EC 302 Intermediate Macroeconomics 3
EC 305 A Closer Look at Capitalism 3
EC 348 Introduction to International Economics 3
EC 351 Econometrics I 3
EC 404 Money, Financial Markets, and the Economy 3
EC 410 Public Finance 3
EC 413 Industrial Organization 3
EC 415 Labor Economics 3
EC 437 Health Economics 3
EC 449 International Finance 3
EC 451 Econometrics II 3
EC 468 Game Theory 3
EC 474 Economics of Financial Institutions and Markets 3
EC 480 Introduction to Economic Research 3
EC 490 Research Seminar in Economics 3
EC 495 Special Topics in Economics 1-6
EC 498 Independent Study in Economics 1-6

Political Science

AFS 409 Black Political Participation in America 3
LPS 315 Public Leadership 3
PS 101 Internet Research 1
PS 102 Data Analysis 1
PS 103 Designing Political Web Pages 1
PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 203 Introduction to Nonprofits 3
PS 204 Problems of American Democracy 3
PS 231 Introduction to International Relations 3
PS 236 Issues in Global Politics 3
PS 241 Introduction to Comparative Politics 3
PS 298 Special Topics in Political Science 1-6
PS 301 The Presidency and Congress 3
PS 302 Campaigns and Elections in the US Political System 3
PS 303 Race in U.S. Politics 3
PS 305 The Justice System in the American Political Process 3
PS 306 Gender and Politics in the United States 3
PS 307 Introduction to Criminal Law in the United States 3
PS 308 Supreme Court and Public Policy 3
PS 309 Equality and Justice in United States Law 3
PS 310 Public Policy 3
PS 312 Introduction to Public Administration 3
PS 313 Criminal Justice Policy 3
PS 314 Science, Technology and Public Policy 3
PS 320 U.S. Environmental Law and Politics 3
PS 331 U.S. Foreign Policy 3
PS 335 International Law 3
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**Semester Sequence**

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>Literature/Major Author of Genre</td>
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<td>Free Elective</td>
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<td><strong>Hours</strong></td>
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<td><strong>Total Hours</strong></td>
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**Major Grade Point Average (MGPA) Requirements** Courses meeting departmental requirements must receive a grade of C- or better. A 2.0 MGPA and overall GPA is required for graduation.

**Career Opportunities**

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine and for those intending to do graduate work in literature, linguistics, film, or rhetoric.

**English (BA): Teacher Education Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Core Curriculum** The undergraduate major in English is built around an 18-hour core that includes one course from each of the following six categories: American Literature, British Literature, World Literature, Film, Linguistics, and Rhetoric. In addition to the 18-hour core, students take 21 hours of course work in one of the five following concentrations.

Students in the Teacher Education program (TED) take 31 hours of professional coursework in addition to the 18-hour core curriculum in English and the 21-hour TED concentration. The concentration includes five literature courses and two English electives. Admission to the program requires the joint permission of the Department of English and the College of Education. Formal applications are required for admission to Teacher Education candidacy and for admission to the Professional Semester. Students who complete the program are eligible to apply for certification to teach English in secondary schools in North Carolina.

**Plan Requirements**

English (BA): Teacher Education Concentration: 120 Total Units
### American Literature

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<thead>
<tr>
<th>Code</th>
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<td>Survey of African-American Literature</td>
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<td>African-American Literature</td>
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<td>ENG 249</td>
<td>Native American Literature</td>
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<td>ENG 252</td>
<td>Major American Writers</td>
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<tr>
<td>ENG 265</td>
<td>American Literature I</td>
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<tr>
<td>ENG 266</td>
<td>American Literature II</td>
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<td>ENG 267</td>
<td>LGBTQI Literature in the U.S.</td>
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<td>ENG/WGS 305</td>
<td>Women and Literature</td>
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<td>ENG 369</td>
<td>The American Novel of the 19th Century</td>
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<td>ENG 370</td>
<td>American Fiction, Twentieth Century and Beyond</td>
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<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>ENG/ECI 405</td>
<td>Literature for Adolescents</td>
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<td>Transatlantic Literatures</td>
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<td>ENG 467</td>
<td>American Colonial Literature</td>
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<td>ENG 468</td>
<td>Studies in Nineteenth-Century American Literature</td>
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<td>ENG 470</td>
<td>American Literature, Twentieth Century and Beyond</td>
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<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<tr>
<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG 262</td>
<td>English Literature II</td>
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<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>ENG 385</td>
<td>Biblical Backgrounds of English Literature</td>
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<td>ENG 390</td>
<td>Classical Backgrounds of English Literature</td>
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<td>ENG 439</td>
<td>Studies in English Renaissance Literature</td>
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<td>ENG 451</td>
<td>Chaucer</td>
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<td>ENG 452</td>
<td>Medieval British Literature</td>
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<td>ENG 453</td>
<td>The Romantic Period</td>
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<td>Major British Author</td>
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<td>ENG 462</td>
<td>18th-Century English Literature</td>
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<td>ENG 463</td>
<td>The Victorian Period</td>
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<td>ENG 464</td>
<td>British Literature and the Founding of Empire</td>
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<td>ENG 465</td>
<td>British Literature and the Dissolution of Empire</td>
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<td>Shakespeare, The Earlier Plays</td>
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### Education Requirements

Select one of the following: 2

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<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
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<td>ED 312</td>
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<td>ECI 307</td>
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<td>Methods and Materials in Teaching English</td>
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<td>ECI 454</td>
<td>Student Teaching in English/Language Arts</td>
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### Humanities & Social Sciences

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<td>History I (p. 689)</td>
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<td>History II (p. 689)</td>
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<td>Foreign Language 200 Level (p. 689)</td>
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<tr>
<td>Philosophy (p. )</td>
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<td>Social Science (3 Different) (p. 689)</td>
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### General Education Program (GEP) Courses

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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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### Free Electives

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<td>Free Electives (12 Hr S/U Lmt)</td>
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**Note:**
1. A grade of C- or higher is required.
2. A grade of C or higher is required.
3. Students should consult their academic advisors to determine which courses fill this requirement.
### World Literature

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<thead>
<tr>
<th>Code</th>
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<td>ENG 487</td>
<td>Shakespeare, The Later Plays</td>
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<tr>
<td>ENG 490</td>
<td>Studies in Medieval Literature</td>
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### Film

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<td>African Literature in English</td>
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<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG/FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG/FL 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG/FL 221</td>
<td>Literature of the Western World I</td>
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<td>ENG/FL 222</td>
<td>Literature of the Western World II</td>
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<td>Literature of the Holocaust</td>
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<td>ENG/FL 275</td>
<td>Literature and War</td>
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<td>African Literature in English</td>
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<td>ENG/FL 392</td>
<td>Major World Author</td>
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<td>ENG/FL 393</td>
<td>Studies in Literary Genre</td>
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<td>ENG/FL 394</td>
<td>Studies in World Literature</td>
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<td>ENG/FL 406</td>
<td>Modernism</td>
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<td>ENG/FL 407</td>
<td>Postmodernism</td>
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<td>ENG 466</td>
<td>Transatlantic Literatures</td>
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<td>FL 301</td>
<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>FL 302</td>
<td>Survey of French Literature from Romanticism to the Contemporary Period</td>
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<td>FL 425</td>
<td>Literature, Cinema and Culture of the Francophone World</td>
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<td>FL 525</td>
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<td>FLG 320</td>
<td>Introduction to German Literature</td>
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<td>FLG 323</td>
<td>Twentieth Century German Literature</td>
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<td>FLG 325</td>
<td>German Lyric Poetry</td>
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<td>FLJ 342</td>
<td>Classical Japanese Literature in Translation</td>
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<td>FLJ 344</td>
<td>Early Modern Japanese Literature in Translation</td>
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<td>FLJ 345</td>
<td>Modern Japanese Literature in Translation</td>
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<td>FLN 301</td>
<td>Twentieth Century Hindi &amp; Urdu Fiction</td>
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<td>Modern Hindi &amp; Urdu Poetry</td>
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<td>Hindi Literature and South Asian Cultural Contexts</td>
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<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>Literature and Culture of Spain I</td>
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<td>Literature and Culture of Spain III</td>
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### Author / Genre

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<td>COM/ENG 364</td>
<td>History of Film to 1940</td>
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<td>History of Film from 1940</td>
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<td>Writing About Film</td>
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<td>ENG 330</td>
<td>Screenwriting</td>
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<td>Topics in Film Studies</td>
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<td>Women &amp; Film</td>
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<td>Film and Literature</td>
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<td>Introduction to Film Theory</td>
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<td>Advanced Screenwriting</td>
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<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
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<td>Topics in Film and Interdisciplinary Studies</td>
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### Author

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<td>Chaucer</td>
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<td>Major British Author</td>
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<td>ENG 486</td>
<td>Shakespeare, The Earlier Plays</td>
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<td>ENG 558</td>
<td>Studies In Shakespeare</td>
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### Genre

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<tr>
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<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>Special Topics in Modern Drama</td>
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<td>ENG 393</td>
<td>Studies in Literary Genre</td>
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<td>ENG 410</td>
<td>Studies in Gender and Genre</td>
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<td>ENG 570</td>
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<td>20TH-Century British Poetry</td>
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<td>Literature, Art, and Society</td>
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<td>Literature and Science</td>
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<td>SOC 429</td>
<td>Quantitative Data Analysis in Sociology</td>
<td>3</td>
</tr>
<tr>
<td>SOC 430</td>
<td>Community and Crime</td>
<td>3</td>
</tr>
<tr>
<td>SOC 440</td>
<td>Social Change</td>
<td>3</td>
</tr>
<tr>
<td>SOC 445</td>
<td>Inequality, Ideology, and Social Justice</td>
<td>3</td>
</tr>
<tr>
<td>SOC 450</td>
<td>Environmental Sociology</td>
<td>3</td>
</tr>
<tr>
<td>SOC 457</td>
<td>Corporate Power in America</td>
<td>3</td>
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</table>
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics In Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

Multidisciplinary
ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Free Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
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</tbody>
</table>

Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Literature/Arts &amp; Letters</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Natural Science with Lab</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Foreign Language 201</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Philosophy</td>
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Second Year

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<th>Course</th>
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<tbody>
<tr>
<td>ECI 205</td>
<td>Introduction to Teaching Humanities and Social Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ED 204 &amp; ECI 204</td>
<td>Introduction to Teaching in Today's Schools and Intro to Teaching</td>
<td>3</td>
</tr>
<tr>
<td>British Literature</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>History I</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Social Science Requirement</td>
<td></td>
<td>3</td>
</tr>
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</table>

Additional Breadth (Natural Science/Mathematics) 3
Health & Exercise Studies Course 1

Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 260</td>
<td>Reading Literature and Exploring Textuality</td>
<td>3</td>
</tr>
<tr>
<td>American Literature</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ED 311</td>
<td>Classroom Assessment Principles and Practices</td>
<td>2</td>
</tr>
<tr>
<td>ED 312</td>
<td>Classroom Assessment Principles and Practices Professional Learning Lab</td>
<td>1</td>
</tr>
<tr>
<td>Natural Science</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Hours** 15

Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 328</td>
<td>Language and Writing</td>
<td>3</td>
</tr>
<tr>
<td>ELP 344</td>
<td>School and Society</td>
<td>3</td>
</tr>
<tr>
<td>History II</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Author/Genre</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
<td>3</td>
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<tr>
<td><strong>Total Hours</strong></td>
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<td><strong>15</strong></td>
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Fourth Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECI 450</td>
<td>Methods and Materials in Teaching English</td>
<td>4</td>
</tr>
<tr>
<td>ENG Elective</td>
<td></td>
<td>9</td>
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<td><strong>Total Hours</strong></td>
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Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECI 454</td>
<td>Student Teaching in English/Language Arts</td>
<td>12</td>
</tr>
<tr>
<td>ENG 400</td>
<td>Applied Criticism</td>
<td>3</td>
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<tr>
<td><strong>Total Hours</strong></td>
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<td><strong>15</strong></td>
</tr>
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</table>

Major Grade Point Average (MGPA) Requirements
Courses meeting departmental requirements must receive a grade of C- or better. A minimum MGPA and overall, cumulative GPA of 2.5 is required for students to be eligible for teacher licensure.

Career Opportunities

A degree in English provides both liberal education and practical knowledge about the role of writing and language in the everyday world. It leads to careers in such fields as teaching, journalism, advertising, public relations, personnel management, technical writing, business writing, and creative writing. It sharpens the analytical and interpretive skills needed for professional and managerial careers, and it serves as an excellent preparation for students planning to study law or medicine.
English (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The English Department offers a minor in English to majors in any field except English. The minor program will allow students to pursue general interests in writing, literature, and language.

Admissions

Students may declare their intention to complete the English minor by meeting with the contact person listed below.

Certification

Dr. Andrew Johnston will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student's final semester at NC State.

Contact Person

Dr. Andrew Johnston
andrew_johnston@ncsu.edu
230 Tompkins Hall
(919) 515 – 4150
SIS code: 16FSM

Plan Requirements

- Complete 15 credit hours at the 200 level or above.
- No more than 6 transfer hours may be credited toward the minor.
- Must maintain a ‘C’ average (2.0) in the minor and earn a grade of ‘C-’ or better in all courses used toward the minor.
- This minor is not open to students in the Film Concentration of the B.A. in English (16ENGLBA 16ENGLFLM) nor the students in the Film Studies Concentration of the B.A. in Arts Studies (16ARTSTBA 16ARTSTFLM).
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 282</td>
<td>Introduction to Film</td>
<td>3</td>
</tr>
<tr>
<td>ENG/COM 364</td>
<td>History of Film to 1940</td>
<td>3</td>
</tr>
<tr>
<td>ENG/COM 374</td>
<td>History of Film From 1940</td>
<td></td>
</tr>
<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td></td>
</tr>
<tr>
<td>ENG 330</td>
<td>Screenwriting</td>
<td></td>
</tr>
<tr>
<td>ENG/COM 364</td>
<td>History of Film to 1940</td>
<td>1</td>
</tr>
<tr>
<td>ENG/COM 374</td>
<td>History of Film From 1940</td>
<td>1</td>
</tr>
<tr>
<td>ENG/AFS 375</td>
<td>African American Cinema</td>
<td></td>
</tr>
<tr>
<td>ENG 378</td>
<td>Women &amp; Film</td>
<td></td>
</tr>
<tr>
<td>ENG 382</td>
<td>Film and Literature</td>
<td></td>
</tr>
<tr>
<td>ENG 384</td>
<td>Introduction to Film Theory</td>
<td></td>
</tr>
</tbody>
</table>

Film Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Departments of English, Communication, Foreign Languages and Literatures, and the Programs in Interdisciplinary Studies offer a minor in Film Studies open to students across the university. The minor provides a comprehensive introduction to the art and industry of the cinema through courses in film analysis, history, theory, criticism, screen writing, and production. No courses for the minor may be taken for S/U credit.

Admissions

Students may declare their intention to complete the Film Studies minor by consulting with Dr. Andrew Johnston as listed below.

Certification

Dr. Andrew Johnston will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Andrew Johnston
andrew_johnston@ncsu.edu
230 Tompkins Hall
(919) 515 – 4150
SIS code: 16FSM

Plan Requirements

- Complete 15 credit hours at the 200 level or above.
- No more than 6 transfer hours may be credited toward the minor.
- Must maintain a ‘C’ average (2.0) in the minor and earn a grade of ‘C-’ or better in all courses used toward the minor.
- This minor is not open to students in the Film Concentration of the B.A. in English (16ENGLBA 16ENGLFLM) nor the students in the Film Studies Concentration of the B.A. in Arts Studies (16ARTSTBA 16ARTSTFLM).
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 282</td>
<td>Introduction to Film</td>
<td>3</td>
</tr>
<tr>
<td>ENG/COM 364</td>
<td>History of Film to 1940</td>
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</tr>
<tr>
<td>ENG/COM 374</td>
<td>History of Film From 1940</td>
<td></td>
</tr>
<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td></td>
</tr>
<tr>
<td>ENG 330</td>
<td>Screenwriting</td>
<td></td>
</tr>
<tr>
<td>ENG/COM 364</td>
<td>History of Film to 1940</td>
<td>1</td>
</tr>
<tr>
<td>ENG/COM 374</td>
<td>History of Film From 1940</td>
<td>1</td>
</tr>
<tr>
<td>ENG/AFS 375</td>
<td>African American Cinema</td>
<td></td>
</tr>
<tr>
<td>ENG 378</td>
<td>Women &amp; Film</td>
<td></td>
</tr>
<tr>
<td>ENG 382</td>
<td>Film and Literature</td>
<td></td>
</tr>
<tr>
<td>ENG 384</td>
<td>Introduction to Film Theory</td>
<td></td>
</tr>
</tbody>
</table>
Journalism (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of English and the Department of Communication offer a minor in Journalism to N.C. State students, except English majors in the Language, Writing and Rhetoric Concentration (16ENGLBA 16ENGLWR). The minor will provide coursework in writing and editing news and features for print and non-print media, as well as an introduction to the profession of journalism.

Admissions and Certification

Students interested in declaring a minor in Journalism should contact the minor coordinator listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Paul Isom
101 Tompkins Hall
205-617-4400
pcisom@ncsu.edu

SIS Code: 16JOM

Plan Requirements

- Completion of 15 credit hours of coursework at the 200 level or above as listed below.
- No more than two (2) courses (six (6) hours) of transfer credit.
- Must have an overall GPA of 2.0 in the minor and may count no course grade lower than a ‘C-’.
- Four (4) required courses and one (1) elective course.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 214</td>
<td>Introduction to Editing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 416</td>
<td>Advanced News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>COM 267</td>
<td>Electronic Media Writing: Theory and Practice</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select one of the following: 3

Linguistics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of English offers a minor in Linguistics to N.C. State students, except LWR English majors. The minor is designed to investigate the structure and function of language as a cognitive and behavioral science. Five courses in designated areas of linguistics are required in the minor. Among students likely to be attracted to this minor are those who expect to pursue graduate study in linguistics, those interested in foreign languages or English as a second language, and those interested in communication sciences. No courses for the minor may be taken for S/U credit.

Admissions

Students may declare their intention to complete the linguistics minor should consult with Dr. Jeffrey Reaser as listed below.

Certification

Dr. Reaser will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Jeffrey Reaser
285 Tompkins Hall
919.515.4176
jreaser@ncsu.edu

SIS Code: 16LIM

Plan Requirements

- Completion of 15 credit hours of designated courses, all at the 200 level or above.
- At least 3 courses must be above the 200 level.
- Must also complete the study of a foreign language through the 201 level.
- Must have an overall GPA of 2.0 in the minor and may count no course grade lower than a ‘C-’.
- At least 9 hours must be taken in residency at NC State.
• Transfer credits must be evaluated by Dr. Reaser, regardless of their disposition by any other office of the University.
• A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>ENG 210</td>
<td>Introduction to Language and Linguistics or ENG 524 Introduction to Linguistics</td>
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Area II
Select one of the following: 3

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<tbody>
<tr>
<td>ENG 315</td>
<td>Phonetics</td>
</tr>
<tr>
<td>ENG 298</td>
<td>Special Projects in English</td>
</tr>
<tr>
<td>ENG 324</td>
<td>Modern English Syntax</td>
</tr>
<tr>
<td>ENG 325</td>
<td>Spoken and Written Traditions of American English Dialects</td>
</tr>
<tr>
<td>ENG 326</td>
<td>History of the English Language</td>
</tr>
<tr>
<td>ENG 327</td>
<td>Language and Gender</td>
</tr>
<tr>
<td>ENG 328</td>
<td>Language and Writing</td>
</tr>
<tr>
<td>ENG 329</td>
<td>Language and Globalization</td>
</tr>
<tr>
<td>FLS 333</td>
<td>The Sounds of Spanish</td>
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</table>

Area III
Select one of the following: 3

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<tbody>
<tr>
<td>ANT 254</td>
<td>Language and Culture</td>
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<tr>
<td>ENG 335</td>
<td>Language Development</td>
</tr>
<tr>
<td>FL 424/524</td>
<td>Linguistics for ESL Professionals</td>
</tr>
<tr>
<td>PHI 331</td>
<td>Philosophy of Language</td>
</tr>
<tr>
<td>PHI 425</td>
<td>Introduction to Cognitive Science</td>
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<tr>
<td>SOC 207</td>
<td>Language and Society</td>
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Area VI
Select two of the following: 6

<table>
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<tr>
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<tr>
<td>ENG 298</td>
<td>Special Projects in English (where relevant)</td>
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<tr>
<td>ENG 315</td>
<td>Phonetics</td>
</tr>
<tr>
<td>ENG 324</td>
<td>Modern English Syntax</td>
</tr>
<tr>
<td>ENG 325</td>
<td>Spoken and Written Traditions of American English Dialects</td>
</tr>
<tr>
<td>ENG 326</td>
<td>History of the English Language</td>
</tr>
<tr>
<td>ENG 327</td>
<td>Language and Gender</td>
</tr>
<tr>
<td>ENG 328</td>
<td>Language and Writing</td>
</tr>
<tr>
<td>ENG 329</td>
<td>Language and Globalization</td>
</tr>
<tr>
<td>ENG 491</td>
<td>Honors in English (where relevant)</td>
</tr>
<tr>
<td>ENG 494</td>
<td>Special Topics in Linguistics</td>
</tr>
<tr>
<td>ENG 498</td>
<td>Special Topics in English (where relevant)</td>
</tr>
<tr>
<td>ENG 523</td>
<td>Language Variation Research Seminar</td>
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<td>ENG 525</td>
<td>Variety in Language</td>
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<tr>
<td>ENG 527</td>
<td>Discourse Analysis</td>
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<tr>
<td>ENG 528</td>
<td>Sociophonetics</td>
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<tr>
<td>ENG 532</td>
<td>Narrative Analysis</td>
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<tr>
<td>ENG 533</td>
<td>Bilingualism and Language Contact</td>
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<td>ENG 534</td>
<td>Quantitative Analysis in Sociolinguistics</td>
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<td>ENG 536</td>
<td>Research Methods in Phonology</td>
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<tr>
<td>ENG 584</td>
<td>Studies in Linguistics</td>
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</table>

Technical and Scientific Communication (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

A minor in Technical and Scientific Communication is available from the English Department for N.C. State students, except English majors in the Language, Writing and Rhetoric Concentration (16ENGLBA 16ENGLWR), who are interested in supplementing their studies in technical, scientific, or other academic fields with strong writing and communication skills. Students minoring in Technical and Scientific Communication will be introduced to numerous genres including internal and external documents such as proposals, reports, science writing, users guides, reference manuals, and online documentation. Critical perspectives towards the role of communication in the creation of scientific and technical knowledge will be examined. The minor may lead to career opportunities in technical and scientific writing and communication. No courses for the minor may be taken for S/U credit.

Admissions and Certification

Students interested in declaring a minor in Technical and Scientific Communication should contact the minor coordinator listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Huiling Ding
131-C Tompkins
919-515-4120
hding@ncsu.edu

SIS Code: 16TSM

Plan Requirements

• A total of 15 hours of course work is required for the minor.
• Students may transfer no more than 6 hours of courses toward the minor.
• Must have an overall 2.0 GPA in the minor and may count no course grade lower than a 'C-'.
• Nine (9) hours are required, while six (6) are elective within two (2) specific course listings.
World Cultural Literacy (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/!

In keeping with the University’s mission to provide an international curriculum, the World Literature minor offers N.C. State students (excluding English majors in Literature concentration) an opportunity to study literature and cultures outside the Anglo-American tradition. Students will develop critical and analytical skills and enhance the global perspective essential in today’s job market. The minor offers choices from a range of courses that include film, animation, illustrations, texts, lyrics, and popular cultural references. Readings are in English translation, but original texts supplied on request. Many World Cultural Literacy courses are cross-listed in the Department of Foreign Languages and Literatures and the English Department.

Admissions

This minor is open to all NC State students, except English majors in the Literature concentration (16ENGLBA 16ENGLLT). Once a student has started taking courses in the minor they should download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_1_13.pdf) and consult with the major advisor for approval of the minor program. After the student obtains the major advisor's signature, they meet with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student's minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey)), 321 Withers), to complete the final certification. Students will receive official recognition on their transcript for the completed minor.

The following courses total 15 hours.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 214</td>
<td>Introduction to Editing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 314</td>
<td>Technical Document Design and Editing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 421</td>
<td>Computer Documentation Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select one of the following:

- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research
- ENG 350 Professional Internships
- or ENG 425 Analysis of Scientific and Technical Writing

Total Hours: 15

Courses (3 credit hours)

- At least two (2) courses at or above the 300 level from the approved list (6 credit hours)
- At least one (1) course at or above the 400 level from approved list (3 credit hours) Note: enrollment in 500-level courses requires permission from minor advisor and home department of the course.
- Two (2) additional courses chosen from the approved course list (6 credit hours) including:
  - One related course from the disciplines of Art History, History, Music, Philosophy and Religious Studies to be counted toward the minor. Choices must follow non-Anglo-American parameters. See suggested related cultural courses list below.

World Cultural Literacy Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
<td>3</td>
</tr>
<tr>
<td>ENG 329</td>
<td>Language and Globalization</td>
<td>3</td>
</tr>
<tr>
<td>ENG 349</td>
<td>African Literature in English</td>
<td>3</td>
</tr>
<tr>
<td>or AFS 349</td>
<td>African Literature in English</td>
<td></td>
</tr>
<tr>
<td>ENG 466</td>
<td>Transatlantic Literatures</td>
<td>3</td>
</tr>
<tr>
<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
<td>3</td>
</tr>
<tr>
<td>FL 216</td>
<td>Art and Society in France</td>
<td>3</td>
</tr>
<tr>
<td>FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>or ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td></td>
</tr>
<tr>
<td>FL 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>or ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
<td></td>
</tr>
<tr>
<td>FL 221</td>
<td>Literature of the Western World I</td>
<td>3</td>
</tr>
<tr>
<td>or ENG 221</td>
<td>Literature of the Western World I</td>
<td></td>
</tr>
<tr>
<td>FL 222</td>
<td>Literature of the Western World II</td>
<td>3</td>
</tr>
<tr>
<td>or ENG 222</td>
<td>Literature of the Western World II</td>
<td></td>
</tr>
<tr>
<td>FL 223</td>
<td>Contemporary World Literature I</td>
<td>3</td>
</tr>
</tbody>
</table>
or ENG 223  Contemporary World Literature I  3
FL 224  Contemporary World Literature II  3
or ENG 224  Contemporary World Literature II  3
FL 246  Literature of the Holocaust  3
or ENG 246  Literature of the Holocaust  3
FL 275  Literature and War  3
or ENG 275  Literature and War  3
FL 392  Major World Author  3
or ENG 392  Major World Author  3
FL 393  Studies in Literary Genre  3
or ENG 393  Studies in Literary Genre  3
FL 394  Studies in World Literature  3
or ENG 394  Studies in World Literature  3
FL 406  Modernism  3
or ENG 406  Modernism  3
FL 407  Postmodernism  3
or ENG 407  Postmodernism  3
FL 495  Special Topics in Foreign Languages and Literatures  1-6
or ENG 495  Special Topics in Foreign Languages and Literatures  1-6
FL 539  Seminar in World Literature (requires permission)  3
or ENG 539  Seminar in World Literature (requires permission)  3

- No language courses are required. However, one FLx 200 level or above may count towards minor electives with approval.
- Courses to be chosen from the approved World Cultural Literacy courses list; however, the minor advisor may approve exceptions, dependent on course content.

Related Cultural Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HA 201</td>
<td>History of Art from Caves to the Renaissance</td>
<td>3</td>
</tr>
<tr>
<td>HA 202</td>
<td>History of Art From the Renaissance Through the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>HA 298</td>
<td>Special Topics in Art History</td>
<td>3</td>
</tr>
<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
<td>3</td>
</tr>
<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
<td>3</td>
</tr>
<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
<td>3</td>
</tr>
<tr>
<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
<td>3</td>
</tr>
<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
<td>3</td>
</tr>
<tr>
<td>HI 217</td>
<td>Caribbean History</td>
<td>3</td>
</tr>
<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
<td>3</td>
</tr>
<tr>
<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 270</td>
<td>Modern Middle East</td>
<td>3</td>
</tr>
<tr>
<td>HI 275</td>
<td>Introduction to History of South and East Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 276</td>
<td>Introduction to History of West Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 370</td>
<td>Modern Egypt</td>
<td>3</td>
</tr>
<tr>
<td>HI 371</td>
<td>Modern Japan, 1850 to Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 374</td>
<td>Visual Culture of Modern South Asia</td>
<td>3</td>
</tr>
<tr>
<td>HI 400</td>
<td>Civilization of the Ancient Near East</td>
<td>3</td>
</tr>
<tr>
<td>MUS 200</td>
<td>Understanding Music: Global Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>MUS 201</td>
<td>Introduction to Music Literature I</td>
<td>3</td>
</tr>
<tr>
<td>MUS 202</td>
<td>Introduction to Music Literature II</td>
<td>3</td>
</tr>
<tr>
<td>PHI 300</td>
<td>Ancient Philosophy</td>
<td>3</td>
</tr>
<tr>
<td>PHI 301</td>
<td>Early Modern Philosophy</td>
<td>3</td>
</tr>
<tr>
<td>PHI 302</td>
<td>19th Century Philosophy</td>
<td>3</td>
</tr>
<tr>
<td>PHI 310</td>
<td>Existentialism</td>
<td>3</td>
</tr>
<tr>
<td>PHI 401</td>
<td>Kant's Critique of Pure Reason</td>
<td>3</td>
</tr>
<tr>
<td>REL 210</td>
<td>Religious Traditions of the World</td>
<td>3</td>
</tr>
<tr>
<td>REL 230</td>
<td>Asian Religions</td>
<td>3</td>
</tr>
<tr>
<td>REL 311</td>
<td>Introduction to the Old Testament</td>
<td>3</td>
</tr>
<tr>
<td>REL 312</td>
<td>Introduction to the New Testament</td>
<td>3</td>
</tr>
<tr>
<td>REL 317</td>
<td>Christianity</td>
<td>3</td>
</tr>
<tr>
<td>REL 331</td>
<td>The Hindu Tradition</td>
<td>3</td>
</tr>
<tr>
<td>REL 332</td>
<td>The Buddhist Traditions</td>
<td>3</td>
</tr>
<tr>
<td>REL 333</td>
<td>Chinese Religions</td>
<td>3</td>
</tr>
<tr>
<td>REL 334</td>
<td>Japanese Religions</td>
<td>3</td>
</tr>
<tr>
<td>REL 340</td>
<td>Islam</td>
<td>3</td>
</tr>
<tr>
<td>REL 350</td>
<td>Introduction to Judaism</td>
<td>3</td>
</tr>
<tr>
<td>REL 383</td>
<td>Religion, Globalism, and Justice</td>
<td>3</td>
</tr>
<tr>
<td>REL 407</td>
<td>Islamic History to 1798</td>
<td>3</td>
</tr>
<tr>
<td>REL 408</td>
<td>Islam in the Modern World</td>
<td>3</td>
</tr>
<tr>
<td>REL 412</td>
<td>Advanced Readings in the Christian Gospels</td>
<td>3</td>
</tr>
<tr>
<td>REL 413</td>
<td>The Life and Letters of the Apostle Paul</td>
<td>3</td>
</tr>
</tbody>
</table>

Department of Foreign Language and Literatures

For more information about this department, including contact information, visit the department (https://fll.chass.ncsu.edu/).

Programs Abroad

Summer study programs are offered in Austria, France, Italy, Spain, and Peru.

Minors in Foreign Language, Literatures, and Cultures

Minor programs in the Department of Foreign Languages and Literatures include courses in language, literature, and civilization. The minor program requires 15 hours of study in Arabic, Chinese Studies, Classical Studies, French, German, Hindi-Urdu, Italian Studies, Japanese, Japan Studies, Persian, Portuguese, Russian Studies, or Spanish.

Undergraduate students majoring in any area of study at NC State are eligible to minor in a foreign language. Students may not, however, major and minor in the same language.

English as a Second Language (ESL)

The English as a Second Language program serves the academic and professional language needs of international university students. Courses are designed to help both undergraduate and graduate students perfect their language skills. The ESL program administers the Speaking Proficiency English Assessment Kit (SPEAK) for potential graduate teaching assistants to measure their oral English proficiency.
ESL Add-On Licensure for K-12 teachers
The ESL program provides an ESL teacher licensure program for undergraduates enrolled in teacher education and for currently licensed North Carolina public school teachers.

TESOL Certificate Program
This non-degree hybrid program which includes a 30-hour internship is designed for those who are interested in teaching English abroad and in community colleges, and working and volunteering in immigrant communities. Students earn a TESOL Certificate in one semester.

Summer Institute in English
The Summer Institute in English offers intensive, communicative instruction and practice to students, business people, and professionals pursuing more advanced proficiency in English.

Faculty
Head
R. V. Gross

Associate Head
Scott Despain

Assistant Head for Student Affairs
S.G. Navey-Davis

Scheduling Officer
A.C. Wright

Distinguished Professor
G.A. Dawes

Professors
H.G. Braunbeck
T.P. Feeny
M.D. Garval
R.V. Gross
H. A. Jaimes
D. M. Marchi
J. Mari
J.A. Pasten
E. Tai

Professors Emeriti
G.F. Gonzalez
J.R. Kelly
Y.B. Rollins
M.A. Witt

Associate Professors
V. Bilenkin
M.A. Darhower
J.S. Despain
S.E. Garrigan
N.K. Isaacson
J.P. Mertz
J. Michnowicz
S.S. Mody
L.A. Mykyta
V.A. Wust

Associate Professors Emeriti
R.A. Alder
S.T. Alonso
M.M. Magill
M.L. Salstad
S.E. Simonsen

Assistant Professors
M. Eley
L.K. Nyota
R.E. Ronquest

Teaching Associate Professors
G. Mathews
N. Phukan
I. Stern

Teaching Assistant Professors
C.J. Block
J.H. Brown
Senior Lecturers

K.A. Coachman
D.T. Kane
J. Khater
J. McConnell
S.G. Navey-Davis
C. Quarterman
S.F. Sottilo
A.C. Wright
H.S. Young

Senior Lecturer Emeriti

T.P. Brody

Lecturers

J.L. Allen
A.R. Bonaduce-Dresler
D.A. Carson
Z. Chen
J.A. Despain
A. Emerson
M.M. Estrada
B.J. Farag
I.N. Galisteo
A.E. Gray
T.K.L. Hoversten
R.M. Kube
M. Mohaghegh
K. Morel
R. Nitta
N.M. Swisher
K. Ueda
L.A. Villagarcía
J.L. Widener
M.C. Woodbridge

Lecturers Emeriti

M. Darrah
L.A. Dolan
K. Hillman
K. Lioret

Plans

• Chinese Studies (Minor) (p. 701)
• Classical Studies (Minor) (p. 701)
• Foreign Languages and Literatures (BA): Arabic Language and Culture Concentration (p. 704)
• Foreign Languages and Literatures (BA): Asian Language Concentration (p. 712)
• Foreign Languages and Literatures (BA): Foreign Language Chinese Education Concentration (p. 721)
• Foreign Languages and Literatures (BA): Foreign Language French Education Concentration (p. 730)
• Foreign Languages and Literatures (BA): Foreign Language German Education Concentration (p. 738)
• Foreign Languages and Literatures (BA): Foreign Language Spanish Education Concentration (p. 745)
• Foreign Languages and Literatures (BA): French Studies Concentration (p. 753)
• Foreign Languages and Literatures (BA): German Studies Concentration (p. 760)
• Foreign Languages and Literatures (BA): German Studies International Economics Concentration (p. 767)
• Foreign Languages and Literatures (BA): German Studies Science and Technology Concentration (p. 774)
• Foreign Languages and Literatures (BA): Spanish Language and Literature Concentration (p. 781)
• Foreign Languages and Literatures Concentration (BA): Foreign Language Education (p. 788)
• French (Minor) (p. 797)
• German (Minor) (p. 797)
• Hindi-Urdu (Minor) (p. 798)
• Italian Studies (Minor) (p. 799)
• Japan Studies (Minor) (p. 800)
• Japanese (Minor) (p. 801)
• Middle East Studies (Minor) (p. 801)
• Portuguese Studies (Minor) (p. 802)
• Russian Studies (Minor) (p. 803)
• Spanish (Minor) (p. 804)
• Teaching English as a Foreign Language (Minor) (p. 805)

Chinese Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Students majoring in any area of study at NC State are eligible to minor in Chinese Studies. The minor cannot be in the same discipline as the major. The minor in Chinese Studies will provide students with an opportunity to round out their study of Chinese language, culture, and political thought. An investigation of the significance of Modern Asia forms an important complement to studies in Economics, Political Science, History, and Multi-disciplinary Studies. Students may declare the minor when they are enrolled in a class that counts toward the minor.

At the completion of the minor the student will:

1. Be able to communicate using the basic skills of modern standard Chinese,
2. Have some familiarity with Chinese culture, literature and political thought and
3. Have a general overview of China’s political and religious institutions and the role of China in Southeast Asia.

Admissions

Students first download a Departmental Minor Declaration Form (https://fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures. Students may declare the minor when they are enrolled in a class that counts toward the minor.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey), 321 Withers, to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Nathaniel Isaacson
Withers 208
919-515-0367
nkisaacs@ncsu.edu

SIS Code: 16CIM

Plan Requirements

• Completion of 15 credit hours is required.
• 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
• The Department of Foreign Languages and Literature will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
• A grade of ‘C-‘ or better is required in all courses in the minor program.
• A maximum of two (2) course may be used (double-counted) towards both departmental major requirements and minor requirements.
• No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLC 201</td>
<td>Intermediate Chinese I</td>
<td>3</td>
</tr>
<tr>
<td>FLC 202</td>
<td>Intermediate Chinese II</td>
<td>3</td>
</tr>
<tr>
<td>FLC 301</td>
<td>Intermediate Chinese III</td>
<td>3</td>
</tr>
<tr>
<td>FLC 302</td>
<td>Intermediate Chinese IV</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLC 351</td>
<td>Modern Chinese Popular Culture</td>
<td></td>
</tr>
<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
<td></td>
</tr>
<tr>
<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
<td></td>
</tr>
<tr>
<td>HI 471</td>
<td>Revolutionary China</td>
<td></td>
</tr>
<tr>
<td>HI 473</td>
<td>Japan’s Empire in Asia, 1868-1945</td>
<td></td>
</tr>
<tr>
<td>REL 332</td>
<td>The Buddhist Traditions</td>
<td></td>
</tr>
<tr>
<td>PS 342</td>
<td>Politics of China and Japan</td>
<td></td>
</tr>
<tr>
<td>PS 343</td>
<td>Government and Politics in South Asia</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 15

Classical Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Minor in Classical Studies is an excellent foundation for advanced work in other academic disciplines as well as professional programs in law, medicine and management. By presenting a broad selection of courses in the various disciplines of language, literature, philosophy, religious studies and history, the minor provides students with a sound introduction to study of the ancient world. Because of the continuity between ancient and modern cultures, it also gives students an opportunity to develop a keener perception and better understanding of the cultural forces at work in the contemporary world.

Depending on their other undergraduate or career goals, students will have the option of pursuing one or more of three concentrations within the Classical Studies minor: Greek, Latin or Classical Culture. The Concentrations in Greek and Latin focus on intensive study of the ancient languages, with significant additional exposure to Classical literature and culture in translation. The Concentration in Classical Culture offers the option of pursuing more general study of Classical literature and culture mostly or exclusively in translation.
By fulfilling the requirements for the Concentration in Classical Culture students will:

1. Acquire a better understanding of the roots of Western culture in the civilizations of Greece and Rome;
2. Learn to assess more keenly the cultures of Greece and Rome in their own varied contexts, and
3. Gain a familiarity with problems of interpretation of texts and the varieties of evidence upon which interpretation may be based;
4. Learn the principal themes and issues in the history of Greek and Roman civilizations;
5. Acquire a deeper understanding of Greek and Roman artistic and literary cultures;
6. Learn accurately to identify principal geographical and demographic features of the ancient world;
7. Increase their intellectual breadth and sophistication, and
8. Gain insight into the complexities of relationships of the languages, literatures and cultures of Greece and Rome.

Students who elect study of the original language(s) to fulfill the requirements for a Concentration in Greek and/or Latin, while attaining all of the goals above, will also:

1. Achieve knowledge of the fundamentals of Greek and/or Latin language, and thereby
2. Gain a deeper understanding of the origin of Western tongues and of language itself;
3. Acquire the ability to read substantial portions of Greek and Latin authors, and thereby
4. Understand and appreciate in their original form some of the most important ideas shaping Western culture.

In many cases, a student completing the requirements for a Concentration in Greek and/or Latin language will also be able to fulfill the requirements for the Concentration in Classical Culture with little additional coursework, and such double (or triple) concentration is encouraged to highlight the breadth of the students knowledge of the ancient world.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/), 321 Withers), to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Gary Mathews
Foreign Languages and Literatures Teaching Assistant Professor
Withers 227, Box 8106
919-515-9306
gary_m@ncsu.edu

SIS Codes:
– Classical Studies: 16CSM
– Classical Studies Classical Culture Concentration: 16CSMCC
– Classical Studies Greek Concentration: 16CSMGRK
– Classical Studies Latin Concentration: 16CSMLAT

Plan Requirements

- Completion of 15 credit hours is required.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- The Department of Foreign Languages and Literature will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
- A grade of “C-” or better is required in all courses in the minor program.
- No courses for the minor may be taken for S/U credit.
- At least one course for the minor must be taken at the 300 level or above.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

Concentration in Classical Culture

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Course</td>
<td>Select one &quot;core&quot; culture course of the following:</td>
<td></td>
</tr>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td></td>
</tr>
<tr>
<td>CLA 325</td>
<td>Gender, Ethnicity &amp; Identity in the Ancient World</td>
<td></td>
</tr>
<tr>
<td>Elective Courses</td>
<td>Select one additional culture course from the list above or from the following:</td>
<td>3</td>
</tr>
<tr>
<td>CLA 215</td>
<td>The Ancient World in Modern Media</td>
<td></td>
</tr>
<tr>
<td>CLA 395</td>
<td>Special Topics in Classical Studies</td>
<td></td>
</tr>
<tr>
<td>CLA 398</td>
<td>Independent Study in Classical Studies</td>
<td></td>
</tr>
<tr>
<td>GRK 201</td>
<td>Intermediate Greek I</td>
<td></td>
</tr>
<tr>
<td>GRK 202</td>
<td>Intermediate Greek II</td>
<td></td>
</tr>
<tr>
<td>GRK 399</td>
<td>Directed Readings in Greek</td>
<td></td>
</tr>
<tr>
<td>LAT 201</td>
<td>Intermediate Latin I</td>
<td></td>
</tr>
<tr>
<td>LAT 202</td>
<td>Intermediate Latin II</td>
<td></td>
</tr>
</tbody>
</table>
LAT 399  Directed Readings in Latin

Select one additional culture course of the following:  3

HI 207  Ancient Mediterranean World
HI 321  Scientific Revolution and European Society, 1500-1800
HI 402  Early Christianity to the Time of Eusebius
HI 403  Ancient Greek Civilization
HI 404  Rome to 337 A.D.
HI 405  History and Archaeology of the Roman Empire
HI 406  From Roman Empire to Middle Ages
PHI 300  Ancient Philosophy
REL 312  Introduction to the New Testament
REL 402  Early Christianity to the Time of Eusebius
REL 412  Advanced Readings in the Christian Gospels
REL 413  The Life and Letters of the Apostle Paul

Select two additional courses:  6

GRK 101  Elementary Greek I
GRK 102  Elementary Greek II
LAT 101  Elementary Latin I
LAT 102  Elementary Latin II

Total Hours  15

1 Other elective courses with appropriate focus on the Classical world may be substituted for the courses listed with approval of the minor advisor.

Concentration in Greek

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<td>GRK 202</td>
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<td>Elective Courses</td>
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<td>Select three of the following:</td>
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<tr>
<td></td>
<td>GRK 399 Directed Readings in Greek (may be taken up to</td>
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<td>LAT 101</td>
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<td>LAT 102</td>
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<td>LAT 399</td>
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<td>CLA 210</td>
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<td>The Ancient World in Modern Media</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<td>CLA 325</td>
<td>Gender, Ethnicity &amp; Identity in the Ancient World</td>
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<td>CLA 395</td>
<td>Special Topics in Classical Studies</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 321</td>
<td>Scientific Revolution and European Society, 1500-1800</td>
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<td>HI 402</td>
<td>Early Christianity to the Time of Eusebius</td>
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<td>HI 403</td>
<td>Ancient Greek Civilization</td>
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<td>Rome to 337 A.D.</td>
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<td>History and Archaeology of the Roman Empire</td>
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<td>Advanced Readings in the Christian Gospels</td>
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<td>REL 413</td>
<td>The Life and Letters of the Apostle Paul</td>
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Total Hours  15
Foreign Languages and Literatures (BA): Arabic Language and Culture Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Pi Delta Phi, French Honor Society, Sigma Delta Pi, or of Pi Delta Phi.

Plan Requirements

### Arabic Language Core

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<td>FLA 202</td>
<td>Intermediate Arabic II&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>FLA 301</td>
<td>Advanced Intermediate Arabic I&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>FLA 330</td>
<td>Media Arabic&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>FLA 440</td>
<td>Modern Arabic Short Story&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>Senior Seminar in Foreign Languages &amp; Literatures&lt;sup&gt;1&lt;/sup&gt;</td>
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### Arabic Studies Concentration

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<td>Intermediate Arabic Conversation II</td>
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<td>HI 270</td>
<td>Modern Middle East&lt;sup&gt;1&lt;/sup&gt;</td>
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### Humanities & Social Sciences

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<td>ENG 101</td>
<td>Academic Writing and Research&lt;sup&gt;1&lt;/sup&gt;</td>
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<td>History II (p. 705)</td>
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<td>Literature I (p. 705)</td>
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<td>Philosophy</td>
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<td>Arts and Letters (p. 707)</td>
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<td>Social Science (3 Different) (p. 708)</td>
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<td>Additional Social Science</td>
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### General Education Program (GEP) Courses

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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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### Free Electives

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<tr>
<td>FLA 101</td>
<td>May count towards free electives if all three following conditions are met; 1) the language was not taken by the student in high school, 2) the student has met high school proficiency in another language, and 3) the language is not the student’s native language. Students should consult their academic advisors to determine which courses fill this requirement.</td>
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### Arabic Studies Advanced Course

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<td>FLA 318</td>
<td>Egyptian Culture through Film</td>
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<tr>
<td>HI 307</td>
<td>Jewish History</td>
<td>3</td>
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<tr>
<td>HI 370</td>
<td>Modern Egypt</td>
<td>3</td>
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<tr>
<td>PS 345</td>
<td>Governments and Politics in the Middle East</td>
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<tr>
<td>REL 311</td>
<td>Introduction to the Old Testament</td>
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<tr>
<td>REL 340</td>
<td>Islam</td>
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<tr>
<td>REL 350</td>
<td>Introduction to Judaism</td>
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### Arabic Studies Advised Elective

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<sup>1</sup> A grade of C- or higher is required.

<sup>2</sup> Students who place into LAT 202 Intermediate Latin II will take one additional elective course from the list below.

Other elective courses with appropriate focus on the Classical world may be substituted for the courses listed with approval of the minor advisor.
FLF 425  Literature, Cinema and Culture of the Francophone World  3
FLF 525  Literature, Cinema and Culture of the Francophone World  3
HI 207  Ancient Mediterranean World  3
HI 307  Jewish History  3
HI 370  Modern Egypt  3
HI 400  Civilization of the Ancient Near East  3
HI 407  Islamic History to 1798  3
HI 408  Islam in the Modern World  3
HI 419  Modern European Imperialism  3
HI 454  History of U.S. Foreign Relations, 1900-Present  3
HI 465  Oil and Crisis in the Gulf  3
HI 466  History of the Palestinian-Israeli Conflict  3
HI 477  Women in the Middle East  3
HI 500  Civilization of the Ancient Near East  3
HI 519  Modern European Imperialism  3
PER 201  Intermediate Persian I  3
PER 202  Intermediate Persian II  3
PS 345  Governments and Politics in the Middle East  3
REL 210  Religious Traditions of the World  3
REL 311  Introduction to the Old Testament  3
REL 340  Islam  3
REL 350  Introduction to Judaism  3
REL 407  Islamic History to 1798  3
REL 408  Islam in the Modern World  3
REL 482  Religion and Conflict  3

History II

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<td>Western Civilization Since 1400</td>
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<td>HI 208</td>
<td>The Middle Ages</td>
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<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<tr>
<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<tr>
<td>HI 251</td>
<td>American History I</td>
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<td>HI 252</td>
<td>American History II</td>
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<tr>
<td>HI 253</td>
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Literature I

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<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
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<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
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<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG 221</td>
<td>Literature of the Western World</td>
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<tr>
<td>ENG 222</td>
<td>Literature of the Western World II</td>
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<td>ENG 251</td>
<td>Major British Writers</td>
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Literature II

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<tr>
<td>AFS 248</td>
<td>Survey of African-American Literature</td>
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<td>AFS 349</td>
<td>African Literature in English</td>
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<tr>
<td>AFS 448</td>
<td>African-American Literature</td>
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<td>AFS 548</td>
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<tr>
<td>ENG 207</td>
<td>Studies in Poetry</td>
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<td>Studies In Fiction</td>
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<td>ENG 209</td>
<td>Introduction to Shakespeare</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>Literature of the Western World</td>
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<td>ENG 232</td>
<td>Literature and Medicine</td>
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<td>ENG 246</td>
<td>Literature of the Holocaust</td>
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<td>Survey of African-American Literature</td>
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<td>ENG 249</td>
<td>Native American Literature</td>
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FL 275 Literature and War 3
FL 392 Major World Author 3
FL 393 Studies in Literary Genre 3
FL 394 Studies in World Literature 3
FL 406 Modernism 3
FL 407 Postmodernism 3
FLN 301 Twentieth Century Hindi & Urdu Fiction 3
FLN 302 Modern Hindi & Urdu Poetry 3
FLN 401 Hindi Literature and South Asian Cultural Contexts 3
WGS 305 Women and Literature 3
WGS 410 Studies in Gender and Genre 3

**Literature II List B**

ENG 219 Studies in Great Works of Non-Western Literature 3
ENG 220 Studies in Great Works of Western Literature 3
ENG 221 Literature of the Western World I 3
ENG 223 Contemporary World Literature I 3
ENG 224 Contemporary World Literature II 3
ENG 246 Literature of the Holocaust 3
ENG 392 Major World Author 3
ENG 393 Studies in Literary Genre 3
ENG 394 Studies in World Literature 3
ENG 406 Modernism 3
ENG 407 Postmodernism 3
FL 219 Studies in Great Works of Non-Western Literature 3
FL 220 Studies in Great Works of Western Literature 3
FL 221 Literature of the Western World I 3
FL 223 Contemporary World Literature I 3
FL 224 Contemporary World Literature II 3
FL 246 Literature of the Holocaust 3
FL 392 Major World Author 3
FL 393 Studies in Literary Genre 3
FL 394 Studies in World Literature 3
FL 406 Modernism 3
FL 407 Postmodernism 3
FLF 301 Survey of French Literature from the Middle Ages through the Enlightenment 3
FLF 302 Survey of French Literature from Romanticism to the Contemporary Period 3
FLF 492 Seminar in French Studies 3
FLG 320 Introduction to German Literature 3
FLG 323 Twentieth Century German Literature 3
FLG 325 German Lyric Poetry 3
FLJ 342 Classical Japanese Literature in Translation 3
FLJ 344 Early Modern Japanese Literature in Translation 3
FLJ 345 Modern Japanese Literature in Translation 3
FLN 301 Twentieth Century Hindi & Urdu Fiction 3
FLN 302 Modern Hindi & Urdu Poetry 3
FLN 401 Hindi Literature and South Asian Cultural Contexts 3
FLR 303 Russian Literature in Translation: The Nineteenth Century 3
FLR 304 Russian Literature in Translation: The Twentieth Century 3
FLS 340 Introduction to Hispanic Literatures and Cultures 3
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<td>Inquiry, Discovery, and Literature</td>
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<td>HON 293</td>
<td>Honors Special Topics - Interdisciplinary</td>
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### Arts and Letters

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<td>Black Popular Culture</td>
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<td>The Arts of a World Capital: London</td>
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**Semester Sequence**

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### Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

### Foreign Languages and Literatures (BA): Asian Language Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/]

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

### Plan Requirements

**Foreign Languages and Literatures (BA): Asian Language Concentration**: 120 Total Units

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### Asian Literature-Upper Level

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### Asian Studies-Advanced Courses

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### Literature I

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### Foreign Languages and Literatures (BA): Asian Language Concentration

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### Social Science

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ANT 428 Human Paleopathology 3
ANT 431 Tourism, Culture and Anthropology 3
ANT 433 Anthropology of Ecotourism and Heritage Conservation 3
ANT 444 Cross-Cultural Perspectives on Women 3
ANT 450 Culture, Ecology, and Sustainable Living 3
ANT 460 Urban Anthropology 3
ANT 461 Wealth, Poverty and International Aid 3
ANT 464 Anthropology of Religion 3
ANT 471 Understanding Latino Migration 3
ANT 475 Environmental Archaeology 3
ANT 483 Theories of Archaeological Research 3
ANT 495 Special Topics in Anthropology 3
ANT 496 Anthropology Internship 6
ANT 498 Independent Study in Anthropology 1-6
ANT 501 Proseminar: Introduction to Graduate Studies in Anthropology 3
ANT 511 Overview of Anthropological Theory 3
ANT 512 Applied Anthropology 3
ANT 516 Research Methods in Cultural Anthropology 3
ANT 521 Human Osteology 3
ANT 522 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 524 Bioarchaeology 3
ANT 528 Human Paleopathology 3
ANT 529 Advanced Methods in Forensic Anthropology 4
ANT 531 Tourism, Culture and Anthropology 3
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ANT 560 Urban Anthropology 3
ANT 561 Wealth, Poverty and International Aid 3
ANT 564 Anthropology of Religion 3
ANT 571 Understanding Latino Migration 3
ANT 575 Environmental Archaeology 3
ANT 583 Theories of Archaeological Research 3
ANT 585 Skeletal Biology in Anthropology 3
ANT 587 Cultural Resource Management 3
ANT 595 Special Topics in Anthropology 1-6
ANT 598 Independent Study in ANT 1-3
FLJ 351 Contemporary Culture in Japan 3
HI 587 Cultural Resource Management 3
IS 471 Understanding Latino Migration 3
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SOC 261 Technology in Society and Culture 3
WGS 444 Cross-Cultural Perspectives on Women 3
WGS 544 Cross-Cultural Perspectives on Women 3

**Agricultural Economics**

ARE 121 Agricultural Finance 3
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
ARE 215 Small Business Accounting 3
ARE 260 Marketing and Risk Management in the Pork Industry 3
ARE 270 Principles of Agribusiness Entrepreneurship 3
ARE 290 Professional Development in Agricultural Business Management 3
ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 3
ARE 301 Intermediate Microeconomics 3
ARE 303 Farm Management 3
ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
ARE 323 Agribusiness Finance 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 345 Global Agribusiness Management 3
ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 3
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 1
ARE 492 External Learning Experience 1-6
ARE 493 Special Problems/Research Exploration 1-6
ARE 494 Agribusiness Study Abroad 1-6
ARE 495 Special Topics in Agricultural and Resource Economics 1-6
ARE 590 Special Topics in ARE 1-99
EC 301 Intermediate Microeconomics 3
EC 336 Introduction to Resource and Environmental Economics 3

**Economics**

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ARE 336 Introduction to Resource and Environmental Economics 3
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Semester Sequence

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| **Second Year** |                                      |       |
| **Fall Semester** |                                    |       |
| FLx 201 and FLx 203 Asian Language I | 4     |
| Asian Studies Elective | 3     |
| GEP Natural Sciences (p. 1429) with Lab | 4     |
| Social Science | 3                                            |       |
| History II     | 3                                            |       |
| **Hours**      |                                              | 17    |
| **Spring Semester** |                                |       |
| FLx 202 and FLx 204 Asian Language II | 4     |
| Literature I   | 3                                            |       |
| GEP Natural Sciences (p. 1429) | 3     |
| Social Science | 3                                            |       |
| GEP Interdisciplinary Perspectives (p. 1426) | 3     |
| **Hours**      |                                              | 16    |

| **Third Year** |                                      |       |
| **Fall Semester** |                                    |       |
| FLx 301 Asian Language | 3     |
| Asian Studies Core Elective | 3     |
| Asian Studies Elective | 3     |
| Arts & Letters | 3                                            |       |
| Free Elective | 2                                            |       |
| GEP Health and Exercise Studies (p. 1422) | 1     |
| **Hours**      |                                              | 15    |
| **Spring Semester** |                                |       |
| FLx 302 Asian Language | 3     |
| Asian Studies Core Elective | 3     |
| Asian Literature Core (Literature II) | 3     |
| Social Science | 3                                            |       |
| GEP Health and Exercise Studies (p. 1422) | 1     |
| **Hours**      |                                              | 13    |

| **Fourth Year** |                                            |       |
| **Fall Semester** |                                    |       |
| FLx 401 Asian Language | 3     |
| GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3     |
| Free Electives | 9                                            |       |
| **Hours**      |                                              | 15    |
| **Spring Semester** |                                |       |
| FL 492 Senior Seminar in Foreign Languages & Literatures | 3     |
| Free Electives | 9                                            |       |
| **Hours**      |                                              | 12    |
| **Total Hours** |                                              | 120   |

1 A grade of C or above is required for these courses to count toward the major.
2 A grade of C- or above is required for these courses to count toward the major.

Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign
languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

**Foreign Languages and Literatures (BA): Foreign Language Chinese Education Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

**Plan Requirements**

**Foreign Languages and Literatures (BA): Foreign Language Chinese Education Concentration:** 120 Total Units

### Code | Title | Hours
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**Language Content Core**

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**Education Concentration**

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**Professional Education**

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**Humanities & Social Sciences**

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**General Education Program (GEP) Courses**

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**Free Electives**

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**Semester Sequence**

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Foreign Languages and Literatures (BA): Foreign Language French Education Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

Major in Foreign Language Education with French, German, or Spanish Teaching Option

In collaboration with the College of Education and the Department of Curriculum and Instruction, the Department of Foreign Languages and Literatures offers a program leading to a French, German, or Spanish teaching license in North Carolina, grades K-12.

Plan Requirements

Foreign Languages and Literatures (BA): Foreign Language French Education Concentration: 120 Total Units

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¹ A grade of C- or higher is required.

Professional Education Component: A grade of C or above is required for these courses. ED 299 Field Experience for 21st Century Teaching/FL 299 Field Experience for 21st Century Teaching field work is taken the semester after Introduction to 21st Century Teaching (ED 204 Introduction to Teaching in Today's Schools and ECI 204 Intro to Teaching).

Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.
Advised Elective

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400 level Advised Elective

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### Sociology

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### Semester Sequence

This is a sample.

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| **Second Year** |                                        |       |
| **Fall Semester** |                                      |       |
| Language & Culture Core |                                      | 3     |
| Language & Culture Core |                                      | 3     |
| GEP Natural Sciences (p. 1429) with Lab |                  | 4     |
| ED 204  | Introduction to Teaching in Today’s Schools | 2     |
| ECI 204 | Intro to Teaching                          | 1     |
| Free Elective |                                         | 3     |
| **Hours** |                                            | 16    |
| **Spring Semester** |                                      |       |
| Language & Culture Core |                                      | 3     |
| FLF Literature I |                                          | 3     |
| GEP Natural Sciences (p. 1429) |                          | 3     |
| Arts & Letters |                                            | 3     |
| GEP Social Sciences (p. 1430) |                          | 3     |
| ED/FL 299 | Field Experience for 21st Century Teaching | 1     |
| **Hours** |                                            | 16    |

| **Third Year** |                                        |       |
| **Fall Semester** |                                      |       |
| FLF Literature II |                                      | 3     |
| GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) | 3     |
| EDP 304  | Educational Psychology                    | 3     |
| FL Advised Elective |                                          | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) |                        | 3     |
| **Hours** |                                            | 15    |
| **Spring Semester** |                                      |       |
| FLF Language Content |                                      | 3     |
| Free Elective |                                          | 3     |
| ELP 344 | School and Society                          | 3     |
| FL Advised Elective |                                          | 3     |
| GEP Social Sciences (p. 1430) |                          | 3     |
| **Hours** |                                            | 15    |

| **Fourth Year** |                                        |       |
| **Fall Semester** |                                      |       |
| ECI 423  | Methods for Teaching Modern Foreign Languages K-12 | 5     |
| FLF 492  | Seminar in French Studies                 | 3     |
| FL Advised Elective |                                          | 3     |
| ED 311  | Classroom Assessment Principles and Practices | 2     |
| ED 312  | Classroom Assessment Principles and Practices Professional Learning Lab | 1     |
| **Hours** |                                            | 14    |
| **Spring Semester** |                                      |       |
| ECI 424 | Student Teaching in Modern Foreign Languages | 12    |
| **Hours** |                                            | 12    |
| **Total Hours** |                                       | 120   |

1. A grade of C- or higher is required.
Professional Education Component: A grade of C or above is required for these courses. ED 299 Field Experience for 21st Century Teaching/FL 299 Field Experience for 21st Century Teaching work is taken the semester after Introduction to 21st Century Teaching (ED 204 Introduction to Teaching in Today’s Schools and ECI 204 Intro to Teaching).

Admission to Candidacy and Professional Year: All FLL Education candidates must be admitted to candidacy by the beginning of the fall semester of Methods Course. All required coursework should be completed prior to student teaching.

Career Opportunities
The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Foreign Languages and Literatures (BA): Foreign Language German Education Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pagas/).

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

Major in Foreign Language Education with French, German, or Spanish Teaching Option
In collaboration with the College of Education and the Department of Curriculum and Instruction, the Department of Foreign Languages and Literatures offers a program leading to a French, German, or Spanish teaching license in North Carolina, grades K-12.

Plan Requirements

Foreign Languages and Literatures (BA): Foreign Language German Education Concentration: 120 Total Units

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Additional Advised Elective (p. 739) 3

German Language Core

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Professional Education

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Humanities & Social Sciences

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Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 740) 3

Social Science (3 Different) (p. 741) 9

General Education Program (GEP) Courses

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Free Elective

Free Electives (12 Hr S/U Lmt) 6

Total Hours 120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

Advised Elective

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### Language & Culture Core

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### FLG Required Core Course

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### FLG Language & Culture Core

Select a maximum of 9 units

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#### Arts and Letters

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REL 334 Japanese Religions 3
REL 340 Islam 3
REL 350 Introduction to Judaism 3
REL 383 Religion, Globalism, and Justice 3
REL 412/512 Advanced Readings in the Christian Gospels 3
REL 413/513 The Life and Letters of the Apostle Paul 3
REL 423/523 Religion and Politics in America 3
REL 424/524 Religion and Politics in Global Perspective 3
REL 471/571/STS 471/571 Darwinism and Christianity 3
REL 472/572/ Women and Religion 3
REL 473/573 Religion, Gender, and Reproductive Technologies 3
REL 482/582 Religion and Conflict 3
REL 489/589 Interpretations of Religion 3
REL 496 Seminar in Religious Studies 3
REL 498/598 Special Topics in Religious Studies 1-6
THE 103 Introduction to the Theater 3
THE 203 Theory and Practice of Acting 3
THE 303 Stage Directing 3
THE 334 Advanced Acting 3
THE 340 African American Theatre 3

Social Science

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Agricultural Economics

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**Psychology**

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<td>Community Psychology Principles and Practice</td>
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PSY 510  Advanced Problems in Psychology  1-3
PSY 511  Advanced Social Psychology  3
PSY 525  Introduction To Cognitive Science  3
PSY 535  Tests and Measurements  3
PSY 540  Human Factors In Systems Design  3
PSY 541  Overview of Human Factors Psychology  3
PSY 558  Psychology and the African Experience  3
PSY 582  Adolescent Development  3
PSY 584  Advanced Developmental Psychology  3
PSY 590  Special Topics in Psychology  3
PSY 591  History and Systems Of Psychology  1-3
WGS 406  Psychology of Gender  3

Sociology

AFS 305  Racial and Ethnic Relations  3
ANT 261  Technology in Society and Culture  3
ANT 428  Human Paleopathology  3
ANT 528  Human Paleopathology  3
GEO 220  Cultural Geography  3
PS 432  Violence, Terrorism, and Public Policy  3
REL 309  Religion and Society  3
SOC 202  Principles of Sociology  3
SOC 203  Current Social Problems  3
SOC 203A  Current Social Problems  3
SOC 204  Sociology of Family  3
SOC 205  Jobs and Work  3
SOC 206  Social Deviance  3
SOC 207  Language and Society  3
SOC 211  Community and Health  3
SOC 212  Race in America  3
SOC 220  Cultural Geography  3
SOC 241  Sociology of Agriculture and Rural Society  3
SOC 241A  Sociology of Agriculture and Rural Society  3
SOC 295  Special Topics in Sociology  1-3
SOC 300  Social Research Methods  4
SOC 301  Human Behavior  3
SOC 304  Gender and Society  3
SOC 305  Racial and Ethnic Relations  3
SOC 306  Criminology  3
SOC 309  Religion and Society  3
SOC 311  Community Relationships  3
SOC 342  International Development  3
SOC 350  Food and Society  3
SOC 351  Population and Planning  3
SOC 381  Sociology of Medicine  3
SOC 395  Special Topics in Sociology  1-3
SOC 400  Theories of Social Structure  3
SOC 401  Theories of Social Interaction  3
SOC 402  Urban Sociology  3
SOC 404  Families and Work  3
SOC 405  Racism in the U.S.  3
SOC 407  Sociology of Sexualities  3
SOC 410  Sociology of Organizations  3
SOC 413  Criminal Justice Field Work  4
SOC 414  Social Class  3
SOC 418  Sociology of Education  3
SOC 425  Juvenile Delinquency  3
SOC 427  Sociology of Law  3
SOC 428  Formal Institutions of Social Control  3
SOC 429  Quantitative Data Analysis in Sociology  3
SOC 430  Community and Crime  3
SOC 440  Social Change  3
SOC 445  Inequality, Ideology, and Social Justice  3
SOC 450  Environmental Sociology  3
SOC 457  Corporate Power in America  3
SOC 465  Social Aspects of Mental Health  3
SOC 492  External Learning Experience  1-6
SOC 493  Special Problems in Sociology  1-6
SOC 495  Special Topics in Sociology  1-3
SOC 498  Independent Study in Sociology  1-6
SOC 508  Social Organization  3
SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 559  Special Topics in Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

Multidisciplinary

ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

Semester Sequence

This is a sample.

Course  Title  Hours
First Year
Fall Semester
ENG 101  Academic Writing and Research  4
FLF 201  Intermediate French I  3
History I  3
GEP Mathematical Sciences (p. 1428)  3
GEP Interdisciplinary Perspectives (p. 1426)  2
GEP Health and Exercise Studies (p. 1422)  1
Hours  16

Spring Semester
FLF 202  Intermediate French II  3
History II  3
GEP Mathematical Sciences (p. 1428)  3
GEP Social Sciences (p. 1430)  3
Philosophy  3
GEP Health and Exercise Studies (p. 1422)  1
Hours  16
### Second Year
#### Fall Semester
- **Language & Culture Core** 3
- **Language & Culture Core** 3
- **GEP Natural Sciences (p. 1429) with Lab** 4
- **ED 204** Introduction to Teaching in Today’s Schools 2
- **ECI 204** Intro to Teaching 1
- **Free Elective** 3

#### Hours 16

#### Spring Semester
- **Language & Culture Core** 3
- **FLF Literature I** 3
- **GEP Natural Sciences (p. 1429)** 3
- **Arts & Letters** 3
- **GEP Social Sciences (p. 1430)** 3
- **ED/FL 299** Field Experience for 21st Century Teaching 1

#### Hours 16

### Third Year
#### Fall Semester
- **FLF Literature II** 3
- **GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)** 3
- **EDP 304** Educational Psychology 3
- **FL Advised Elective** 3
- **GEP Interdisciplinary Perspectives (p. 1426)** 3

#### Hours 15

#### Spring Semester
- **FLF Language Content** 3
- **Free Elective** 3
- **ELP 344** School and Society 3
- **FL Advised Elective** 3
- **GEP Social Sciences (p. 1430)** 3

#### Hours 15

### Fourth Year
#### Fall Semester
- **ECI 423** Methods for Teaching Modern Foreign Languages K-12 5
- **FLF 492** Seminar in French Studies 3
- **FL Advised Elective** 3
- **ED 311** Classroom Assessment Principles and Practices 2
- **ED 312** Classroom Assessment Principles and Practices Professional Learning Lab 1

#### Hours 14

#### Spring Semester
- **ECI 424** Student Teaching in Modern Foreign Languages 12

#### Hours 12

#### Total Hours 120

**Professional Education Component:** A grade of C or above is required for these courses. ED 299 Field Experience for 21st Century Teaching/FL 299 Field Experience for 21st Century Teaching field work is taken the semester after Introduction to 21st Century Teaching (ED 204 Introduction to Teaching in Today’s Schools and ECI 204 Intro to Teaching).

All Education students must pass the Praxis II Subject Area Tests.

**Study Abroad/Internship Abroad** It is strongly recommended that students participate in at least one study abroad experience to a French-speaking country. Please note that no more than 15 hours of transfer credit (from a non-NCSU program) may be applied towards the major. NCSU sponsored programs count as regular coursework.

**Admission to Candidacy and Professional Year:** All FLL Education candidates must be admitted to candidacy by the beginning of the fall semester of Methods Course. All required coursework should be completed prior to student teaching.

### Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

### Foreign Languages and Literatures (BA): Foreign Language Spanish Education Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

### Major in Foreign Language Education with French, German, or Spanish Teaching Option

In collaboration with the College of Education and the Department of Curriculum and Instruction, the Department of Foreign Languages and Literatures offers a program leading to a French, German, or Spanish teaching license in North Carolina, grades K-12.

### Plan Requirements

Foreign Languages and Literatures (BA): Foreign Language Spanish Education Concentration: 120 Total Units
### Foreign Languages and Literatures (BA): Foreign Language Spanish Education Concentration

**Language Core**

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**FLS Education Concentration**

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**General Education Program (GEP) Courses**

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Total Hours: 120

¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.

**FLS Language & Culture Core**

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<td>FLS 360</td>
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**Advised Elective**

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**400 level Advised Elective**

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### Additional Advised Elective

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<td>The Arts of a World Capital: London</td>
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<td>ARS/STS 257</td>
<td>Technology in the Arts</td>
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<td>The Arts and Politics</td>
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<td>ARS/MUS 306</td>
<td>Music Composition with Computers</td>
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ARS 351 Arts, Ideas and Values 3
ARS 353 Arts and Cross-Cultural Contacts 3
ARS 354 The Arts and the Sacred 3
CLA 210 Classical Mythology 3
COM/ENG 321 Survey of Rhetorical Theory 3
COM/ENG 364 History of Film to 1940 3
COM/ENG 374 History of Film From 1940 3
COM/ENG 395 Studies in Rhetoric and Digital Media 3
COM/ENG 411 Rhetorical Criticism 3
D 231 Design History for Engineers and Scientists 3
DAN 272 Dance Composition - Solo Forms 1
DAN 295 Problems of Dance Performance 2
ENG 282 Introduction to Film 3
ENG 289 Poetry Writing 3
ENG 323 Writing in the Rhetorical Tradition 3
ENG 374 History of Film From 1940 3
ENG 378 Women & Film 3
ENG 382 Film and Literature 3
ENG 394 Studies in World Literature 3
ENG 426 Analyzing Style 3
ENG 492 Special Topics in Film Styles and Genres 3
FL 216 Art and Society in France 3
FLC 351 Modern Chinese Popular Culture 3
FLF 318 The Heritage of French Cinema 3
FLG 318 New German Cinema and Beyond 3
FLI 318 Italian Society Through Cinema 3
FLR 318 Russian Cinema and Society 3
FSL 360 Hispanic Cinema 3
GD 203 History of Graphic Design 3
GD 303 Graphic Design Theory and Practice 3
HA 201 History of Art from Caves to the Renaissance 3
HA 202 History of Art From the Renaissance Through the 20th Century 3
HA 203 History of American Art 3
HA/HI 240 Introduction to Visual Culture 3
HA 298 Special Topics in Art History 3
HA 395 History of Art: Study Abroad 3
HA 401 19th Century European Art from Revolution to Post-Impressionism 3
HA 404 Italian Renaissance Art and Material Culture 3
HA 498 Independent Study in History of Art 1-6
HESM 322 Dance and Society 3
HESM 324 Concert Dance History 3
HESM 326 Current Trends in Dance 3
HI/REL 320 Religion in American History 3
HI 402/502 REL 402/502 Early Christianity to the Time of Eusebius 3
HI 408/508 REL 408/508 Islam in the Modern World 3
HI 407/507 REL 407/507 Islamic History to 1798 3
HON 390 Music and the Celtic World 3
IDS 496 Topics in Film and Interdisciplinary Studies 3
LAR 444 History of Landscape Architecture 3
MUS 105 Introduction to Music in Western Society 3
MUS 180 Introduction to Musical Experiences 3
MUS 181 Exploring Music Theory 3
MUS 200 Understanding Music: Global Perspectives 3
MUS 201 Introduction to Music Literature I 3
MUS 202 Introduction to Music Literature II 3
MUS 206 America's Music 3
MUS 310 Music of the 17th and 18th Centuries 3
MUS 315 Music of the 19th Century 3
MUS 320 Music of the 20th Century 3
MUS 330 Survey of Musical Theater 3
MUS 350 Music of Asia 3
MUS/WGS 360 Women In Music 3
REL 200 Introduction to the Study of Religion 3
REL 210 Religious Traditions of the World 3
REL 220 Religion in the Contemporary World 3
REL 230 Asian Religions 3
REL 298 Special Topics in Religious Studies 3
REL/SOC 309 Religion and Society 3
REL 311 Introduction to the Old Testament 3
REL 312 Introduction to the New Testament 3
REL 314 Introduction to Intertestamental Literature 3
REL 317 Christianity 3
REL 323 Religious Cults, Sects, and Minority Faiths in America 3
REL 327 Issues in Contemporary Religion 3
REL 331 The Hindu Tradition 3
REL 332 The Buddhist Traditions 3
REL 333 Chinese Religions 3
REL 334 Japanese Religions 3
REL 340 Islam 3
REL 350 Introduction to Judaism 3
REL 383 Religion, Globalism, and Justice 3
REL 412/512 Advanced Readings in the Christian Gospels 3
REL 413/513 The Life and Letters of the Apostle Paul 3
REL 423/523 Religion and Politics in America 3
REL 424/524 Religion and Politics in Global Perspective 3
REL 471/571 STS 471/571 Darwinism and Christianity 3
REL 472/572 Women and Religion 3
REL 473/573 Religion, Gender, and Reproductive Technologies 3
REL 482/582 Religion and Conflict 3
REL 489/589 Interpretations of Religion 3
REL 496 Seminar in Religious Studies 3
REL 498/598 Special Topics in Religious Studies 1-6
THE 103 Introduction to the Theater 3
THE 203 Theory and Practice of Acting 3
THE 303 Stage Directing 3
THE 334 Advanced Acting 3
THE 340 African American Theatre 3
## Social Science

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### Agricultural Economics

<p>| ARE 121 | Agricultural Finance                                                  | 3     |
| ARE 201 | Introduction to Agricultural &amp; Resource Economics                    | 3     |
| ARE 201A| Introduction to Agricultural &amp; Resource Economics                    | 3     |
| ARE 215 | Small Business Accounting                                             | 3     |
| ARE 260 | Marketing and Risk Management in the Pork Industry                    | 1     |
| ARE 270 | Principles of Agribusiness Entrepreneurship                           | 3     |
| ARE 290 | Professional Development in Agricultural Business Management          | 3     |
| ARE 295 | Special Topics in Agricultural &amp; Resource Economics (200 Level)       | 1-6   |
| ARE 301 | Intermediate Microeconomics                                           | 3     |
| ARE 303 | Farm Management                                                       | 3     |
| ARE 304 | Agribusiness Management                                               | 3     |
| ARE 306 | Agricultural Law                                                      | 3     |
| ARE 309 | Environmental Law &amp; Economic Policy                                  | 3     |
| ARE 311 | Agricultural Markets                                                  | 3     |
| ARE 312 | Agribusiness Marketing                                                | 3     |
| ARE 321 | Agricultural Financial Management                                     | 3     |
| ARE 323 | Agribusiness Finance                                                  | 3     |
| ARE 332 | Human Resource Management for Agribusiness                            | 3     |
| ARE 336 | Introduction to Resource and Environmental Economics                  | 3     |
| ARE 345 | Global Agribusiness Management                                        | 3     |</p>
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**Economics**

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**Political Science**

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## Semester Sequence

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The expansion of international relations makes the knowledge of foreign languages critical for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

### Foreign Languages and Literatures (BA): French Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

#### Plan Requirements

**Foreign Languages and Literatures (BA): French Studies Concentration: 120 Total Units**

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### Career Opportunities

The expansion of international relations makes the knowledge of foreign languages critical for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

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**GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3**

**EDP 304 Educational Psychology 3**

**FL Advised Elective 3**

**GEP Interdisciplinary Perspectives (p. 1426) 3**

**Spring Semester**

**FLF Language Content 3**

**Free Elective 3**

**ELP 344 School and Society 3**

**FL Advised Elective 3**

**Fall Semester**

**ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1**

**Hours 15**

### Fourth Year

#### Fall Semester

**ECI 423 Methods for Teaching Modern Foreign Languages K-12 5**

**FLF 492 Seminar in French Studies 3**

**FL Advised Elective 3**

**ED 311 Classroom Assessment Principles and Practices 2**

**ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1**

**Hours 14**

#### Spring Semester

**ECI 424 Student Teaching in Modern Foreign Languages 12**

**Hours 12**

**Total Hours 120**

1 A grade of C- or higher is required.

### Professional Education Component

A grade of C or above is required for these courses. ED 299 Field Experience for 21st Century Teaching/FL 299 Field Experience for 21st Century Teaching field work is taken after Introduction to 21st Century Teaching (ED 204 Introduction to Teaching in Today's Schools and ECI 204 Intro to Teaching).

All Education students must pass the Praxis II Subject Area Tests.

### Study Abroad/Internship Abroad

It is strongly recommended that students participate in at least one study abroad experience to a French-speaking country. Please note that no more than 15 hours of transfer credit (from a non-NCSU program) may be applied towards the major. NCSU sponsored programs count as regular coursework.

### Admission to Candidacy and Professional Year

All FLL Education candidates must be admitted to candidacy by the beginning of the fall semester of Methods Course. All required coursework should be completed prior to student teaching.

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**NC State University 753**
**History II**

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**Literature I**

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**Arts and Letters**

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<td>Arts and Cross-Cultural Contacts</td>
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LPS 315  Public Leadership  3
PS 101  Internet Research  1
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PS 103  Designing Political Web Pages  1
PS 201  American Politics and Government  3
PS 202  State and Local Government  3
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SOC 492  External Learning Experience  1-6
SOC 493  Special Problems in Sociology  1-6
SOC 495  Special Topics in Sociology  1-3
SOC 498  Independent Study in Sociology  1-6
SOC 508  Social Organization  3
SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics In Sociology  1-6
WGS 204 Sociology of Family  3
WGS 304 Gender and Society  3
WGS 407 Sociology of Sexualities  3

**Multidisciplinary**

ENG 210 Introduction to Language and Linguistics  3
GEO 220 Cultural Geography  3
SOC 220 Cultural Geography  3
STS 402 Peace and War in the Nuclear Age  3

### Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses that represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<th>Course</th>
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<td>Advanced Conversation: Contemporary French Cultures</td>
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Third Year
Fall Semester
FLF 302 Survey of French Literature from Romanticism to the Contemporary Period 3
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
Social Science 3
Free Electives 6

Hours 15

Spring Semester
Literature I 3
FLF Departmental Elective 3
Free Electives 9

Hours 15

Fourth Year
Fall Semester
FLF 492 Seminar in French Studies 3
GEP Interdisciplinary Perspectives (p. 1426) 3
Free Electives 9

Hours 15

Spring Semester
FLF Departmental Elective 3
GEP Health and Exercise Studies (p. 1422) 1
Free Electives 9

Hours 13

Total Hours 120

1 A grade of C- or higher is required.

* Study Abroad/Internship Abroad: It is strongly recommended that students participate in at least one study abroad experience to a French speaking country. NCSU sponsored study abroad programs count as regular coursework.

Career Opportunities
The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Foreign Languages and Literatures (BA): German Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

Plan Requirements

Foreign Languages and Literatures - German Studies Concentration(16FLLBA): 120 Total Units

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<td>Introduction to German Literature ¹</td>
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<td>FLG 323</td>
<td>Twentieth Century German Literature ¹</td>
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<td>German Lyric Poetry ¹</td>
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<td>Senior Seminar in German Studies ¹</td>
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<td>Philosophy</td>
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General Education Program (GEP) Courses

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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Free Electives
Free Electives (12 Hr S/U Lmt) ² 24

Total Hours 120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine how to complete this requirement.
### Intermediate German

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<tr>
<td>FLG 202</td>
<td>Intermediate German II</td>
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<tr>
<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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**Select a minimum of 3 units**

### Language & Culture Core

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<td>FLG 302</td>
<td>German Oral and Written Expression</td>
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<td>FLG 307</td>
<td>Business German</td>
<td>3</td>
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<tr>
<td>FLG 311</td>
<td>Introduction to German Translation</td>
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**Select a maximum of 6 units**

### Language & Culture Core II

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<td>New German Cinema and Beyond</td>
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<td>FLG 390</td>
<td>German Studies Topics</td>
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<td>FLG 398</td>
<td>Independent Study in German</td>
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<td>FLG 430</td>
<td>Cultural Artifacts in the German-Speaking Countries</td>
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**Select a maximum of 3 units**

### FL/FLG Advised Electives I

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<td>Introduction to German Translation</td>
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<td>FLG 315</td>
<td>Germanic Civilization and Culture</td>
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<td>German Studies Topics</td>
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<td>FLG 398</td>
<td>Independent Study in German</td>
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<td>FLG 420</td>
<td>Current Issues in German-Language Media</td>
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<td>FLG 440</td>
<td>Green Germany: Nature and Environment in German Speaking Cultures</td>
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### Advised Electives II

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<td>The Arts of Vienna 1900</td>
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<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<td>ENG 222</td>
<td>Literature of the Western World II</td>
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<tr>
<td>ENG 246</td>
<td>Literature of the Holocaust</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>Literature of the Western World II</td>
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<td>FL 246</td>
<td>Literature of the Holocaust</td>
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<td>HA 401</td>
<td>19th Century European Art from Revolution to Post-Impressionism</td>
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<td>MUS 310</td>
<td>Music of the 17th and 18th Centuries</td>
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<td>Music of the 19th Century</td>
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### History I

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<td>Introduction to History of South and East Africa</td>
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<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>The Middle Ages</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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<td>British History to 1688</td>
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<td>History of British Cultures and Societies From 1688</td>
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<td>American History I</td>
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### Arts and Letters

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<td>ADN 112</td>
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<td>Introduction to African-American Music</td>
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<td>ARC 241</td>
<td>History of World Architecture</td>
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<td>The Arts of a World Capital: London</td>
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<td>Technology in the Arts</td>
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<td>Mathematics and Models in Music</td>
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<td>The Arts and Politics</td>
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<td>Studies in Rhetoric and Digital Media</td>
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<td>Women &amp; Film</td>
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<td>Film and Literature</td>
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<td>Analyzing Style</td>
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<td>Art and Society in France</td>
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<td>Modern Chinese Popular Culture</td>
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<td>The Heritage of French Cinema</td>
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<td>History of Graphic Design</td>
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<td>Graphic Design Theory and Practice</td>
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<td>History of Art from Caves to the Renaissance</td>
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<td>History of Art From the Renaissance Through the 20th Century</td>
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<td>History of American Art</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>FLG 323</td>
<td>Twentieth Century German Literature</td>
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<tr>
<td>FLG Advised Electives I</td>
<td>3</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)</td>
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<tr>
<td><strong>Hours</strong></td>
<td>16</td>
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</table>
coming years. The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Study Abroad

It is required that all German Studies students participate in at least one regular semester of study abroad or internship (3-4 months minimum) in a German-speaking country. Please note that no more than 15 hours of transfer credit (from study abroad or other US Institutions which are not a part of UNC-Online) may be applied towards core courses in German Studies (core: required courses, departmental electives, FLG electives I and II, and advised electives I and II). FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland is an internship course with up to 6 credits. For students who choose study abroad instead of an internship, FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland serves as a placeholder for transfer credits from the study abroad semester.

Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

### Foreign Languages and Literatures (BA): German Studies International Economics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

### Plan Requirements

#### Foreign Languages and Literatures (BA): German Studies International Economics Concentration: 120 Total Units

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<td>Intermediate German I (^1)</td>
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<td>FLG 307</td>
<td>Business German (^1)</td>
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<tr>
<td>Language &amp; Culture Core I (p. 768) (^1)</td>
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<td>FLG 492</td>
<td>Senior Seminar in German Studies (^1)</td>
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#### Concentration Requirements

| Advised Electives (p. 768) \(^1\) | 6     |
| Economics Electives (p. 768) \(^1\) | 15    |
| FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland \(^1\) | 3     |

#### Humanities and Social Sciences

| ENG 101  | Academic Writing and Research \(^1\)     | 4     |
| History I (p. 768)                        | 3     |
| History II (p. 768)                       | 3     |
| Philosophy                                | 3     |

Any PHI course on the approved GEP-Humanities list.

| Arts and Letters (p. 769)                  | 3     |
| Social Science (3 Different) (p. 770)      | 9     |
| Additional Social Science                  | 3     |

#### General Education Program (GEP) Courses

| GEP Mathematical Sciences (p. 1428)        | 6     |
| GEP Natural Sciences (p. 1429)             | 7     |
| GEP Health and Exercise Studies (p. 1422)  | 2     |
| GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) | 5     |

---

\(^1\) A grade of C- or higher is required.
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

### Free Electives

Free Electives (12 Hr S/U Lmt) \(^2\) 18

Total Hours 120

\(^1\) A grade of C- or higher is required.
\(^2\) Students should consult their academic advisors to determine which courses fill this requirement.

### Intermediate German

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### Language & Culture Core I

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<td>German Oral and Written Expression</td>
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<td>FLG 311</td>
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<td>Germanic Civilization and Culture</td>
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<td>New German Cinema and Beyond</td>
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<td>Twentieth Century German Literature</td>
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<td>FLG 325</td>
<td>German Lyric Poetry</td>
<td>3</td>
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<td>FLG 390</td>
<td>German Studies Topics</td>
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<td>FLG 398</td>
<td>Independent Study in German</td>
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<td>FLG 420</td>
<td>Current Issues in German-Language Media</td>
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<td>Cultural Artifacts in the German-Speaking Countries</td>
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<td>FLG 440</td>
<td>Green Germany: Nature and Environment in German Speaking Cultures</td>
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### Additional Literature Requirement

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### Advised Electives

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<td>AFS 252</td>
<td>The Arts of Vienna 1900</td>
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<tr>
<td>EN 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
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<td>Literature of the Western World II</td>
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<td>EN 246</td>
<td>Literature of the Holocaust</td>
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<td>FL 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
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<tr>
<td>FL 222</td>
<td>Literature of the Western World II</td>
<td>3</td>
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<td>FL 246</td>
<td>Literature of the Holocaust</td>
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### Economics Electives

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<tr>
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<td>Principles of Microeconomics</td>
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### History I

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<td>AFS 276</td>
<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>Modern Asia: 1800 to Present</td>
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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>History of British Cultures and Societies From 1688</td>
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<tr>
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<td>HI 252</td>
<td>American History II</td>
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<td>Early American History</td>
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**Arts and Letters**

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<td>Drawing I</td>
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<td>ADN 414</td>
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<td>Introduction to African-American Music</td>
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<td>History of Jazz</td>
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<td>AFS/ARS 346</td>
<td>Black Popular Culture</td>
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<td>AFS/ENG 375</td>
<td>African American Cinema</td>
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<td>Experiencing Architecture</td>
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<td>ARC 141</td>
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<td>ARC 241</td>
<td>History of World Architecture</td>
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<td>ARS 251</td>
<td>The Arts of a World Capital: London</td>
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<td>Technology in the Arts</td>
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<td>ARS 258</td>
<td>Mathematics and Models in Music</td>
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<td>The Arts and Politics</td>
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<td>ARS/MUS 306</td>
<td>Music Composition with Computers</td>
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<td>ARS 351</td>
<td>Arts, Ideas and Values</td>
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<td>ARS 353</td>
<td>Arts and Cross-Cultural Contacts</td>
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<td>ARS 354</td>
<td>The Arts and the Sacred</td>
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<td>Classical Mythology</td>
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<tr>
<td>COM/ENG 321</td>
<td>Survey of Rhetorical Theory</td>
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<td>COM/ENG 364</td>
<td>History of Film to 1940</td>
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<td>COM/ENG 374</td>
<td>History of Film From 1940</td>
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<td>COM/ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<td>Rhetorical Criticism</td>
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<td>Design History for Engineers and Scientists</td>
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<td>Dance Composition - Solo Forms</td>
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<td>Concert Dance History</td>
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<td>Current Trends in Dance</td>
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<td>Religion in American History</td>
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<td>Early Christianity to the Time of Eusebius</td>
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<td>Islam in the Modern World</td>
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<td>REL 340</td>
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<td>Introduction to Judaism</td>
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<td>Religion, Globalism, and Justice</td>
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<td>Advanced Readings in the Christian Gospels</td>
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<td>The Life and Letters of the Apostle Paul</td>
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### Social Science

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### Multidisciplinary

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### Semester Sequence

This is a sample.

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<td>GEP Mathematical Sciences (p. 1428)</td>
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Foreign Languages and Literatures (BA): German Studies Science and Technology Concentration

GEP Natural Sciences (p. 1429) with Lab 4

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Second Year

Fall Semester

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<td>Arts &amp; Letters</td>
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Spring Semester

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<td>History II</td>
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Third Year

Fall Semester

| FLG 320 Introduction to German Literature | 3 |
|                                          |   |
| FLG 307 Business German                  | 3 |
| Philosophy                                | 3 |
| GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3 |
| Free Electives                            | 3 |

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Spring Semester

| Best Semester to Study Abroad ²       | 3 |
| Economics Elective ¹                  |   |
| FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland | 3 |
| Advised Elective                      | 3 |
| Free Electives                        | 3 |

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Fourth Year

Fall Semester

| Advised Elective                     | 3 |
| Economics Elective ¹                 |   |
| Additional Literature Requirement ¹  | 3 |
| GEP Interdisciplinary Perspectives (p. 1426) | 3 |
| Free Electives                       | 3 |

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Senior Year

Spring Semester

| FLG 492 Senior Seminar in German Studies | 3 |
| Additional Literature Requirement ¹     | 3 |
| GEP Interdisciplinary Perspectives (p. 1426) | 2 |

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Free Electives 6

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<th>Total Hours</th>
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¹ A grade of C- or higher is required.

Study Abroad

It is required that all German Studies students participate in at least one regular semester of study abroad or internship (3-4 months minimum) in a German-speaking country. Please note that no more than 15 hours of transfer credit (from study abroad or other US Institutions which are not a part of UNC-Online) may be applied towards core courses in German Studies (core: required courses, departmental electives, FLG electives I and II, and advised electives I and II). FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland is an internship course with up to 6 credits. For students who choose study abroad instead of an internship, FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland serves as a placeholder for transfer credits from the study abroad semester.

Career Opportunities

The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Foreign Languages and Literatures (BA): German Studies Science and Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations are B.A. in Foreign Languages and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or Delta Phi Alpha, German Honor Society.

Plan Requirements

Foreign Languages and Literatures (BA): German Studies Science and Technology Concentration: 120 Total Units

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</table>
Language & Culture Core (p. 775)

Literature Elective (p. 775)

FLG 492 Senior Seminar in German Studies

FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland

Concentration Requirements

Advised Electives (p. 775)

Humanities and Social Sciences

ENG 101 Academic Writing and Research

FLG 201 Intermediate German I

History I (p. 775)

History II (p. 776)

Philosophy

Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 776)

Social Sciences (2 Different) (p. 777)

General Education Program (GEP) Courses

GEP Mathematical Sciences (p. 1428)

GEP Natural Sciences (p. 1429)

GEP Health and Exercise Studies (p. 1422)

GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)

GEP Interdisciplinary Perspectives (p. 1426)

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt)

Total Hours

Select a maximum of 3 units

Language & Culture Core II

Select a maximum of 3 units

FLG 315 Germanic Civilization and Culture

FLG 318 New German Cinema and Beyond

FLG 323 Twentieth Century German Literature

FLG 325 German Lyric Poetry

FLG 390 German Studies Topics

FLG 398 Independent Study in German

FLG 420 Current Issues in German-Language Media

FLG 430 Cultural Artifacts in the German-Speaking Countries

FLG 440 Green Germany: Nature and Environment in German Speaking Cultures

Literature Elective

Code Title Hours

FLG 323 Twentieth Century German Literature 3

FLG 325 German Lyric Poetry 3

Advised Electives

Code Title Hours

Select a minimum of 6 units

ARS 252 The Arts of Vienna 1900 3

ENG 220 Studies in Great Works of Western Literature 3

ENG 222 Literature of the Western World II 3

ENG 246 Literature of the Holocaust 3

FL 220 Studies in Great Works of Western Literature 3

FL 222 Literature of the Western World II 3

FL 246 Literature of the Holocaust 3

FLG 315 Germanic Civilization and Culture 3

FLG 318 New German Cinema and Beyond 3

FLG 323 Twentieth Century German Literature 3

FLG 325 German Lyric Poetry 3

FLG 390 German Studies Topics 3

FLG 398 Independent Study in German 1-6

FLG 420 Current Issues in German-Language Media 3

FLG 430 Cultural Artifacts in the German-Speaking Countries 3

FLG 440 Green Germany: Nature and Environment in German Speaking Cultures 3

History I

Code Title Hours

AFS/HI 275 Introduction to History of South and East Africa 3

AFS/HI 276 Introduction to History of West Africa 3

HI 207 Ancient Mediterranean World 3

HI 214 History and Archaeology of Ancient Latin America 3

HI 215 Latin America to 1826 3

HI 216 Latin America Since 1826 3

HI 217 Caribbean History 3

HI 232 The World from 1200 to 1750 3

HI 233 The World Since 1750 3

HI 263 Asian Civilizations to 1800 3

HI 264 Modern Asia: 1800 to Present 3

HI 270 Modern Middle East 3
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<td>SOC 351 Population and Planning</td>
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<td>SOC 400 Theories of Social Structure</td>
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<td>SOC 401 Theories of Social Interaction</td>
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<td>SOC 402 Urban Sociology</td>
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<td>SOC 404 Families and Work</td>
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<td>SOC 405 Racism in the U.S.</td>
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<td>SOC 407 Sociology of Sexualities</td>
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<td>SOC 410 Sociology of Organizations</td>
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<td>SOC 413 Criminal Justice Field Work</td>
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<td>SOC 428 Formal Institutions of Social Control</td>
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<td>SOC 429 Quantitative Data Analysis in Sociology</td>
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<td>SOC 457 Corporate Power in America</td>
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<td>SOC 492 External Learning Experience</td>
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<td>SOC 508 Social Organization</td>
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<td>SOC 509 Population Problems</td>
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<td>SOC 514 Developing Societies</td>
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<td>WGS 304 Gender and Society</td>
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<td>GEO 220 Cultural Geography</td>
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<tr>
<td>STS 402 Peace and War in the Nuclear Age</td>
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**Semester Sequence**

This is a sample.

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<tr>
<td>Fall</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>FLG 201</td>
<td>Intermediate German I (CP)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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</table>
GEP Mathematical Sciences (p. 1428) 3
Free Elective 3

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**Spring Semester**

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<th>Course</th>
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<tr>
<td>FLG 202 or FLG 212 Intermediate German II (CP) or German Language, Culture, Science, and Technology</td>
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<td>History I</td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Natural Sciences (p. 1429) with Lab</td>
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**Second Year**

**Fall Semester**

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<th>Course</th>
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<tr>
<td>Language &amp; Culture Core 1</td>
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<tr>
<td>History II</td>
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<tr>
<td>Social Science</td>
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<td>Arts &amp; Letters</td>
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**Spring Semester**

<table>
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<tbody>
<tr>
<td>Language &amp; Culture Core 1</td>
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<td>Philosophy</td>
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<td>Social Science</td>
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<td>Free Elective</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Third Year**

**Fall Semester**

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<tr>
<td>FLG 320 Introduction to German Literature</td>
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<td>Advised Elective 1</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>Free Electives</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
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<tr>
<td>Advised Elective 1</td>
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<tr>
<td>FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland</td>
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<td>Free Electives</td>
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**Fourth Year**

**Fall Semester**

<table>
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<th>Course</th>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Spring Semester**

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<tr>
<td>FLG 492 Senior Seminar in German Studies</td>
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<td>German Literature Elective 1</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Free Electives**

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**Total Hours**

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<tr>
<td>14</td>
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1 A grade of C- or higher is required.

**Study Abroad/Internship Abroad**

It is required that all German Studies students participate in at least one regular semester of study abroad or internship (3-4 months minimum) in a German-speaking country. Please note that no more than 15 hours of transfer credit (from study abroad or from other US institutions which are not a part of UNC-Online) may be applied towards the core courses in German Studies (core: required courses, departmental electives, FLG electives I and II, and advised electives I and II). FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland is an internship course with up to 6 credits. For students who choose study abroad instead of an internship, FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland serves as a placeholder for transfer credits from the study abroad semester. Students in the Science and Technology concentration who study abroad must take a 3 credit course related to their other major, taught in German.

**Career Opportunities**

The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

**Foreign Languages and Literatures (BA): Spanish Language and Literature Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

**Plan Requirements**

**Foreign Languages and Literatures (BA): Spanish Language and Literature Concentration: 120 Total Units**

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>FLS 201</td>
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**Departmental Requirements**

**Departmental Requirements**

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<th>Code</th>
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<tr>
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or FLS 212 Spanish: Language, Technology, Culture  
FLS 202 Intermediate Spanish II  
FLS 331 Spanish Oral and Written Expression I  
or FLS 335 Spanish for Native and Heritage Speakers  
FLS 332 Spanish Oral and Written Expression II  
FLS 333 The Sounds of Spanish  
FLS 340 Introduction to Hispanic Literatures and Cultures  
FLS Literature/Culture Core (p. 782)  
Departmental Electives 300/400 level (p. 782)  
Departmental Electives 400 level (p. 782)  
FLS 492 Seminar in Hispanic Studies  

**Humanities & Social Sciences**

ENG 101 Academic Writing and Research  
History I (p. 782)  
History II (p. 782)  
Philosophy  
Any PHI course on the approved GEP-Humanities list.  
Arts and Letters (p. 783)  
Social Science (3 Different) (p. 784)  
Additional Social Science  

**General Education Program (GEP) Courses**

GEP Mathematical Sciences (p. 1428)  
GEP Natural Sciences (p. 1429)  
GEP Health and Exercise Studies (p. 1422)  
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)  
GEP Interdisciplinary Perspectives (p. 1426)  
GEP U.S. Diversity (p. 1431) (verify requirement)  
GEP Global Knowledge (p. 1419) (verify requirement)  

**Free Electives**

Free Electives (12 Hr S/U Lmt)  
Total Hours 120  

1 A grade of C- or higher is required.  
2 Students should consult their academic advisors to determine which courses fill this requirement.

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**FLS Literature/Culture Core**

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<td>Literature and Culture of Spain I</td>
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<td>FLS 342</td>
<td>Literature and Culture of Spain II</td>
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<td>FLS 343</td>
<td>Literature and Culture of Spain III</td>
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<td>Literature and Culture of Latin America I</td>
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<td>FLS 352</td>
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<td>FLS 353</td>
<td>Literature and Culture of Latin America III</td>
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<td>FLS 395</td>
<td>Study Abroad Programs in Spanish</td>
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**Departmental Electives 300/400 level**

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<td>HI 214</td>
<td>History and Archaeology of Ancient America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>HI 216</td>
<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<tr>
<td>HI 233</td>
<td>The World Since 1750</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>HI 270</td>
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**History I**

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<td>AFS/HI 276</td>
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**History II**

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<td>HI 208</td>
<td>The Middle Ages</td>
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HI 209  From Renaissance to Revolution: The Origins of Modern Europe 3
HI 210  Modern Europe 1815-Present 3
HI 221  British History to 1688 3
HI 222  History of British Cultures and Societies From 1688 3
HI 251  American History I 3
HI 252  American History II 3
HI 253  Early American History 3
HI 254  Modern American History 3

**Arts and Letters**

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<td>ADN 112</td>
<td>Introduction to Three-Dimensional Design</td>
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<td>ADN 212</td>
<td>Photography I</td>
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<td>ADN 281</td>
<td>Drawing I</td>
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<td>ADN 414</td>
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<td>AFS/MUS 230</td>
<td>Introduction to African-American Music</td>
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<td>AFS/MUS 260</td>
<td>History of Jazz</td>
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<td>Black Popular Culture</td>
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<td>AFS/ENG 375</td>
<td>African American Cinema</td>
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<td>Experiencing Architecture</td>
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<td>ARC 141</td>
<td>Introduction to Architectural History</td>
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<td>History of World Architecture</td>
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<td>ARS 251</td>
<td>The Arts of a World Capital: London</td>
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<td>Technology in the Arts</td>
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<td>ARS 258</td>
<td>Mathematics and Models in Music</td>
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<td>The Arts and Politics</td>
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<td>Arts and Cross-Cultural Contacts</td>
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<td>ARS 354</td>
<td>The Arts and the Sacred</td>
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<td>COM/ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
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<td>Rhetorical Criticism</td>
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<td>Introduction to Film</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>History of Film From 1940</td>
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<td>Women &amp; Film</td>
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<td>Film and Literature</td>
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<td>Analyzing Style</td>
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<td>Special Topics in Film Styles and Genres</td>
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<td>FL 216</td>
<td>Art and Society in France</td>
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<td>Italian Society Through Cinema</td>
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### Hours

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¹ Additional note: ¹ Additional note: ¹
Spring Semester
FLS 202 Intermediate Spanish II 3
History II 3
GEP Mathematical Sciences (p. 1428) 3
Social Science 3
Philosophy 3
GEP Health and Exercise Studies (p. 1422) 1

Hours 16

Second Year
Fall Semester
FLS 331 Spanish Oral and Written Expression I 3
or FLS 335
FLS 333 The Sounds of Spanish 3
GEP Natural Sciences (p. 1429) with Lab 4
Social Science 3
GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) 3

Hours 16

Spring Semester
FLS 332 Spanish Oral and Written Expression II 3
FLS 340 Introduction to Hispanic Literatures and Cultures 3
GEP Natural Sciences (p. 1429) 3
Social Science 3
Arts & Letters 3

Hours 15

Third Year
Fall Semester
FLS Literature and Culture 3
FLS Department Elective (300/400-level) 3
Free Electives 2 6
GEP Interdisciplinary Perspectives (p. 1426) 3

Hours 15

Spring Semester
GEP Interdisciplinary Perspectives (p. 1426) 2
FLS Departmental Elective (300/400-level) 3
Free Electives 2 9

Hours 14

Fourth Year
Fall Semester
FLS Departmental Elective (400-level) 3
FLS Departmental Elective (400-level) 3
Free Electives 2 9

Hours 15

Spring Semester
FLS 492 Seminar in Hispanic Studies 3
Free Electives 2 9

Hours 12

Total Hours 120

1 A grade of C- or higher is required.
2 Free Electives: Any course except MA 101, FL_101, FLS 105, LAT 101, GRK 101, and PER 101.101-level foreign-language courses can be used as free electives if they are in languages other than the language the student sues to fulfill major language requirement. Only 12 credit hours of free electives may be taken for credit only (S/U).

Study Abroad/Internship Abroad: It is strongly recommended that students participate in at least one study abroad experience to a Spanish-speaking country. Please note that no more than 15 hours of transfer credit (from a non-NCSU program) may be applied towards the major. NCSU sponsored programs count as regular coursework.

Career Opportunities
The expansion of international relations makes the knowledge of foreign languages a critical need for today’s professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

Foreign Languages and Literatures Concentration (BA): Foreign Language Education

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

All the general requirements for Bachelor of Arts degree must be met. Degree designations are B.A. in Foreign Languages and Literatures. Major concentrations in Arabic Language and Culture, Asian Language, French Language and Literatures, German Studies, Spanish Language and Literatures, and Foreign Language Education with a French, German, or Spanish option.

Outstanding students may become members of the Pi Delta Phi, French Honor Society, Sigma Delta Pi, National Hispanic Honor Society, or of Delta Phi Alpha, German Honor Society.

Plan Requirements

Foreign Languages and Literatures (BA): Foreign Language Education: 120 Total Units

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Foreign Language 492 Seminar (p. 789) ³ 3

**Education Concentration**
Advised Elective (p. 790) ³ 3
400 level Advised Elective (p. 790) ³ 3
Additional Advised Elective (p. 790) ³ 3

**Professional Education**
EDP 304 Educational Psychology ¹ 3
ELP 344 School and Society ¹ 3
ED 204 Introduction to Teaching in Today's Schools ¹ 2
ECI 204 Intro to Teaching ¹ 1
ED 311 Classroom Assessment Principles and Practices ¹ 2
ED 312 Classroom Assessment Principles and Practices ¹ 1

**Humanities & Social Sciences**
ENG 101 Academic Writing and Research ¹ 4
History I (p. 791) 3
History II (p. 791) 3
Philosophy 3

   Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 791) 3
Social Science (3 Different) (p. 792) 9

**General Education Program (GEP) Courses**
GEP Mathematical Sciences (p. 1428) 6
GEP Natural Sciences (p. 1429) 7
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement) 3
GEP Global Knowledge (p. 1419) (verify requirement) 3

**Free Electives**
Free Electives (12 Hr S/U Lmt) ² 6

Total Hours 120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

**Language & Culture Core**

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<td>Hispanic Cinema</td>
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<td>Advanced Conversation: Contemporary French Cultures</td>
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<td>French Phonetics and Pronunciation</td>
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**Literature I**

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**Foreign Language 492 Seminar**

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Select a minimum of 3 units.
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### 400 level Advised Elective

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### 400 level Advised Elective

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<td>FLS 402</td>
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<td>Spanish-English Comparative Grammar</td>
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<td>French Cultures and Contexts</td>
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<td>Cultural Artifacts in the German-Speaking Countries</td>
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### Additional Advised Elective

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<td>Art and Society in France</td>
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<td>Internship in Teaching English as a Second Language</td>
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<td>Issues and Trends in Foreign Language Education: Theory &amp; Practice</td>
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<td>Instructional Technology in Foreign Language Education: Addressing the Standards</td>
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<td>College Teaching of Foreign Languages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>British History to 1688</td>
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<td>History of British Cultures and Societies From 1688</td>
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## Arts and Letters

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# Foreign Languages and Literatures Concentration (BA): Foreign Language Education

| ENG 394 | Studies in World Literature | 3 |
| ENG 426 | Analyzing Style | 3 |
| ENG 492 | Special Topics in Film Styles and Genres | 3 |
| FL 216 | Art and Society in France | 3 |
| FLC 351 | Modern Chinese Popular Culture | 3 |
| FLF 318 | The Heritage of French Cinema | 3 |
| FLG 318 | New German Cinema and Beyond | 3 |
| FLS 318 | Italian Society Through Cinema | 3 |
| FLS 318 | Russian Cinema and Society | 3 |
| GD 203 | History of Graphic Design | 3 |
| GD 303 | Graphic Design Theory and Practice | 3 |
| HA 201 | History of Art from Caves to the Renaissance | 3 |
| HA 202 | History of Art From the Renaissance Through the 20th Century | 3 |
| HA 203 | History of American Art | 3 |
| HA/HI 240 | Introduction to Visual Culture | 3 |
| HA 298 | Special Topics in Art History | 3 |
| HA 395 | History of Art: Study Abroad | 3 |
| HI 401 | 19th Century European Art from Revolution to Post-Impressionism | 3 |
| HA 404 | Italian Renaissance Art and Material Culture | 3 |
| HA 498 | Independent Study in History of Art | 1-6 |
| HESM 322 | Dance and Society | 3 |
| HESM 324 | Concert Dance History | 3 |
| HESM 326 | Current Trends in Dance | 3 |
| HI/REL 320 | Religion in American History | 3 |
| HI 402/502/ | Early Christianity to the Time of Eusebius | 3 |
| REL 402/502 | | |
| HI 408/508/ | Islam in the Modern World | 3 |
| REL 408/508 | | |
| HI 407/507/ | Islamic History to 1798 | 3 |
| REL 407/507 | | |
| HON 390 | Music and the Celtic World | 3 |
| IDS 496 | Topics in Film and Interdisciplinary Studies | 3 |
| LAR 444 | History of Landscape Architecture | 3 |
| MUS 105 | Introduction to Music in Western Society | 3 |
| MUS 180 | Introduction to Musical Experiences | 3 |
| MUS 181 | Exploring Music Theory | 3 |
| MUS 200 | Understanding Music: Global Perspectives | 3 |
| MUS 201 | Introduction to Music Literature I | 3 |
| MUS 202 | Introduction to Music Literature II | 3 |
| MUS 206 | America’s Music | 3 |
| MUS 310 | Music of the 17th and 18th Centuries | 3 |
| MUS 315 | Music of the 19th Century | 3 |
| MUS 320 | Music of the 20th Century | 3 |
| MUS 330 | Survey of Musical Theater | 3 |
| MUS 350 | Music of Asia | 3 |
| MUS/WGS 360 | Women in Music | 3 |
| REL 200 | Introduction to the Study of Religion | 3 |
| REL 210 | Religious Traditions of the World | 3 |
| REL 220 | Religion in the Contemporary World | 3 |
| REL 230 | Asian Religions | 3 |
| REL 298 | Special Topics in Religious Studies | 3 |
| REL/SOC 309 | Religion and Society | 3 |
| REL 311 | Introduction to the Old Testament | 3 |
| REL 312 | Introduction to the New Testament | 3 |
| REL 314 | Introduction to Intertestamental Literature | 3 |
| REL 317 | Christianity | 3 |
| REL 323 | Religious Cults, Sects, and Minority Faiths in America | 3 |
| REL 327 | Issues in Contemporary Religion | 3 |
| REL 331 | The Hindu Tradition | 3 |
| REL 332 | The Buddhist Traditions | 3 |
| REL 333 | Chinese Religions | 3 |
| REL 334 | Japanese Religions | 3 |
| REL 340 | Islam | 3 |
| REL 350 | Introduction to Judaism | 3 |
| REL 383 | Religion, Globalism, and Justice | 3 |
| REL 412/512 | Advanced Readings in the Christian Gospels | 3 |
| REL 413/513 | The Life and Letters of the Apostle Paul | 3 |
| REL 423/523 | Religion and Politics in America | 3 |
| REL 424/524 | Religion and Politics in Global Perspective | 3 |
| REL 471/571/ | Darwinism and Christianity | 3 |
| STS 471/571 | | |
| REL 472/572/ | Women and Religion | 3 |
| REL 473/573 | Religion, Gender, and Reproductive Technologies | 3 |
| REL 482/582 | Religion and Conflict | 3 |
| REL 489/589 | Interpretations of Religion | 3 |
| REL 496 | Seminar in Religious Studies | 3 |
| REL 498/598 | Special Topics in Religious Studies | 1-6 |
| THE 103 | Introduction to the Theater | 3 |
| THE 203 | Theory and Practice of Acting | 3 |
| THE 303 | Stage Directing | 3 |
| THE 334 | Advanced Acting | 3 |
| THE 340 | African American Theatre | 3 |

## Social Science

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ANT 370 Introduction to Forensic Anthropology 3
ANT 371 Human Variation 3
ANT 374 Disease and Society 3
ANT 389 Fundamentals of Archaeological Research 3
ANT 395 Special Topics in Anthropology 1-3
ANT 411 Overview of Anthropological Theory 3
ANT 412 Applied Anthropology 3
ANT 416 Research Methods in Cultural Anthropology 3
ANT 419 Ethnographic Field Methods 3
ANT 421 Human Osteology 3
ANT 422 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 424 Bioarchaeology 3
ANT 427 Bioarchaeological Fieldwork 3
ANT 428 Human Paleopathology 3
ANT 431 Tourism, Culture and Anthropology 3
ANT 433 Anthropology of Ecotourism and Heritage Conservation 3
ANT 444 Cross-Cultural Perspectives on Women 3
ANT 450 Culture, Ecology, and Sustainable Living 3
ANT 460 Urban Anthropology 3
ANT 461 Wealth, Poverty and International Aid 3
ANT 464 Anthropology of Religion 3
ANT 471 Understanding Latino Migration 3
ANT 475 Environmental Archaeology 3
ANT 483 Theories of Archaeological Research 3
ANT 495 Special Topics in Anthropology 3
ANT 496 Anthropology Internship 6
ANT 498 Independent Study in Anthropology 1-6
ANT 501 Proseminar: Introduction to Graduate Studies in Anthropology 3
ANT 511 Overview of Anthropological Theory 3
ANT 512 Applied Anthropology 3
ANT 516 Research Methods in Cultural Anthropology 3
ANT 521 Human Osteology 3
ANT 522 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 524 Bioarchaeology 3
ANT 528 Human Paleopathology 3
ANT 529 Advanced Methods in Forensic Anthropology 4
ANT 531 Tourism, Culture and Anthropology 3
ANT 533 Anthropology of Ecotourism and Heritage Conservation 3
ANT 544 Cross-Cultural Perspectives on Women 3
ANT 550 Culture, Ecology, and Sustainable Living 3
ANT 560 Urban Anthropology 3
ANT 561 Wealth, Poverty and International Aid 3
ANT 564 Anthropology of Religion 3
ANT 571 Understanding Latino Migration 3
ANT 575 Environmental Archaeology 3
ANT 583 Theories of Archaeological Research 3
ANT 585 Skeletal Biology in Anthropology 3
ANT 587 Cultural Resource Management 3

ANT 595 Special Topics in Anthropology 1-6
ANT 598 Independent Study in ANT 1-3
FLJ 351 Contemporary Culture in Japan 3
HI 587 Cultural Resource Management 3
IS 471 Understanding Latino Migration 3
IS 571 Understanding Latino Migration 3
SOC 261 Technology in Society and Culture 3
WGS 444 Cross-Cultural Perspectives on Women 3
WGS 544 Cross-Cultural Perspectives on Women 3

Agricultural Economics

ARE 121 Agricultural Finance 3
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
ARE 215 Small Business Accounting 3
ARE 260 Marketing and Risk Management in the Pork Industry 1
ARE 270 Principles of Agribusiness Entrepreneurship 3
ARE 290 Professional Development in Agricultural Business Management 3
ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 1-6
ARE 301 Intermediate Microeconomics 3
ARE 303 Farm Management 3
ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
ARE 323 Agribusiness Finance 3
ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
ARE 345 Global Agribusiness Management 3
ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
ARE 475 Food Policy 3
ARE 490 Career Seminar in Agriculture & Resource Economics 3
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**Economics**

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**Political Science**

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</tr>
<tr>
<td>Spring Semester</td>
<td>Student Teaching in Modern Foreign Languages</td>
<td>12</td>
</tr>
<tr>
<td>ECI 424</td>
<td>Student Teaching in Modern Foreign Languages</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hours</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Total Hours</td>
<td>120</td>
</tr>
</tbody>
</table>

1 A grade of C or above is required for these courses.

All Education students must pass the Praxis II Subject Area tests.

**Study Abroad/Internship Abroad:** It is strongly recommended that students participate in at least one study abroad experience to a Spanish-speaking country. Please note that no more than 15 hours of transfer credit (from a non-NCSU program) may be applied towards the major. NCSU sponsored programs count as regular coursework. FLG students are required to study abroad no later than the Junior Year.

**Professional Education Component:** A grade of C or above is required for these courses. ED/FL 299 fieldwork is taken the semester after Introduction to 21st Century Teaching (ED 204 and ECI 204).

**Admission to Candidacy and Professional Year** All FLL Education candidates must be admitted to candidacy by the beginning of the fall semester of Methods Course. All required coursework to be completed prior to student teaching.

**Career Opportunities**

The expansion of international relations makes the knowledge of foreign languages a critical need for today's professional. The student of foreign languages is not limited to teaching, translating or interpreting. There are careers in politics, diplomacy, commerce, business, agriculture, science, and research in which a thorough knowledge of foreign languages and cultures is crucial for success. The demand for multilingual personnel extends to all fields of human enterprise and will continue to grow in the coming years.

**French (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The objective of the minor in a foreign language is to enable students majoring in any field to acquire proficiency in a second language, understanding the culture, and knowledge of the countries in which the language is spoken.

**Admissions**

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor's signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student's minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

**Certification**

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/), 321 Withers), to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

**Contact Person**

Dr. Scott Despain
319 Withers Hall
919-513-1482
despain@ncsu.edu

**Plan Requirements**

- Completion of 15 credit hours is required.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- The Department of Foreign Languages and Literature will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
- A grade of ‘C-’ or better is required in all courses in the minor program.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

**Code** | **Title**                                           | **Hours** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FLF 201</td>
<td>Intermediate French I</td>
<td>3</td>
</tr>
<tr>
<td>or</td>
<td>FLF 212 French: Language, Culture, and Technology</td>
<td></td>
</tr>
<tr>
<td>FLF 202</td>
<td>Intermediate French II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Courses**

Select three additional upper-division (300-400-level) courses in French 1

| Total Hours | 15 |

1 of which must be a course in film, literature or civilization

French literature courses also satisfy the College of Humanities and Social Sciences (CHASS) literature requirement and may satisfy literature or humanities electives in many other majors.

**German (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The objective of the minor in a foreign language is to enable students majoring in any field to acquire proficiency in a second language,
understanding the culture, and knowledge of the countries in which the language is spoken.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey), to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Lutz Kube
225 Withers
919.515.9280
lkube@ncsu.edu

Plan Requirements

• Completion of 15 credit hours is required.
• 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
• The Department of Foreign Languages and Literatures will determine which courses transferred from other institutions may qualify in meeting requirements for the minor, as well as the number of transfer credits permitted to meet program requirements.
• It is required that students complete at least three (3) courses either at NC State or at an NC State sponsored study-abroad program.
• A grade of ‘C’ or better is required in all courses in the minor program.
• A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.
• No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

Elective Courses

Select three of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARS 252</td>
<td>The Arts of Vienna 1900</td>
<td></td>
</tr>
<tr>
<td>FLG 301</td>
<td>Advanced German</td>
<td>2</td>
</tr>
<tr>
<td>FLG 302</td>
<td>German Oral and Written Expression</td>
<td>2</td>
</tr>
<tr>
<td>FLG 307</td>
<td>Business German</td>
<td>2</td>
</tr>
<tr>
<td>FLG 311</td>
<td>Introduction to German Translation</td>
<td>2</td>
</tr>
<tr>
<td>FLG 315</td>
<td>Germanic Civilization and Culture</td>
<td></td>
</tr>
<tr>
<td>FLG 318</td>
<td>New German Cinema and Beyond</td>
<td></td>
</tr>
<tr>
<td>FLG 320</td>
<td>Introduction to German Literature</td>
<td></td>
</tr>
<tr>
<td>FLG 323</td>
<td>Twentieth Century German Literature</td>
<td></td>
</tr>
<tr>
<td>FLG 325</td>
<td>German Lyric Poetry</td>
<td></td>
</tr>
<tr>
<td>FLG 390</td>
<td>German Studies Topics</td>
<td></td>
</tr>
<tr>
<td>FLG 398</td>
<td>Independent Study in German</td>
<td></td>
</tr>
<tr>
<td>FLG 420</td>
<td>Current Issues in German-Language Media</td>
<td></td>
</tr>
<tr>
<td>FLG 430</td>
<td>Cultural Artifacts in the German-Speaking Countries</td>
<td></td>
</tr>
<tr>
<td>FLG 440</td>
<td>Green Germany: Nature and Environment in German Speaking Cultures</td>
<td></td>
</tr>
<tr>
<td>FLG 492</td>
<td>Senior Seminar in German Studies</td>
<td></td>
</tr>
<tr>
<td>FLG 499</td>
<td>Internship in Germany, Austria, or German-Speaking Switzerland</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 15

1 If placing at the FLG 300 level through the NC State Placement Exam, you will need to take an additional course at the 300 or 400 level in order to assemble the 15 credits for the minor.
2 No more than two (2) courses may be selected from the language skill courses FLG 301 Advanced German, FLG 302 German Oral and Written Expression, FLG 307 Business German, FLG 311 Introduction to German Translation.

Hindi-Urdu (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Students majoring in any area of study at NC State are eligible to minor in Hindi-Urdu. The minor in Hindi-Urdu provides students with an understanding of South Asian language, culture, history, and religious traditions, and gives students a foundation from which to explore the relation between the nations of South Asia and others throughout the world. Students who intend to work overseas or in multicultural settings and firms within the United States will find this minor very useful.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
</tr>
<tr>
<td>FLG 3XX/4XX ¹</td>
<td></td>
</tr>
<tr>
<td>FLG 202</td>
<td>Intermediate German II</td>
</tr>
<tr>
<td>or FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
</tr>
</tbody>
</table>
Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/)), 321 Withers, to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Sujata S. Mody
417 Withers Hall
919.515.9315
ssmody@ncsu.edu

SIS Code: 16HINDIM

Plan Requirements

- Completion of at least 15 credit hours.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- All courses for the minor must be completed with a grade of ‘C-’ or better.
- Students must demonstrate tested oral and written proficiency in Hindi-Urdu at the FLN 302 Modern Hindi & Urdu Poetry level. This requirement will normally be met by the successful completion of FLN 301 Twentieth Century Hindi & Urdu Fiction and FLN 302 Modern Hindi & Urdu Poetry with a grade of ‘C-’ or better.
- Students are expected to have mastered either the Hindi or Urdu writing systems, but not necessarily both.
- No more than 6 transfer credits may be applied toward the Minor requirement.
- Credit earned on the NC State Summer in India Study Abroad Program may be counted toward the Minor requirement.
- Courses taken in non-NC State Study Abroad or Summer Language Programs may be counted toward the minor but are subject to the transfer credit limit.
- Prerequisite courses (e.g. FLN 101 Elementary Hindi-Urdu I, FLN 102 Elementary Hindi-Urdu II) will be in addition to the hours required for the minor.
- Hindi-Urdu language drill courses (FLN 103 Elementary Hindi-Urdu I Conversation, FLN 104 Elementary Hindi-Urdu II Conversation, FLN 203 Intermediate Hindi-Urdu I Conversation, FLN 204 Intermediate Hindi-Urdu II Conversation) are in addition to the Minor requirement.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLN 301</td>
<td>Twentieth Century Hindi &amp; Urdu Fiction (offered Fall semester)</td>
<td>3</td>
</tr>
<tr>
<td>FLN 302</td>
<td>Modern Hindi &amp; Urdu Poetry (offered Spring semester)</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select three of the following: 9

<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLN 201 Intermediate Hindi-Urdu I 1</td>
</tr>
<tr>
<td>FLN 202 Intermediate Hindi-Urdu II 1</td>
</tr>
<tr>
<td>REL 230 Asian Religions</td>
</tr>
<tr>
<td>REL 331 The Hindu Tradition</td>
</tr>
<tr>
<td>HI 474 Modern India</td>
</tr>
<tr>
<td>PS 343 Government and Politics in South Asia</td>
</tr>
</tbody>
</table>

Total Hours 15

1 Note: Students who have taken the proficiency examination and placed out of FLN 201 Intermediate Hindi-Urdu I and/or FLN 202 Intermediate Hindi-Urdu II may not count these courses toward the Minor.

These courses may not be offered every semester or every year. Check the Schedule of Courses. With the Minor advisor’s approval, additional South Asia-related courses offered as Special Topics in Foreign Languages, World Literature, History, and Religion Studies may be used to fulfill the elective course requirement.

Italian Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The objective of the minor in a foreign language is to enable students majoring in any field to acquire proficiency in a second language, understanding the culture, and knowledge of the countries in which the language is spoken.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis 919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/), 321 Withers, to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.
Contact Person
Anna Rita Bonaduce-Dresler
Withers Hall 222, Box 8106
919.515.9294
arbonadu@ncsu.edu

SIS Code: 16ITM

Plan Requirements
- Completion of 15 credit hours is required.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- The Department of Foreign Languages and Literature will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
- A grade of ‘C-’ or better is required in all courses in the minor program.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLI 201</td>
<td>Intermediate Italian I</td>
<td>3</td>
</tr>
<tr>
<td>FLI 202</td>
<td>Intermediate Italian II</td>
<td>3</td>
</tr>
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</table>

Elective Courses
Select two of the following: 6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLI 208</td>
<td>Intermediate Italian Conversation</td>
<td></td>
</tr>
<tr>
<td>FLI 308</td>
<td>Italian Reading and Conversation</td>
<td></td>
</tr>
<tr>
<td>FL 295</td>
<td>Special Topics in Foreign Languages and/or Literatures</td>
<td></td>
</tr>
<tr>
<td>FL 298</td>
<td>Independent Study in Foreign Language or Literature</td>
<td></td>
</tr>
<tr>
<td>FLI 318</td>
<td>Italian Society Through Cinema</td>
<td></td>
</tr>
<tr>
<td>FL 495</td>
<td>Special Topics in Foreign Languages and Literatures</td>
<td></td>
</tr>
<tr>
<td>FL 498</td>
<td>Independent Study in Foreign Language or Literature</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following: 3

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLI 315</td>
<td>Italian Civilization and Culture</td>
<td></td>
</tr>
<tr>
<td>FLI 318</td>
<td>Italian Society Through Cinema</td>
<td></td>
</tr>
<tr>
<td>HI 410</td>
<td>Italian Renaissance</td>
<td></td>
</tr>
<tr>
<td>HI 418</td>
<td>Fascist Italy and Nazi Germany</td>
<td></td>
</tr>
<tr>
<td>HA 201</td>
<td>History of Art from Caves to the Renaissance</td>
<td></td>
</tr>
<tr>
<td>HA 202</td>
<td>History of Art From the Renaissance Through the 20th Century</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 15

Japan Studies (Minor)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Over the next two decades, the nations of the Pacific Rim will continue to grow and exert global influence in the areas of culture, business and economics, international relations. The Japan Studies Minor provides students with an understanding of the language, culture and history of Japan and gives students a foundation on which to explore the future of this nation and its relations with others through out the world. Students of any major who intend to work overseas or in multicultural settings and firms within the United States will find this minor very useful.

Admissions
Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification of Minor
A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/), 321 Withers), to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person
John Mertz
402 Withers
919.515.9297
john_mertz@ncsu.edu

SIS Code: 16JSM

Plan Requirements
- 18 hours (6 courses) of course work.
- 6 hours (2 courses) of Japanese language instruction at or above the FLJ 201 Intermediate Japanese I level.
- Tested language competency of FLJ 202 Intermediate Japanese II or greater.
- A minimum grade of ‘C’ for all courses taken toward the completion of the minor.
- A maximum of two (2) course may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.
Japanese (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The objective of the minor in a foreign language is to enable students majoring in any field to acquire proficiency in a second language, understanding the culture, and knowledge of the countries in which the language is spoken.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/ registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/), 321 Withers), to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

John Mertz
402 Withers
919.515.9297
john_mertz@ncsu.edu

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### Middle East Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Middle East Studies Minor complements majors in all disciplines, including the sciences, humanities, business, and engineering by providing an interdisciplinary study of a vibrant and critical region of the world. It provides students with an in-depth understanding of the region, its languages, peoples, histories, and cultures. The minor enhances student employment opportunities in both public and private sectors. It also facilitates the development of skills necessary to work and live successfully in the Middle East. Study Abroad and internship programs in the Middle East are offered to encourage and support student engagement in the region. Students can tailor the Minor to suit their individual interests. No courses for the minor may be taken for S/U credit.

As part of the minor, students are strongly encouraged to participate in Study Abroad Program in the Middle East; however, this is not required.

Admissions and Certification of Minor

Jodi Stewart Khater will be responsible for advising students in the Middle East Studies Minor. Students must submit an “Application for Minor” form to Jodi Stewart Khater, the Program Administrator, at any time prior to the end of the pre-registration period of the student’s final semester. Prior to the end of the first week of the student’s final semester, the students must sign the application form, indicating all grades received for the
courses completed in the minor program and courses to be taken during
the student’s final semester.

Contact Person

Jodi Stewart Khater
411 Withers hall
919.515.2509
jskhater@ncsu.edu

Plan Requirements

• Completion of 15 credit hours as required.
• 9 Credit hours must be taken at NC State and a maximum of six
  (6) credit hours may be transferred into the minor from another
  institution.
• A maximum of two (2) courses may be used (double-counted)
  towards both departmental major requirements and minor
  requirements.
• A minimum of C- is required for all courses.
• No courses for the minor may be taken for S/U credit.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Course</td>
<td>Select one of the following 201-level Middle Eastern language courses: 1</td>
<td>3</td>
</tr>
<tr>
<td>FLA 201</td>
<td>Intermediate Arabic I</td>
<td></td>
</tr>
<tr>
<td>PER 201</td>
<td>Intermediate Persian I</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective Courses</th>
<th>Select four of the following: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 395</td>
<td>Special Topics in Anthropology (appropriate Middle East offerings per approval of the minor advisor)</td>
</tr>
<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
</tr>
<tr>
<td>HI 270</td>
<td>Modern Middle East</td>
</tr>
<tr>
<td>HI 370</td>
<td>Modern Egypt</td>
</tr>
<tr>
<td>HI 400</td>
<td>Civilization of the Ancient Near East</td>
</tr>
<tr>
<td>HI 419</td>
<td>Modern European Imperialism</td>
</tr>
<tr>
<td>HI 465</td>
<td>Oil and Crisis in the Gulf</td>
</tr>
<tr>
<td>HI 466</td>
<td>History of the Palestinian-Israeli Conflict</td>
</tr>
<tr>
<td>HI 477</td>
<td>Women in the Middle East</td>
</tr>
<tr>
<td>HI 454/554</td>
<td>History of U.S. Foreign Relations, 1900-Present</td>
</tr>
<tr>
<td>HI 491</td>
<td>Seminar in History (topic must be related to Middle East and approved by Program Administrator)</td>
</tr>
<tr>
<td>HI 498</td>
<td>Independent Study in History (appropriate Middle East offerings per approval of the minor advisor)</td>
</tr>
<tr>
<td>FLA 202</td>
<td>Intermediate Arabic II</td>
</tr>
<tr>
<td>FLA 301</td>
<td>Advanced Intermediate Arabic I</td>
</tr>
<tr>
<td>FLA 330</td>
<td>Media Arabic</td>
</tr>
<tr>
<td>FLF 425</td>
<td>Literature, Cinema and Culture of the Francophone World</td>
</tr>
<tr>
<td>FL 295</td>
<td>Special Topics in Foreign Languages and/or Literatures (appropriate Middle East offerings per approval of the minor advisor)</td>
</tr>
<tr>
<td>FL 498</td>
<td>Independent Study in Foreign Language or Literature (appropriate Middle East offerings per approval of the minor advisor)</td>
</tr>
</tbody>
</table>

Total Hours 15

1 Demonstrated 201 equivalency in Turkish or Hebrew (not currently taught at NCSU, but transfer credit and/or proficiency may be applied as determined by the Middle East Studies minor advisor).

Important Notes regarding the required language course:

• Most students will need to take the 101/102 series of language courses prior to their enrollment in the required 201 course, and
  should plan their schedules accordingly.
• The Student may waive the Language Course requirement by showing proficiency at the 201 level in a Middle Eastern language.
  Please contact the Middle East Studies minor advisor to make an appointment for the proficiency test.
• Related language courses taken at NCSU above the 201 level may be counted as elective courses for the Middle East Studies minor.

Notes:

• Students are required to obtain the approval of the minor advisor for special topics courses before enrolling in such courses.
• Middle East language courses that are above 201 can also be counted as part of the 12 credit hour requirement.
• Courses taken as part of the 12 credit hour requirement must be from 2 or more different departments.

Portuguese Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Admissions

Students first download a Minor Declaration Form and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis
Plan Requirements

- Completion of 15 credit hours is required.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- The Department of Foreign Languages and Literature will determine which courses transferred from other institutions may qualify to meet requirements for the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLP 201</td>
<td>Intermediate Portuguese I</td>
<td>3</td>
</tr>
<tr>
<td>FL 295</td>
<td>Special Topics in Foreign Languages and/or Literatures</td>
<td>3</td>
</tr>
<tr>
<td>FLP 401 or FL 295</td>
<td>Brazilian Portuguese for Spanish Speakers</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select two of the following: 6

- ANT 325 Andean South America
- ANT 330 Peoples and Cultures of Africa
- AFS 240 African Civilization
- AFS 342 Introduction to the African Diaspora
- AFS 343 African American Religions
- FOR 414 World Forestry
- HI 215 Latin America to 1826
- HI 216 Latin America Since 1826
- HI 276 Introduction to History of West Africa
- HI 453 United States-Latin American Relations Since 1823
• A grade of ‘C-‘ or better is required in all courses in the minor program.
• A maximum of two (2) course may be used (double-counted) towards both departmental major requirements and minor requirements.
• No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLR 201</td>
<td>Intermediate Russian I</td>
<td>12</td>
</tr>
<tr>
<td>FLR 202</td>
<td>Intermediate Russian II</td>
<td></td>
</tr>
<tr>
<td>FLR 303</td>
<td>Russian Literature in Translation: The Nineteenth Century ¹</td>
<td></td>
</tr>
<tr>
<td>FLR 304</td>
<td>Russian Literature in Translation: The Twentieth Century ¹</td>
<td></td>
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</tbody>
</table>

Elective Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL 295</td>
<td>Special Topics in Foreign Languages and/or Literatures (Russian)</td>
<td>3</td>
</tr>
<tr>
<td>FLR 318</td>
<td>Russian Cinema and Society</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 15

¹ Russian literature courses also satisfy the College of Humanities and Social Sciences (CHASS) literature requirement and may satisfy literature or humanities electives in many other majors. Check your Automatic Degree Audit for a listing of acceptable literature courses or consult with the advisor for your major to see how these courses may be used in your degree.

Spanish (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The objective of the minor in a foreign language is to enable students majoring in any field to acquire proficiency in a second language, understanding the culture, and knowledge of the countries in which the language is spoken.

Admissions

Students first download a Departmental Minor Declaration Form (https://cdn.chass.ncsu.edu/sites/fll.chass.ncsu.edu/documents/Minor_Declaration_Form_8_15.pdf) and consult with their major advisor for approval of the minor program. After the student obtains the major advisor’s signature, he/she meets with the minor advisor to develop a plan of study indicating required courses and expected dates of completion. A copy of the student’s minor plan of study will be kept on file in the Department of Foreign Languages and Literatures.

Certification

A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. Students should meet with the Coordinator of Advising, Ms. Susan Navey-Davis (919.515.9288, https://fll.chass.ncsu.edu/people/faculty_staff/navey (https://fll.chass.ncsu.edu/people/faculty_staff/navey/)), 321 Withers Hall, to complete the final certification. Students will receive official recognition on their transcripts for the completed minor.

Contact Person

Dr. Mark Darhower
Spanish Upper Division Coordinator
Dept. Foreign Languages and Literatures
405 Withers Hall, Campus Box 8106
Raleigh, NC 27695
919.513.4807
mark_darhower@ncsu.edu

SIS Code: 16SPM

Plan Requirements

• Completion of 15 credit hours is required.
• At least nine of the 15 credits must be above the 200 level.
• Nine credit hours must be taken at NC State. A maximum of six (6) credit hours may be transferred into the minor from another institution.
• The Department of Foreign Languages and Literatures will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
• A maximum of six credits from a non-NC State study abroad program may count towards the minor. Credits earned in NC State-sponsored study abroad programs for Spanish count as if they were earned on the NC State campus.
• A grade of ‘C-‘ or better is required in all courses in the minor program and an overall GPA of 2.0 must be maintained in the minor courses.
• All courses in the minor must be taken for a letter grade. Credit-only (S/U) grade is not permitted.
• A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
• No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLS 202</td>
<td>Intermediate Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>FLS 331</td>
<td>Spanish Oral and Written Expression I</td>
<td>3</td>
</tr>
<tr>
<td>FLS 332</td>
<td>Spanish Oral and Written Expression II</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select two of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture ¹</td>
<td></td>
</tr>
<tr>
<td>FLS 295</td>
<td>Intermediate Special Topics in Spanish ¹</td>
<td></td>
</tr>
<tr>
<td>FLS 333</td>
<td>The Sounds of Spanish ²</td>
<td></td>
</tr>
<tr>
<td>FLS 336</td>
<td>Spanish for Business ²</td>
<td></td>
</tr>
<tr>
<td>FLS 337</td>
<td>Spanish for Tourism in the Hispanic World ²</td>
<td></td>
</tr>
<tr>
<td>FLS 340</td>
<td>Introduction to Hispanic Literatures and Cultures ²</td>
<td></td>
</tr>
<tr>
<td>FLS 341</td>
<td>Literature and Culture of Spain I ²</td>
<td></td>
</tr>
<tr>
<td>FLS 342</td>
<td>Literature and Culture of Spain II ²</td>
<td></td>
</tr>
<tr>
<td>FLS 343</td>
<td>Literature and Culture of Spain III ²</td>
<td></td>
</tr>
<tr>
<td>FLS 351</td>
<td>Literature and Culture of Latin America I ²</td>
<td></td>
</tr>
</tbody>
</table>
Teaching English as a Foreign Language (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The objective of a minor in Teaching English as a Foreign Language (TEFL) is to enable students to acquire a deeper understanding of English as an international language and formal training in teaching English as a foreign language in various cultural and/or educational contexts.

Contact Person

Jillian S. Haeseler
325 Withers Hall
919.515.9299

Effective Date: 1/2019

SIS code: 16TEFLM

Plan Requirements

- Completion of 15 credit hours is required.
- 9 Credit hours must be taken at NC State and a maximum of six (6) credit hours may be transferred into the minor from another institution.
- The Department of Foreign Languages and Literatures will determine which courses transferred from other institutions may qualify in meeting requirements for the minor, as well as the number of transfer credits permitted to meet program requirements.
- It is required that students complete at least three (3) courses either at NC State or at an NC State sponsored study-abroad program.
- A grade of ‘C-‘ or better is required in all courses in the minor program.

- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

Students may declare the minor when they are enrolled in a class that counts toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL 424</td>
<td>Linguistics for ESL Professionals</td>
<td>3</td>
</tr>
<tr>
<td>FL 436</td>
<td>Perspectives on English as a New Language</td>
<td>3</td>
</tr>
<tr>
<td>FL 427</td>
<td>Methods and Materials in Teaching English as a Second Language</td>
<td>3</td>
</tr>
<tr>
<td>ENG 326</td>
<td>History of the English Language</td>
<td>3</td>
</tr>
<tr>
<td>FL 440</td>
<td>Internship in Teaching English as a Second Language</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select one of the following:

- ENG 325 | Spoken and Written Traditions of American English Dialects | 3 |
- ENG 326 | History of the English Language | |
- ENG 327 | Language and Gender | |
- ENG 328 | Language and Writing | |
- ENG 329 | Language and Globalization | |

Total Hours | 18 |

Department of History

The study of History provides students with a sense of the complexity and contingency of events in an ever-changing world. It provides rich and diverse perspectives. It informs us about the prevalence of unintended consequences. Our goal is to foster independent, research-based judgment of human behavior, similarities, and difference. The Department of History at NC State brings alive the treasure of diverse human experiences and cultures, from the ancient near East to the post-Cold War world, from medieval life to modern science and technology, from the ancient Americas to the modern United States.

Undergraduate students have the choice to study a wide range of historical topics or to follow a particular interest in clusters of electives. We pride ourselves on outstanding teaching, and we offer small classes that allow a great deal of individual attention.

Department Highlights:

- Our faculty connect students to current historical scholarship. Faculty members have a strong record of teaching awards, grant and fellowship awards, publications, and public outreach.
- Students in our programs can receive credit for a professional internship for research or outreach work in agencies, organizations, or museums.
- The departmental Honors Program guide highly qualified and motivated students through individual, directed study with a faculty mentor, producing an Honors Thesis of original research.
- High-achieving History students are invited to join the NC State chapter of Phi Alpha Theta, the national honor society for the promotion of the study of history.
The History Club (https://getinvolved.ncsu.edu/organization/historyclub) provides opportunity to meet and engage with fellow students and explore interests in history in an informal setting.

For more information about our department, including contact information, visit our website (https://history.ncsu.edu/).

Contact

Dr. David Zonderman
Professor and Department Head
North Carolina State University
350 Withers Hall, Box 8108
Raleigh, NC 27695-8108
Phone: 919-515-2483
Email: david_zonderman@ncsu.edu

Faculty

Head
D. A. Zonderman

Associate Head and Director of Undergraduate Programs
W. C. Kimler

Assistant Department Head for Student Affairs
D. Bruno

Director of the Public History Program
T. S. Gordon

Director of Graduate Programs
B. S. Sirota

Director of the Honors Program
D. Bruno

Scheduling Officer
K. Mellen Charron

Distinguished Professor
D. P. Gilmartin

Alumni Distinguished Graduate Professor
C. T. Friend

Alumni Distinguished Undergraduate Professor
W. C. Kimler
D. A. Zonderman

Professors
D. R. Ambaras
R. S. Bassett
C. T. Friend
D. P. Gilmartin
T. S. Gordon
H. S. Hurlburt
A. F. Khater
M. G. Kim
K. P. Luria
N. Mitchell
S. T. Parker
J. E. Rudolph
K. S. Vincent
D. A. Zonderman

Associate Professor
M. M. Booker
K. Mellen Charron
M. L. Cherry
B. L. M. Kelley
W. C. Kimler
S. M. Lee
J. L. Mell
B. S. Sirota
N. B. Strote

Assistant Professor
X. Duan
F. Freitas
History (BA)

The Bachelor of Arts in History offers a broad educational experience that also provides essential skills of critical reading, research, judgment, and perspective. These are skills that employers seek in a wide range of fields. The small department offers a “small college” experience within the wealth of NC State’s diverse offerings and opportunities.

The curriculum offers a great deal of student choice in courses and electives. Flexibility of requirements allows the pursuit of either a diverse experience or a focused, thematic study. Your advisor can help you explore how you might build a thematic interest into your course selection. There are opportunities for guided research experiences and professional internship. Free electives in the curriculum make it straightforward to complete a Minor in one of the many disciplines at NC State.

For more information about his program, visit our website (https://history.ncsu.edu/undergrad/).

Plan Requirements

**History (BA):** 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
</table>
| ENG 101  | Academic Writing and Research 
| History I & History Breadth (p. 808) | 6     |
| History II & History Breadth (p. 808) | 6     |
| Literature I (p. 809) | 3     |
| Literature II (p. 809) | 3     |

1. These courses are part of the Humanities & Social Sciences requirement.
History (BA)

Foreign Language 200 Level (p. 810) 3
Philosophy 3
   Any PHI course on the approved GEP-Humanities list.
Arts and Letters (p. 810) 3
Social Science (3 Different) (p. 812) 9
Additional Social Science 3

Departmental Requirements
Pre 1600 Co-Requisite (verify requirement) (p. 815) 1
HI 300  Sophomore Seminar in History  3
Departmental Advanced Elective (p. 815) 1 9
Department Electives  9

Three (3) courses selected from HI 3xx or HI 4xx level, or HA 3xx or HA 4xx level (excluding HI 300 and HI 491).

HI 491  Seminar in History  3

General Education Program (GEP) Courses
GEP Mathematical Sciences (p. 1428) 6
GEP Natural Sciences (p. 1429) 7
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2 30
Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

History I & History Breadth

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI 275</td>
<td>Introduction to History of South and East Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 276</td>
<td>Introduction to History of West Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 317</td>
<td>Cuba Today: Historical and Sociopolitical Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>HI 318</td>
<td>Environmental History of Cuba: Prehistory to the Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 370</td>
<td>Modern Egypt</td>
<td>3</td>
</tr>
<tr>
<td>HI 371</td>
<td>Modern Japan, 1850 to Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 374</td>
<td>Visual Culture of Modern South Asia</td>
<td>3</td>
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</table>

History II & History Breadth

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>HI 205</td>
<td>Western Civilization Since 1400</td>
<td>3</td>
</tr>
<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
<td>3</td>
</tr>
<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
<td>3</td>
</tr>
<tr>
<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 221</td>
<td>British History to 1688</td>
<td>3</td>
</tr>
<tr>
<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
<td>3</td>
</tr>
<tr>
<td>HI 321</td>
<td>Scientific Revolution and European Society, 1500-1800</td>
<td>3</td>
</tr>
<tr>
<td>HI 322</td>
<td>Rise of Modern Science</td>
<td>3</td>
</tr>
<tr>
<td>HI 324</td>
<td>History of Common Law and Constitution</td>
<td>3</td>
</tr>
<tr>
<td>HI 332</td>
<td>Germany and the World Wars</td>
<td>3</td>
</tr>
<tr>
<td>HI 338</td>
<td>Empire, War, and Revolution in Russia</td>
<td>3</td>
</tr>
</tbody>
</table>

American History

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFS 372</td>
<td>African-American History Through the Civil War, 1619-1865</td>
<td>3</td>
</tr>
<tr>
<td>AFS 373</td>
<td>African-American History Since 1865</td>
<td>3</td>
</tr>
<tr>
<td>HI 251</td>
<td>American History I</td>
<td>3</td>
</tr>
<tr>
<td>HI 252</td>
<td>American History II</td>
<td>3</td>
</tr>
<tr>
<td>HI 253</td>
<td>Early American History</td>
<td>3</td>
</tr>
<tr>
<td>HI 254</td>
<td>Modern American History</td>
<td>3</td>
</tr>
<tr>
<td>HI 320</td>
<td>Religion in American History</td>
<td>3</td>
</tr>
<tr>
<td>HI 345</td>
<td>American Popular Culture</td>
<td>3</td>
</tr>
<tr>
<td>HI 346</td>
<td>The Civil War Era in Popular Culture</td>
<td>3</td>
</tr>
<tr>
<td>HI 350</td>
<td>American Military History</td>
<td>3</td>
</tr>
<tr>
<td>HI 351</td>
<td>U.S. Naval History</td>
<td>3</td>
</tr>
<tr>
<td>HI 354</td>
<td>The Rise of the American Empire</td>
<td>3</td>
</tr>
<tr>
<td>HI 364</td>
<td>History of North Carolina</td>
<td>3</td>
</tr>
<tr>
<td>HI 365</td>
<td>The American West</td>
<td>3</td>
</tr>
<tr>
<td>HI 366</td>
<td>Native American History</td>
<td>3</td>
</tr>
<tr>
<td>HI 372</td>
<td>African-American History Through the Civil War, 1619-1865</td>
<td>3</td>
</tr>
<tr>
<td>HI 373</td>
<td>African-American History Since 1865</td>
<td>3</td>
</tr>
<tr>
<td>HI 380</td>
<td>History of Nonprofits, Philanthropy, and Social Change</td>
<td>3</td>
</tr>
<tr>
<td>REL 320</td>
<td>Religion in American History</td>
<td>3</td>
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### Literature I

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
<td>3</td>
</tr>
<tr>
<td>ENG 222</td>
<td>Literature of the Western World II</td>
<td>3</td>
</tr>
<tr>
<td>ENG 251</td>
<td>Major British Writers</td>
<td>3</td>
</tr>
<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
<td>3</td>
</tr>
<tr>
<td>ENG 261</td>
<td>English Literature I</td>
<td>3</td>
</tr>
<tr>
<td>ENG 262</td>
<td>English Literature II</td>
<td>3</td>
</tr>
<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
<td>3</td>
</tr>
<tr>
<td>FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>FL 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>FL 221</td>
<td>Literature of the Western World I</td>
<td>3</td>
</tr>
<tr>
<td>FL 222</td>
<td>Literature of the Western World II</td>
<td>3</td>
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**Sociology**

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REL 309  Religion and Society  3
SOC 202  Principles of Sociology  3
SOC 203  Current Social Problems  3
SOC 203A  Current Social Problems  3
SOC 204  Sociology of Family  3
SOC 205  Jobs and Work  3
SOC 206  Social Deviance  3
SOC 207  Language and Society  3
SOC 211  Community and Health  3
SOC 212  Race in America  3
SOC 220  Cultural Geography  3
SOC 241  Sociology of Agriculture and Rural Society  3
SOC 241A  Sociology of Agriculture and Rural Society  3
SOC 295  Special Topics in Sociology  1-3
SOC 300  Social Research Methods  4
SOC 301  Human Behavior  3
SOC 304  Gender and Society  3
SOC 305  Racial and Ethnic Relations  3
SOC 306  Criminology  3
SOC 309  Religion and Society  3
SOC 311  Community Relationships  3
SOC 342  International Development  3
SOC 350  Food and Society  3
SOC 351  Population and Planning  3
SOC 381  Sociology of Medicine  3
SOC 395  Special Topics in Sociology  1-3
SOC 400  Theories of Social Structure  3
SOC 401  Theories of Social Interaction  3
SOC 402  Urban Sociology  3
SOC 404  Families and Work  3
SOC 405  Racism in the U.S.  3
SOC 407  Sociology of Sexualities  3
SOC 410  Sociology of Organizations  3
SOC 413  Criminal Justice Field Work  4
SOC 414  Social Class  3
SOC 418  Sociology of Education  3
SOC 425  Juvenile Delinquency  3
SOC 427  Sociology of Law  3
SOC 428  Formal Institutions of Social Control  3
SOC 429  Quantitative Data Analysis in Sociology  3
SOC 430  Community and Crime  3
SOC 440  Social Change  3
SOC 445  Inequality, Ideology, and Social Justice  3
SOC 450  Environmental Sociology  3
SOC 457  Corporate Power in America  3
SOC 465  Social Aspects of Mental Health  3
SOC 492  External Learning Experience  1-6
SOC 493  Special Problems in Sociology  1-6
SOC 495  Special Topics in Sociology  1-3
SOC 498  Independent Study in Sociology  1-6
SOC 508  Social Organization  3
SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics in Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

Multidisciplinary

ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

Pre 1600 Co-Requisite

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<tr>
<td>HI 568</td>
<td>Slavery in the Americas</td>
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</table>
## Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>Exploring World History</td>
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<td>HI 571</td>
<td>Revolutionary China</td>
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<td>Japan's Empire in Asia, 1868-1945</td>
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<td>History of the Republic of South Africa</td>
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<td>HI 576</td>
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<td>HI 579</td>
<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<td>HI 581</td>
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### First Year

#### Fall Semester

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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| Hours | 17 |

### Spring Semester

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<td>History</td>
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| Hours | 13 |

### Second Year

#### Fall Semester

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<td>Literature I</td>
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<td>Social Science</td>
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### Third Year

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<td>Literature II</td>
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<td>GEP Natural Sciences (p. 1429) with Lab</td>
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<td>Philosophy</td>
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| Hours | 16 |

#### Spring Semester

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### Fourth Year

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| Hours | 15 |

#### Spring Semester

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| Hours | 14 |

### Total Hours

|  | 120 |

1 A grade of C- or higher is required.

## History (BA): Teacher Education Concentration

Ideal for future teachers, the Teacher Education Concentration is a track to a B.A. in History that includes the specific history and social science courses recommended for eventual Social Studies teachers in North Carolina. Students take the full array of undergraduate requirements, and gain a strong foundation of historical and social science content. Advanced students can use free electives to begin graduate-level Education classes.

In collaboration with the College of Education, students with a 3.5 GPA may apply some of the credits from their senior year to the Master of Arts...
in Teaching (M.A.T.) This accelerated program is intended to be a five-year track to the M.A.T. degree. Professional education courses, and the student teaching experience in a high school, are part of the graduate portion of the program, leading to eligibility for North Carolina certification to teach Social Studies in secondary schools in North Carolina and most other states. Holders of the M.A.T. are more competitive in the teacher job market and often earn higher salary.

For more information about this program, visit our website (https://history.ncsu.edu/undergrad/).

Department of History
North Carolina State University
Campus Box 8108
Raleigh, NC 27695-8108

Contact
Dr. William Kimler
Associate Professor and Director of Undergraduate Programs
North Carolina State University
350 Withers Hall, Box 8108
Raleigh NC 27695-8108
Phone: 919-515-2483
Email: kimler@ncsu.edu

Plan Requirements

History (BA): Teacher Education Concentration: 120 Total Units

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<td>HI 232</td>
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<td>The World Since 1750</td>
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<td>American History I</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)
GEP Interdisciplinary Perspectives (p. 1426)
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2                21
Total Hours                                      120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
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FLG 318  New German Cinema and Beyond  3
FLI 318  Italian Society Through Cinema  3
FLR 318  Russian Cinema and Society  3
FLS 360  Hispanic Cinema  3
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GD 303  Graphic Design Theory and Practice  3
HA 201  History of Art from Caves to the Renaissance  3
HA 202  History of Art From the Renaissance Through the 20th Century  3
HA 203  History of American Art  3
HA/Hi 240  Introduction to Visual Culture  3
HA 298  Special Topics in Art History  3
HA 395  History of Art: Study Abroad  3
HA 401  19th Century European Art from Revolution to Post-Impressionism  3
HA 404  Italian Renaissance Art and Material Culture  3
HA 498  Independent Study in History of Art  1-6
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HESM 326  Current Trends in Dance  3
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Hi 402/502/REL 402/502  Early Christianity to the Time of Eusebius  3
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Hi 408/508  Islamic History to 1798  3
HON 390  Music and the Celtic World  3
IDS 496  Topics in Film and Interdisciplinary Studies  3
LAR 444  History of Landscape Architecture  3
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MUS 180  Introduction to Musical Experiences  3
MUS 181  Exploring Music Theory  3
MUS 200  Understanding Music: Global Perspectives  3
MUS 201  Introduction to Music Literature I  3
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MUS 315  Music of the 19th Century  3
MUS 320  Music of the 20th Century  3
MUS 330  Survey of Musical Theater  3
MUS 350  Music of Asia  3
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REL 210  Religious Traditions of the World  3
REL 220  Religion in the Contemporary World  3
REL 230  Asian Religions  3
REL 298  Special Topics in Religious Studies  3
REL/SOC 309  Religion and Society  3
REL 311  Introduction to the Old Testament  3
REL 312  Introduction to the New Testament  3
REL 314  Introduction to Intertestamental Literature  3
REL 317  Christianity  3
REL 323  Religious Cults, Sects, and Minority Faiths in America  3
REL 327  Issues in Contemporary Religion  3
REL 331  The Hindu Tradition  3
REL 332  The Buddhist Traditions  3
REL 333  Chinese Religions  3
REL 334  Japanese Religions  3
REL 340  Islam  3
REL 350  Introduction to Judaism  3
REL 383  Religion, Globalism, and Justice  3
REL 412/512  Advanced Readings in the Christian Gospels  3
REL 413/513  The Life and Letters of the Apostle Paul  3
REL 423/523  Religion and Politics in America  3
REL 424/524  Religion and Politics in Global Perspective  3
REL 471/571/STS 471/571  Darwinism and Christianity  3
REL 472/572/  Women and Religion  3
REL 473/573  Religion, Gender, and Reproductive Technologies  3
REL 482/582  Religion and Conflict  3
REL 489/589  Interpretations of Religion  3
REL 496  Seminar in Religious Studies  3
REL 498/598  Special Topics in Religious Studies  1-6
THE 103  Introduction to the Theater  3
THE 203  Theory and Practice of Acting  3
THE 303  Stage Directing  3
THE 334  Advanced Acting  3
THE 340  African American Theatre  3

Behavioral Sciences

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**Departmental Advanced Electives**

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<td>From Roman Empire to Middle Ages</td>
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<td>HI 407</td>
<td>Islamic History to 1798</td>
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<td>Italian Renaissance</td>
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<td>Trials of Faith: Religious Reformation in Early-Modern Europe</td>
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<td>The Sexes and Society in Early-Modern Europe</td>
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<tr>
<td>HI 414</td>
<td>From Kings to Revolution: The History of Early-Modern France</td>
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<tr>
<td>HI 415</td>
<td>The French Revolution</td>
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<td>HI 418</td>
<td>Fascist Italy and Nazi Germany</td>
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<td>Modern European Imperialism</td>
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<td>European Intellectual History: The Eighteenth Century</td>
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<td>European Intellectual History: The 19th Century</td>
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<tr>
<td>HI 429</td>
<td>20th Century Britain</td>
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<tr>
<td>HI 430</td>
<td>Modern France</td>
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<td>HI 434</td>
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<tr>
<td>HI 437</td>
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<td>Early American Borderlands</td>
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<p>| HI 452  | Recent America                                                       | 3     |
| HI 453  | United States-Latin American Relations Since 1823                   | 3     |
| HI 454  | History of U.S. Foreign Relations, 1900-Present                      | 3     |
| HI 455  | History of the Civil Rights Movement                                 | 3     |
| HI 459  | The Early American Republic                                          | 3     |
| HI 461  | Civilization of the Old South                                       | 3     |
| HI 462  | Southern History since the Civil War                                 | 3     |
| HI 463  | Topics in History and Memory                                         | 3     |
| HI 465  | Oil and Crisis in the Gulf                                          | 3     |
| HI 466  | History of the Palestinian-Israeli Conflict                          | 3     |
| HI 467  | Modern Mexico                                                        | 3     |
| HI 468  | Slavery in the Americas                                              | 3     |
| HI 469  | Latin American Revolutions in the Twentieth Century                  | 3     |
| HI 470  | Exploring World History                                              | 3     |
| HI 471  | Revolutionary China                                                  | 3     |
| HI 472  | Fashion, Food, and Fun: Material Culture in Chinese History          | 3     |
| HI 473  | Japan's Empire in Asia, 1868-1945                                    | 3     |
| HI 474  | Modern India                                                         | 3     |
| HI 475  | History of the Republic of South Africa                              | 3     |
| HI 476  | Leadership in Modern Africa                                          | 3     |
| HI 477  | Women in the Middle East                                             | 3     |
| HI 478  | Islam and Christianity in Sub-Saharan Africa                        | 3     |
| HI 479  | Africa (sub-Saharan) in the Twentieth Century                        | 3     |
| HI 481  | History of the Life Sciences                                         | 3     |
| HI 482  | Darwinism in Science and Society                                     | 3     |
| HI 483  | Science and Religion in European History                            | 3     |
| HI 484  | Science in European Culture                                          | 3     |
| HI 485  | History of American Technology                                       | 3     |
| HI 486  | Science and Empire                                                  | 3     |
| HI 488  | Family and Community History                                         | 3     |
| HI 495  | Honors Research in History I                                         | 2     |
| HI 496  | Honors Research in History II                                        | 4     |
| HI 498  | Independent Study in History                                         | 1-6   |
| HI 499  | Special Topics in History                                            | 1-3   |
| HI 500  | Civilization of the Ancient Near East                                | 3     |
| HI 503  | Ancient Greek Civilization                                           | 3     |
| HI 504  | Rome to 337 A.D.                                                     | 3     |
| HI 505  | History and Archaeology of the Roman Empire                          | 3     |
| HI 506  | From Roman Empire to Middle Ages                                     | 3     |
| HI 509  | The High Middle Ages                                                 | 3     |
| HI 511  | Trials of Faith: Religious Reformation in Early-Modern Europe        | 3     |
| HI 512  | The Sexes and Society in Early-Modern Europe                         | 3     |
| HI 514  | From Kings to Revolution: The History of Early-Modern France         | 3     |
| HI 515  | The French Revolution                                                | 3     |
| HI 518  | Fascist Italy and Nazi Germany                                       | 3     |
| HI 519  | Modern European Imperialism                                          | 3     |
| HI 521  | European Intellectual History: The Eighteenth Century                 | 3     |</p>
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<td>HI 523</td>
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<td>Recent America</td>
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<td>United States-Latin American Relations Since 1823</td>
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<td>HI 555</td>
<td>History of the Civil Rights Movement</td>
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<td>The Early American Republic</td>
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<td>History of the Republic of South Africa</td>
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<td>Leadership in Modern Africa</td>
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<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<td>HI 581</td>
<td>History of the Life Sciences</td>
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<td>Early Christianity to the Time of Eusebius</td>
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<td>Islamic History to 1798</td>
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<td>Islam in the Modern World</td>
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<tr>
<td>WGS 548</td>
<td>American Women in the Twentieth Century</td>
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</table>

**Semester Sequence**

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.
History (BS)

The Bachelor of Science in History allows students to integrate a broad base in science and math with a history education. Students obtain both the analytical and writing skills that come from a history major and the technical proficiency that comes with coursework in science and engineering. This combination is very helpful in a wide variety of careers, including law, business, and public policy. This degree is particularly well suited for students transferring into history from a science or engineering major, or combining studies in a science or engineering discipline.

The curriculum offers flexibility in courses and electives. Students work with their advisor to design a concentration in a single area of science and technology, including the possibility of a second major or minor in a science, technology, engineering, or mathematics discipline. There are opportunities for guided research experiences and professional internship.

For more information about this program, visit our website (https://history.ncsu.edu/undergrad/).

Department of History
North Carolina State University
Campus Box 8108
Raleigh, NC 27695-8108

Contact
Dr. William Kimler
Associate Professor and Director of Undergraduate Programs
North Carolina State University
350 Withers Hall, Box 8108
Raleigh NC 27695-8108
Phone: 919-515-2483
Email: kimler@ncsu.edu

Plan Requirements

<table>
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**Departmental Requirements**

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<tr>
<td>Pre 1600 Co-Requisites (verify requirement) (p. 827)</td>
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<tr>
<td>History I &amp; History Breadth (p. 827)</td>
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<td>History II &amp; History Breadth (p. 827)</td>
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<tr>
<td>HI 300</td>
<td>Sophomore Seminar in History</td>
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<tr>
<td>HI 4xx (p. 827)</td>
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**Departmental Electives**

Choose three courses selected from HI or HA 4xx level (excluding HI 491), and an additional course selected from either HI or HA 3xx or 4xx (excluding HI 491).

**Basic Science**

<table>
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<tr>
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<td>Basic Sciences (3 Different) (p. 829)</td>
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<td>Science Electives (p. 829)</td>
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**Mathematics**

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<td>Calculus (p. 830)</td>
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<tr>
<td>Math Electives</td>
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Two additional math or statistics courses chosen from MA 114 and above or ST 301 and above. One of the courses must be selected from the GEP Mathematical Sciences (p. 1428) list. 6 to 8 credits

**Advanced Sciences/Technology Requirements**

Advanced Sciences/Technology Requirements (See Advisor) | 15    |

**Humanities & Social Sciences**

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<td>ENG 101</td>
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<tr>
<td>Philosophy</td>
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<td>Any PHI course on the approved GEP-Humanities list.</td>
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<tr>
<td>Arts and Letters (p. 830)</td>
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<tr>
<td>Literature (p. 831)</td>
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<td>Writing and Communication (p. 832)</td>
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<td>Social Science (3 Different) (p. 833)</td>
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**General Education Program (GEP) Courses**

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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

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1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine how to complete this requirement.

3 Students should consult their academic advisors to determine which courses fill this requirement.
### Pre 1600 Co-Requisite

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<td>AFS 276</td>
<td>Introduction to History of West Africa</td>
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<td>HI 205</td>
<td>Western Civilization Since 1400</td>
<td>3</td>
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<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
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<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
<td>3</td>
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<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
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<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>British History to 1688</td>
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<tr>
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<td>The World from 1200 to 1750</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 321</td>
<td>Scientific Revolution and European Society, 1500-1800</td>
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<td>HI 341</td>
<td>Technology in History</td>
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### History I & History Breadth

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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>HI 335</td>
<td>The World at War</td>
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<tr>
<td>HI 340</td>
<td>History of Agriculture</td>
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#### World History

Select a maximum of 3 units

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<td>The World at War</td>
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<tr>
<td>HI 341</td>
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#### Asia/Africa/Latin American History

Select a maximum of 3 units

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<td>AFS 276</td>
<td>Introduction to History of West Africa</td>
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</tr>
<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
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<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
<td>3</td>
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<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
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<tr>
<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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### History II & History Breadth

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#### European History

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### Basic Sciences

#### Code | Title | Hours
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### Biological Sciences
Select a maximum of 4 units
<br>BIO 105 | Biology in the Modern World | 3
BIO 106 | Biology in the Modern World Laboratory | 1
BIO 140 | Survey of Animal Diversity | 3
BIO 141 | Animal Diversity Laboratory | 1
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4

### Chemistry
Select a maximum of 4 units
<br>CH 101 | Chemistry - A Molecular Science | 3
CH 102 | General Chemistry Laboratory | 1
CH 201 | Chemistry - A Quantitative Science | 3
CH 202 | Quantitative Chemistry Laboratory | 1

### Earth Sciences
Select a maximum of 4 units
<br>MEA 100 | Earth System Science: Exploring the Connections | 4
MEA 101 | Geology I: Physical | 3

### Science Electives

#### Code | Title | Hours
--- | --- | ---
BIO 105 | Biology in the Modern World | 3
BIO 106 | Biology in the Modern World Laboratory | 1
BIO 140 | Survey of Animal Diversity | 3
BIO 141 | Animal Diversity Laboratory | 1
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4
BIO 227 | Understanding Structural Diversity through Biological Illustration | 3
BIT 100 | Current Topics in Biotechnology | 4
BIT 210 | Phage Hunters | 3
BIT 211 | Phage Genomics | 2
CH 100 | Chemistry and Society | 4
CH 101 | Chemistry - A Molecular Science | 3
CH 102 | General Chemistry Laboratory | 1
CH 103 | General Chemistry I for Students in Chemical Sciences | 3
CH 104 | General Chemistry Laboratory I for Students in Chemical Sciences | 1
CH 201 | Chemistry - A Quantitative Science | 3
CH 202 | Quantitative Chemistry Laboratory | 1
CH 203 | General Chemistry II for Students in Chemical Sciences | 3
CH 204 | General Chemistry Laboratory II for Students in Chemical Sciences | 1
CS 213 | Crop Science | 3
### History (BS)

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**Sociology**

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REL 309  Religion and Society  3
SOC 202  Principles of Sociology  3
SOC 203  Current Social Problems  3
SOC 203A  Current Social Problems  3
SOC 204  Sociology of Family  3
SOC 205  Jobs and Work  3
SOC 206  Social Deviance  3
SOC 207  Language and Society  3
SOC 211  Community and Health  3
SOC 212  Race in America  3
SOC 220  Cultural Geography  3
SOC 220  Cultural Geography  3
SOC 241  Sociology of Agriculture and Rural Society  3
SOC 241A  Sociology of Agriculture and Rural Society  3
SOC 295  Special Topics in Sociology  1-3
SOC 300  Social Research Methods  4
SOC 301  Human Behavior  3
SOC 304  Gender and Society  3
SOC 305  Racial and Ethnic Relations  3
SOC 306  Criminology  3
SOC 309  Religion and Society  3
SOC 311  Community Relationships  3
SOC 342  International Development  3
SOC 350  Food and Society  3
SOC 351  Population and Planning  3
SOC 381  Sociology of Medicine  3
SOC 395  Special Topics in Sociology  1-3
SOC 400  Theories of Social Structure  3
SOC 401  Theories of Social Interaction  3
SOC 402  Urban Sociology  3
SOC 404  Families and Work  3
SOC 405  Racism in the U.S.  3
SOC 407  Sociology of Sexualities  3
SOC 410  Sociology of Organizations  3
SOC 413  Criminal Justice Field Work  4
SOC 414  Social Class  3
SOC 418  Sociology of Education  3
SOC 425  Juvenile Delinquency  3
SOC 427  Sociology of Law  3
SOC 428  Formal Institutions of Social Control  3
SOC 429  Quantitative Data Analysis in Sociology  3
SOC 430  Community and Crime  3
SOC 440  Social Change  3
SOC 445  Inequality, Ideology, and Social Justice  3
SOC 450  Environmental Sociology  3
SOC 457  Corporate Power in America  3
SOC 465  Social Aspects of Mental Health  3
SOC 492  External Learning Experience  1-6
SOC 493  Special Problems in Sociology  1-6
SOC 495  Special Topics in Sociology  1-3
SOC 498  Independent Study in Sociology  1-6
SOC 508  Social Organization  3
SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics in Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

**Multidisciplinary**

ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

**Semester Sequence**

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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</table>

**Total Hours**: 120

---

1. A grade of C- or higher is required.

* Residency Requirement: A minimum of 18 hours in the major at NC State. Fifteen (15) of the 18 hours must be at the 400 level and must include at least one 491 seminar.

* Grade Point Average Requirement: A minimum GPA of 2.0 overall and in the major is required for graduation.

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### History (Minor)

The minor in History provides additional breadth and depth of study to a variety of majors. The study of history provides understanding of historical background and context, along with experience in research, analysis, and writing. For example, students majoring in political science but with a special interest in the Middle East or Europe can gain a much deeper understanding of how events in the past have shaped present dilemmas. Likewise, those wishing to attend law school can choose from a range of courses in legal history. Students can tailor the course selection in the Minor to suit individual interests.

For more information about this program, visit the Minor website (https://oucc.dasa.ncsu.edu/history-16him/).

Department of History
North Carolina State University
Campus Box 8108

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### Contact

Dr. Dean Bruno
Teaching Associate Professor and Assistant Head for Student Affairs
North Carolina State University
265 Withers Hall, Box 8108
Raleigh NC 27695-8108
Phone: 919-515-2217
Email: dbruno@ncsu.edu

### Plan Requirements

- Open to any student and is without any prerequisites.
- Completion of 15 hours (5 courses) in History.
- A grade of ‘C-’ or better in all completed courses used toward the minor.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.
- A maximum of 6 hours of advanced placement credit or transfer credit can be applied towards the minor. The department will determine whether courses which have been transferred from other institutions qualify for the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Required Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Choose 2 courses (6 credits) in History (HI) or History of Art (HA) at the 200-level.</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Elective Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select one course in HI or HA at the 400 level</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select two courses at the 300 level or above</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>Total Hours</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

### Department of Philosophy and Religious Studies

The disciplines of Philosophy and Religious Studies tackle important questions with rigorous standards, relying on over two millennia of accumulated wisdom.

Philosophy seeks to advance our understanding of ourselves and the nature of reality, mind, knowledge and morality. It is concerned with fundamental questions and critically investigates what other disciplines and other human activities take for granted. Philosophy students at NC State study the writings of great philosophers and recent work on topics such as the relationship between mind and brain, the demands of morality, the justification of political and legal institutions, the relationship between knowledge and reality, and the nature of the logic that structures human language and thought.

Religious Studies does not seek to advance the practice of religion or any particular religion, but to understand religion as a complex and significant human phenomenon. Students majoring in Religious Studies at NC State study the history, texts and practices of both well-known and lesser-known religious traditions as well as a range of theoretical and comparative issues concerning religion, such as the meaning of ritual, the role of gender, the impact of religion in the modern world, and the relationship between religion and conflict.
Both Philosophy and Religious Studies help students to develop their capacity to think critically, constructively and independently, to analyze and solve problems, and to elaborate their ideas and present them in a clear, cogent and well-organized way.

For more information about our department, including contact information, visit our website (http://catalog.ncsu.edu/undergraduate/humanities-social-sciences/philosophy-religious-studies/https://philrel.chass.ncsu.edu).

Department of Philosophy and Religious Studies
340 Withers Hall
Campus Box 8103
Raleigh, NC 27695-8103
Phone: 919-515-3214
Fax: 919-513-4351
Email: phil_rel@ncsu.edu

Contact Person
Dr. Catherine Driscoll (Philosophy)
Director of Undergraduate Advising
343B Withers Hall
Phone: 919-51-7846
Email: catherine_driscoll@ncsu.edu

Dr. Jason Bivins (Religious Studies)
Director of Religious Studies
447 Withers Hall
Phone: 919-515-6102
Email: jcbivins@ncsu.edu

Faculty
Head
M. J. Pendlebury

Associate Head
D. F. Austin

Director of Religious Studies and Senior Religious Studies Advisor
J. C. Bivins

Director of Undergraduate Advising
C. M. Driscoll

Senior Philosophy Adviser
R. Mabrito

Distinguished University Professor
W. Adler

Professors
J. C. Bivins
M. F. Bykova
J. W. Carroll
G. L. Comstock
C. M. Driscoll
T. J. Hinton
B. B. Levenbook
M. J. Pendlebury

Professor Emeritus
A. D. VanDeVeer

Associate Professors
D. F. Austin
M. K. Cunningham
R. P. Endicott
K. A. Hanwood
S. C. Ferguson II
R. A. Mabrito
L. McLaughlin
S. M. Puryear

Associate Professor Emeritus
H. D. Levin

Assistant Professors
V. Dubiljevic
K. Richardson
S. Soyarslan

Assistant Professor Emeritus
D. D. Auerbach

Assistant Teaching Professor
W. Bauer
J. Bowers
E. Carter
Religious Studies Honors Program

The honors program in Religious Studies guides outstanding majors in independent, critical inquiry of the academic study of religion. Admission to the program requires junior standing, completion of nine hours in the major, and a 3.25 GPA overall and in the major. Honors students must complete at least nine credit hours of honors option course work in Religious Studies (including at least one 400 level course) and write an honors paper as part of an independent study course (REL 498 Special Topics in Religious Studies) which is evaluated by an honors committee.

Graduation requires a 3.25 GPA overall and in the major. Successful completion of the program is noted on the student’s transcript and in the commencement and honors convocation programs.

Cognitive Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Psychology and the Department of Philosophy and Religion offer an interdisciplinary minor in cognitive science. The minor offers the student the opportunity for in-depth study with the framework of the “computer model” of the mind. Students study such topics as the nature of human information processing, the acquisition and use of language, and machine intelligence. No courses for the minor may be taken for S/U credit.

Students completing the minor in Cognitive Science will:

• Possess a background in logic, linguistics, psychology, philosophy, computer science and an appreciation and understanding of contemporary research in cognitive science.
• Be acquainted with the range and nature of problems united under the title “cognitive science”.
• Have a general understanding of the computational model of the mind and of the ways in which the computer, together with other technical advances, has revolutionized contemporary thinking about the mind.
• Have an in-depth understanding of at least 2 or 3 central empirical issues currently under investigation in the field of cognitive science.
• Have become aware of both the value and difficulty of pursuing interdisciplinary approaches to research question.

Admissions and Certification of Minor

In both instances, students should contact the contact person listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in 340 Withers and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Catherine Driscoll
434B Withers Hall
919.513.7846
catherine_driscoll@ncsu.edu

SIS Code: 16CNM
Plan Requirements

- A minimum of 15 hours is required for the minor in Cognitive Science.
- Students must maintain a grade of 'C-' or better in each course used toward the minor.
- Cognitive Science minor courses must include at least 3 of the 5 primary disciplines: philosophy (including logic), psychology, computer science, linguistics, and neurobiology.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

The department will determine whether courses which have been transferred from other institutions qualify for the minor. No more than two courses from other institutions may count toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI/PSY 425</td>
<td>Introduction to Cognitive Science</td>
<td>6</td>
</tr>
<tr>
<td>PSY 420</td>
<td>Cognitive Processes</td>
<td></td>
</tr>
<tr>
<td>CSC 411</td>
<td>Introduction to Artificial Intelligence</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses

Select three of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC 333</td>
<td>Automata, Grammars, and Computability</td>
<td></td>
</tr>
<tr>
<td>CSC 411</td>
<td>Introduction to Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>ENG 210</td>
<td>Introduction to Language and Linguistics</td>
<td></td>
</tr>
<tr>
<td>ENG 324</td>
<td>Modern English Syntax</td>
<td></td>
</tr>
<tr>
<td>ENG 524</td>
<td>Introduction to Linguistics</td>
<td></td>
</tr>
<tr>
<td>ENG 525</td>
<td>Variety In Language</td>
<td></td>
</tr>
<tr>
<td>ENG 527</td>
<td>Discourse Analysis</td>
<td></td>
</tr>
<tr>
<td>LOG 335</td>
<td>Symbolic Logic</td>
<td></td>
</tr>
<tr>
<td>LOG 435</td>
<td>Advanced Logic &amp; Metamathematics</td>
<td></td>
</tr>
<tr>
<td>LOG 430</td>
<td>Varieties of Logic</td>
<td></td>
</tr>
<tr>
<td>PHI 331</td>
<td>Philosophy of Language</td>
<td></td>
</tr>
<tr>
<td>PHI 332</td>
<td>Philosophy of Psychology</td>
<td></td>
</tr>
<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
<td></td>
</tr>
<tr>
<td>PHI/PSY 425</td>
<td>Introduction to Cognitive Science</td>
<td></td>
</tr>
<tr>
<td>PHI 447</td>
<td>Philosophy, Evolution and Human Nature</td>
<td></td>
</tr>
<tr>
<td>PSY 340</td>
<td>Ergonomics</td>
<td></td>
</tr>
<tr>
<td>PSY 400</td>
<td>Perception</td>
<td></td>
</tr>
<tr>
<td>PSY 420</td>
<td>Cognitive Processes</td>
<td></td>
</tr>
<tr>
<td>PSY 430</td>
<td>Biological Psychology</td>
<td></td>
</tr>
<tr>
<td>BIO 488</td>
<td>Neurobiology</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 15

Ethics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Ethical issues arise in every field of human endeavor, so knowledge of ethics is beneficial to students regardless of their major. The Minor in Ethics is designed to expose students in a systematic way to the fundamental theories and concepts of ethics. It is a highly desirable minor because it demonstrates to employers, graduate schools, and professional schools an interest in and knowledge of ethical issues.

In addition to taking a solid core of philosophy courses focusing on ethics, students pursuing the minor may also elect to count towards it one relevant course from another department. This course will be chosen from a list of courses offered by a wide range of other departments including Anthropology, Engineering, Genetics, History, Microbiology, Political Science, and the Science, Technology, & Society Program.

Admissions

Students may declare their intention to complete the Ethics minor. Should students wish to transfer courses from other institutions toward the minor, students should consult with Dr. Timothy Hinton, advisor for the minor.

Certification

To be certified as having completed the minor in Ethics, students must have a minimum 2.0 grade point average across all courses used toward the minor. Dr. Hinton will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Persons

Dr. Timothy Hinton, Minor Advisor
Department of Philosophy and Religious Studies
Withers Hall 456
919.513.7941
tim_hinton@ncsu.edu

Joanna King, Student Services Associate
Department of Philosophy and Religious Studies
Withers Hall 340
919.515.6100
joanna_king@ncsu.edu

SIS code: 16ETHM

Plan Requirements

- The minor consists of 15 hours of credit (5 courses) including 6 hours of required courses and 9 hours of elective courses.
- A grade of 'C-' or better will be required for all courses taken to fulfill the minor requirements.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

The department will determine whether courses which have been transferred from other institutions qualify for the minor. No more than two courses from other institutions may count toward the minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI 375</td>
<td>Ethics</td>
<td>6</td>
</tr>
<tr>
<td>PHI 376</td>
<td>History of Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 475</td>
<td>Ethical Theory</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses
Select two of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI 214</td>
<td>Issues in Business Ethics</td>
<td>6</td>
</tr>
<tr>
<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
<td></td>
</tr>
<tr>
<td>PHI 309</td>
<td>Political Philosophy</td>
<td></td>
</tr>
<tr>
<td>PHI 313</td>
<td>Ethical Problems in the Law</td>
<td></td>
</tr>
<tr>
<td>PHI/STS 325</td>
<td>Bio-Medical Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 375</td>
<td>Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 376</td>
<td>History of Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 420</td>
<td>Global Justice</td>
<td></td>
</tr>
<tr>
<td>PHI 475</td>
<td>Ethical Theory</td>
<td></td>
</tr>
<tr>
<td>REL 473</td>
<td>Religion, Gender, and Reproductive Technologies</td>
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</tr>
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</table>

Select one of the following or from the electives above:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG/WGS 327</td>
<td>Language and Gender</td>
<td>3</td>
</tr>
<tr>
<td>GN 301</td>
<td>Genetics in Human Affairs</td>
<td></td>
</tr>
<tr>
<td>HI/AFS 455</td>
<td>History of the Civil Rights Movement</td>
<td></td>
</tr>
<tr>
<td>MB 200</td>
<td>The Fourth Horseman: Plagues that Changed the World</td>
<td></td>
</tr>
<tr>
<td>PHI 310</td>
<td>Existentialism</td>
<td></td>
</tr>
<tr>
<td>PHI 312</td>
<td>Philosophy of Law</td>
<td></td>
</tr>
<tr>
<td>PHI 320</td>
<td>Philosophy of Race</td>
<td></td>
</tr>
<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
<td></td>
</tr>
<tr>
<td>PS 204</td>
<td>Problems of American Democracy</td>
<td></td>
</tr>
<tr>
<td>PS/WGS 306</td>
<td>Gender and Politics in the United States</td>
<td></td>
</tr>
<tr>
<td>PS 309</td>
<td>Equality and Justice in United States Law</td>
<td></td>
</tr>
<tr>
<td>PS 361</td>
<td>Introduction to Political Theory</td>
<td></td>
</tr>
<tr>
<td>PS/AFS 409</td>
<td>Black Political Participation in America</td>
<td></td>
</tr>
<tr>
<td>PS/WGS 418</td>
<td>Gender Law and Policies</td>
<td></td>
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<tr>
<td>PS 462</td>
<td>Seminar in Political Theory</td>
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</tr>
<tr>
<td>SOC/WGS 304</td>
<td>Gender and Society</td>
<td></td>
</tr>
<tr>
<td>SOC/AFS 305</td>
<td>Racial and Ethnic Relations</td>
<td></td>
</tr>
<tr>
<td>SOC/WGS 407</td>
<td>Sociology of Sexualities</td>
<td></td>
</tr>
<tr>
<td>SOC 428</td>
<td>Formal Institutions of Social Control</td>
<td></td>
</tr>
<tr>
<td>STS 304</td>
<td>Ethical Dimensions of Progress</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 15

**Health, Medicine and Human Values (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

The minor in Health, Medicine, and Human Values offers students an opportunity to critically assess a range of issues that are fundamental to the health of individuals as well as of society. From such an understanding, students as citizens will be more adequately prepared to meet these challenges in both private and public arenas. No courses for the minor may be taken for S/U credit.

**Admissions**

Students interested in declaring a minor in Health, Medicine and Human Values should consult with the contact person listed below. Students who choose this minor will be assigned a minor advisor who can work with the student as needed to assure progression in completion of the minor.

**Certification**

The contact person listed below will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact Persons**

Dr. Gary L. Comstock, Minor Advisor  
Department of Philosophy and Religious Studies  
Withers Hall Rm 458  
919-515-6173  
gcomstock@ncsu.edu

Joanna King Student Services Associate  
Department of Philosophy and Religious Studies  
Withers Hall 340  
919.515.6100  
joanna_king@ncsu.edu

**Effective Date: 8/2018**

**SIS Code: 16HMM**

**Plan Requirements**

- A grade of ‘C-’ or better is required in all courses to be used toward the minor, with an overall average of at least 2.0.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
- No courses for the minor may be taken for S/U credit.

The department will determine whether courses which have been transferred from other institutions qualify for the minor. No more than two courses from other institutions may count toward the minor.

**Elective Courses**

Select at least two of the following from Group I - Humanities and Social Sciences Perspective on Health and Medicine

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 437</td>
<td>Health Economics</td>
<td></td>
</tr>
<tr>
<td>HI 322</td>
<td>Rise of Modern Science</td>
<td></td>
</tr>
<tr>
<td>or HI 481</td>
<td>History of the Life Sciences</td>
<td></td>
</tr>
<tr>
<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
<td></td>
</tr>
<tr>
<td>or PHI 309</td>
<td>Political Philosophy</td>
<td></td>
</tr>
<tr>
<td>or PHI 375</td>
<td>Ethics</td>
<td></td>
</tr>
<tr>
<td>or PHI 376</td>
<td>History of Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
<td></td>
</tr>
<tr>
<td>REL 473/573</td>
<td>Religion, Gender, and Reproductive Technologies</td>
<td></td>
</tr>
<tr>
<td>SOC 381</td>
<td>Sociology of Medicine</td>
<td></td>
</tr>
<tr>
<td>or SOC 465</td>
<td>Social Aspects of Mental Health</td>
<td></td>
</tr>
</tbody>
</table>

Select at least two of the following from Group II - Science Perspective on Health and Medicine

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STS/PHI 325</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
</tr>
</tbody>
</table>
Logic and Methodology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Minor in Logic and Methodology is designed to expose students to the most technical areas of philosophy (logic, philosophy of language, philosophy of science). These subjects underlie such fields as cognitive science, computer science, and bio-informatics (including knowledge engineering and data-mining). It is a highly desirable minor because it reveals to employers, graduate schools and professional schools a willingness to engage in theoretical reasoning needed in these fields.

Admissions and Certification of Minor

A grade of C- or better will be required for all courses taken to fulfill the minor requirements. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification must be completed no later than the end of the regular registration period one semester prior to the semester of graduation.

The coordinator of advising will ascertain whether the requirements of the minor have been fulfilled. The department will determine whether courses that have been transferred from other institutions qualify for its minors. No more than two courses from other institutions may count toward the minor.

Contact Persons

Dr. Kevin Richardson
343 Withers Hall
919.515.6331
karicha6@ncsu.edu

Joanna King, Student Services Associate

Department of Philosophy and Religious Studies
Withers Hall 340
919.515.6100
joanna_king@ncsu.edu

Effective Date: 6/2009

SIS Code: 16LOGM

Plan Requirements

A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

Students must complete five 3 hour courses, as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG 335</td>
<td>Symbolic Logic</td>
<td>3</td>
</tr>
<tr>
<td>PHI 331</td>
<td>Philosophy of Language</td>
<td>3</td>
</tr>
<tr>
<td>PHI 340</td>
<td>Philosophy of Science</td>
<td>3</td>
</tr>
<tr>
<td>PHI 440</td>
<td>The Scientific Method</td>
<td>3</td>
</tr>
<tr>
<td>PHI 333</td>
<td>Knowledge and Skepticism</td>
<td></td>
</tr>
<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
<td></td>
</tr>
<tr>
<td>PHI 447</td>
<td>The Scientific Method</td>
<td></td>
</tr>
<tr>
<td>PHI 447</td>
<td>Philosophy, Evolution and Human Nature</td>
<td></td>
</tr>
</tbody>
</table>

Philosophy (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Philosophy and Religious Studies offers a Bachelor of Arts (B.A.) in Philosophy, and a Bachelor of Science (B.S.) in Philosophy, plus three concentrations. These different programs all cover basic core areas of philosophy that are essential to any good philosophy major, but they also allow students to pursue and showcase different areas of emphasis.

The Differences Between the B.A. and the B.S. in Philosophy

The biggest differences between the B.A. in Philosophy and the B.S. in Philosophy arise from differences between the College of Humanities and Social Sciences’ requirements for the B.A. and the B.S. These differences can be summarized as follows:

- For the B.A., the College requires more courses in the humanities and social sciences, including a 3-credit 201-level course in a foreign language.
- For the B.S., the College requires more courses in the natural sciences and mathematics, plus a 15-credit science or technology option.

The B.A. in Philosophy is, in general, best suited to:
• students with strong interests in a foreign language, history or literature;
• students who would like to transfer to a philosophy major from another major in the humanities or social sciences; and
• students who would like to combine a major in philosophy with another major in the humanities or social sciences.

The B.S. in Philosophy is, in general, best suited to:

• students with strong interests in mathematics, science, or technology;
• students who would like to transfer to a philosophy major from a major in mathematics, science or technology; and
• students who would like to combine a major in philosophy with another major in mathematics, science or technology.

The only difference between the departmental requirements for the B.A. in Philosophy without a concentration and the B.S. in Philosophy without a concentration is that one course in philosophy of science is required for the B.S. but not for the B.A.

For more information about this program, including contact information and career opportunities, visit our website (https://philrel.chass.ncsu.edu/philosophy/).

Contact Person
Dr. Catherine Driscoll
Director of Undergraduate Advising
434B Withers Hall
Phone: 919-51-7846
Email: catherine_driscoll@ncsu.edu

Plan Requirements

Philosophy (BA): 120 Total Units

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Additional Social Science
General Education Program (GEP) Courses
GEP Mathematical Sciences (p. 1428) | 6 |
GEP Natural Sciences (p. 1429) | 7 |
GEP Health and Exercise Studies (p. 1422) | 2 |
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3 |
GEP Interdisciplinary Perspectives (p. 1426) | 5 |
GEP U.S. Diversity (p. 1431) (verify requirement) | 9 |
GEP Global Knowledge (p. 1419) (verify requirement) | 3 |
Foreign Language Proficiency (p. 1417) (verify requirement) | 3 |

Free Electives
Free Electives (12 Hr S/U Lmt) 2 | 33 |
Total Hours | 120 |

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Logic

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PHI 425  Introduction to Cognitive Science  3
PHI 440  The Scientific Method  3
PHI 447  Philosophy, Evolution and Human Nature  3
PHI 425  Introduction to Cognitive Science  3

**PHI or LOG Electives**

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**400-Level PHI/LOG Course**

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**Acad Writing Research**

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**Transfer Sequence**

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**History I**

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**History II**

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## Literature I

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**FLF 301** | Survey of French Literature from the Middle Ages through the Enlightenment | 3 |
**FLF 302** | Survey of French Literature from Romanticism to the Contemporary Period | 3 |
**FLF 492** | Seminar in French Studies | 3 |
**FLG 320** | Introduction to German Literature | 3 |
**FLG 323** | Twentieth Century German Literature | 3 |
**FLG 325** | German Lyric Poetry | 3 |
**FLG 325** | German Lyric Poetry | 3 |
**FLJ 342** | Classical Japanese Literature in Translation | 3 |
**FLJ 344** | Early Modern Japanese Literature in Translation | 3 |
**FLJ 345** | Modern Japanese Literature in Translation | 3 |
**FLN 301** | Twentieth Century Hindi & Urdu Fiction | 3 |
**FLN 302** | Modern Hindi & Urdu Poetry | 3 |
**FLN 401** | Hindi Literature and South Asian Cultural Contexts | 3 |
**FLR 303** | Russian Literature in Translation: The Nineteenth Century | 3 |
**FLR 304** | Russian Literature in Translation: The Twentieth Century | 3 |
**FLS 340** | Introduction to Hispanic Literatures and Cultures | 3 |
**FLS 341** | Literature and Culture of Spain I | 3 |
**FLS 342** | Literature and Culture of Spain II | 3 |
**FLS 343** | Literature and Culture of Spain III | 3 |
**FLS 351** | Literature and Culture of Latin America I | 3 |
**FLS 352** | Literature and Culture of Latin America II | 3 |
**FLS 353** | Literature and Culture of Latin America III | 3 |
**FLS 492** | Seminar in Hispanic Studies | 3 |
**HON 202** | Inquiry, Discovery, and Literature | 3 |
**HON 293** | Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge | 3 |

**Foreign Language 200 Level**

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ADN 414  Color and Light  3
AFS/MUS 230  Introduction to African-American Music  3
AFS/MUS 260  History of Jazz  3
AFS/ARS 346  Black Popular Culture  3
AFS/ENG 375  African American Cinema  3
ARC 140  Experiencing Architecture  3
ARC 141  Introduction to Architectural History  3
ARC 241  History of World Architecture  3
ARS 251  The Arts of a World Capital: London  3
ARS/STS 257  Technology in the Arts  3
ARS 258  Mathematics and Models in Music  3
ARS 259  The Arts and Politics  3
ARS/MUS 306  Music Composition with Computers  3
ARS 351  Arts, Ideas and Values  3
ARS 353  Arts and Cross-Cultural Contacts  3
ARS 354  The Arts and the Sacred  3
CLA 210  Classical Mythology  3
COM/ENG 321  Survey of Rhetorical Theory  3
COM/ENG 364  History of Film to 1940  3
COM/ENG 374  History of Film From 1940  3
COM/ENG 395  Studies in Rhetoric and Digital Media  3
COM/ENG 411  Rhetorical Criticism  3
D 231  Design History for Engineers and Scientists  3
DAN 272  Dance Composition - Solo Forms  1
DAN 295  Problems of Dance Performance  2
ENG 282  Introduction to Film  3
ENG 289  Poetry Writing  3
ENG 323  Writing in the Rhetorical Tradition  3
ENG 374  History of Film From 1940  3
ENG 378  Women & Film  3
ENG 382  Film and Literature  3
ENG 394  Studies in World Literature  3
ENG 426  Analyzing Style  3
ENG 492  Special Topics in Film Styles and Genres  3
FL 216  Art and Society in France  3
FLC 351  Modern Chinese Popular Culture  3
FLF 318  The Heritage of French Cinema  3
FLG 318  New German Cinema and Beyond  3
FLI 318  Italian Society Through Cinema  3
FLR 318  Russian Cinema and Society  3
FLS 360  Hispanic Cinema  3
GD 203  History of Graphic Design  3
GD 303  Graphic Design Theory and Practice  3
HA 201  History of Art from Caves to the Renaissance  3
HA 202  History of Art From the Renaissance Through the 20th Century  3
HA 203  History of American Art  3
HA/HI 240  Introduction to Visual Culture  3
HA 298  Special Topics in Art History  3
HA 395  History of Art: Study Abroad  3
HA 401  19th Century European Art from Revolution to Post-Impressionism  3
HA 404  Italian Renaissance Art and Material Culture  3
HA 498  Independent Study in History of Art  1-6
HESM 322  Dance and Society  3
HESM 324  Concert Dance History  3
HESM 326  Current Trends in Dance  3
HI/REL 320  Religion in American History  3
HI 402/502/ REL 402/502  Early Christianity to the Time of Eusebius  3
HI 408/508/ REL 408/508  Islam in the Modern World  3
HI 407/507/ REL 407/507  Islamic History to 1798  3
HON 390  Music and the Celtic World  3
IDS 496  Topics in Film and Interdisciplinary Studies  3
LAR 444  History of Landscape Architecture  3
MUS 105  Introduction to Music in Western Society  3
MUS 180  Introduction to Musical Experiences  3
MUS 181  Exploring Music Theory  3
MUS 200  Understanding Music: Global Perspectives  3
MUS 201  Introduction to Music Literature I  3
MUS 202  Introduction to Music Literature II  3
MUS 206  America's Music  3
MUS 310  Music of the 17th and 18th Centuries  3
MUS 315  Music of the 19th Century  3
MUS 320  Music of the 20th Century  3
MUS 330  Survey of Musical Theater  3
MUS 350  Music of Asia  3
MUS/WGS 360  Women In Music  3
REL 200  Introduction to the Study of Religion  3
REL 210  Religious Traditions of the World  3
REL 220  Religion in the Contemporary World  3
REL 230  Asian Religions  3
REL 298  Special Topics in Religious Studies  3
REL/SOC 309  Religion and Society  3
REL 311  Introduction to the Old Testament  3
REL 312  Introduction to the New Testament  3
REL 314  Introduction to Intertestamental Literature  3
REL 317  Christianity  3
REL 323  Religious Cults, Sects, and Minority Faiths in America  3
REL 327  Issues in Contemporary Religion  3
REL 331  The Hindu Tradition  3
REL 332  The Buddhist Traditions  3
REL 333  Chinese Religions  3
REL 334  Japanese Religions  3
REL 340  Islam  3
REL 350  Introduction to Judaism  3
REL 383  Religion, Globalism, and Justice  3
REL 412/512  Advanced Readings in the Christian Gospels  3
REL 413/513  The Life and Letters of the Apostle Paul  3
REL 423/523  Religion and Politics in America  3
### Social Science

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Third Year
Fall Semester

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Spring Semester

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Spring Semester

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Total Hours 120-121

Philosophy (BA): Philosophy Ethics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Philosophy and Religious Studies offers a Bachelor of Arts (B.A.) in Philosophy, and a Bachelor of Science (B.S.) in Philosophy, plus three concentrations. These different programs all cover core basic areas of philosophy that are essential to any good philosophy major, but they also allow students to pursue and showcase different areas of emphasis.

The B.A. in Philosophy with a Concentration in Ethics provides excellent preparation for top graduate programs in Philosophy as well as for professional training in fields as diverse as law, library science, management and medicine. Although the major does not train students for a particular career, it develops skills that are useful for work in any field that requires critical, constructive and independent thinking.

For more information about this program, visit our website (https://philrel.chass.ncsu.edu/philosophy/philosophy_major.php).

Contact Person

Dr. Catherine Driscoll
Director of Undergraduate Advising
434B Withers Hall
Phone: 919-51-7846
Email: catherine_driscoll@ncsu.edu

Plan Requirements

Philosophy (BA): Philosophy Ethics Concentration: 120 Total Units

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Humanities & Social Sciences

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Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 855) | Arts and Letters (p. 855) | 3     |
Social Science (3 Different) (p. 857) | Social Science (3 Different) (p. 857) | 9     |

* Credit in the major will be given for PHI 205 only if it is the student's first PHI course.

The Department of Philosophy and Religion does not accept D grades (D-, D, D+) in courses taken to satisfy any major requirements or in ENG 101 taken to satisfy the Introduction to Writing GEP requirement.

A major GPA of at least 2.0 is required for graduation.

If a student takes a course that double counts in fulfilling more than one requirement, the student will need to take a free elective course(s) to meet the total of 120 credit hours for graduation.
Additional Social Science 3

General Education Program (GEP) Courses

GEP Mathematical Sciences (p. 1428) 6
GEP Natural Sciences (p. 1429) 7
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) 2 33

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

### Logic

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### History of Philosophy

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### Contemporary Philosophy

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<td>Philosophy of Language</td>
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<td>Knowledge and Skepticism</td>
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<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
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### Intro Ethics

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### Ethics Electives

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<td>Ethical Problems in the Law</td>
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### 400-Level PHI/LOG Course

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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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ENG 219  Studies in Great Works of Non-Western Literature  3
ENG 220  Studies in Great Works of Western Literature  3
ENG 221  Literature of the Western World I  3
ENG 222  Literature of the Western World II  3
ENG 223  Contemporary World Literature I  3
ENG 224  Contemporary World Literature II  3
ENG 246  Literature of the Holocaust  3
ENG 392  Major World Author  3
ENG 393  Studies in Literary Genre  3
ENG 394  Studies in World Literature  3
ENG 406  Modernism  3
ENG 407  Postmodernism  3
FL 219  Studies in Great Works of Non-Western Literature  3
FL 220  Studies in Great Works of Western Literature  3
FL 221  Literature of the Western World I  3
FL 222  Literature of the Western World II  3
FL 223  Contemporary World Literature I  3
FL 224  Contemporary World Literature II  3
FL 246  Literature of the Holocaust  3
FL 392  Major World Author  3
FL 393  Studies in Literary Genre  3
FL 394  Studies in World Literature  3
FL 406  Modernism  3
FL 407  Postmodernism  3
FL 301  Twentieth Century Hindi & Urdu Fiction  3
FL 302  Modern Hindi & Urdu Poetry  3
FL 401  Hindi Literature and South Asian Cultural Contexts  3
WGS 305  Women and Literature  3
WGS 410  Studies in Gender and Genre  3

Foreign Language 200 Level

Code  Title  Hours
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FL 210  Intermediate Arabic I  3
FL 211  Intermediate Chinese I  3
FL 212  Intermediate French I  3
FL 213  Intermediate German I  3
FL 214  Intermediate Italian I  3
FL 215  Intermediate Japanese I  3
FL 216  Intermediate Hindi-Urdu I  3
FL 217  Intermediate Portuguese I  3
FL 218  Intermediate Russian I  3
FL 219  Intermediate Spanish I  3
FL 220  Spanish: Language, Technology, Culture  3
GR 201  Intermediate Greek I  3
LAT 201  Intermediate Latin I  3
PER 201  Intermediate Persian I  3

Arts and Letters

Code  Title  Hours
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ADN 111  Introduction to Two-Dimensional Design  3
ADN 112  Introduction to Three-Dimensional Design  3
ADN 212  Photography I  3
ADN 281  Drawing I  3
ADN 414  Color and Light  3
AFS/MUS 230  Introduction to African-American Music  3
AFS/MUS 260  History of Jazz  3
AFS/ARS 346  Black Popular Culture  3
AFS/ENG 375  African American Cinema  3
ARC 140  Experiencing Architecture  3
ARC 141  Introduction to Architectural History  3
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**Sociology**

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### Philosophy (BA): Philosophy of Law Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of Philosophy and Religious Studies offers a Bachelor of Arts (B.A.) in Philosophy, and a Bachelor of Science (B.S.) in Philosophy, plus three concentrations. These different programs all cover basic core areas of philosophy that are essential to any good philosophy major, but they also allow students to pursue and showcase different areas of emphasis.

The B.A. in Philosophy with a Concentration in Philosophy of Law provides excellent preparation for top graduate programs in Philosophy as well as for professional training in fields as diverse as law, library science, management and medicine. Although the major does not train students for a particular career, it develops skills that are useful for work in any field that requires critical, constructive and independent thinking.

For more information about this program, visit our website (https://philrel.chass.ncsu.edu/philosophy/philosophy_major.php).

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#### Plan Requirements

**Philosophy (BA): Philosophy of Law Concentration:** 120 Total Units

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Total Hours 120

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1. A grade of C- or higher is required.
### Logic

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### History of Philosophy

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### 400-Level PHI/LOG Course

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Philosophy (BA): Philosophy of Law Concentration

Literature II List B

- ENG 219  Studies in Great Works of Non-Western Literature  3
- ENG 220  Studies in Great Works of Western Literature  3
- ENG 221  Literature of the Western World I  3
- ENG 222  Contemporary World Literature I  3
- ENG 223  Contemporary World Literature II  3
- ENG 246  Literature of the Holocaust  3
- ENG 392  Major World Author  3
- ENG 393  Studies in Literary Genre  3
- ENG 394  Studies in World Literature  3
- ENG 406  Modernism  3
- ENG 407  Postmodernism  3
- FL 219  Studies in Great Works of Non-Western Literature  3
- FL 220  Studies in Great Works of Western Literature  3
- FL 221  Literature of the Western World I  3
- FL 222  Literature of the Western World II  3
- FL 223  Contemporary World Literature I  3
- FL 224  Contemporary World Literature II  3
- FL 246  Literature of the Holocaust  3
- FL 392  Major World Author  3
- FL 393  Studies in Literary Genre  3
- FL 394  Studies in World Literature  3
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- FLF 301  Survey of French Literature from the Middle Ages through the Enlightenment  3
- FLF 302  Survey of French Literature from Romanticism to the Contemporary Period  3
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**Philosophy (BA): Philosophy of Law Concentration**

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<td>Tests and Measurements</td>
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**Sociology**

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SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 309 Religion and Society 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
SOC 400 Theories of Social Structure 3
SOC 401 Theories of Social Interaction 3
SOC 402 Urban Sociology 3
SOC 404 Families and Work 3
SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
SOC 413 Criminal Justice Field Work 4
SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics in Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

Multidisciplinary
ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Foreign Language 200 Level

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<td>PER 201</td>
<td>Intermediate Persian I</td>
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Semester Sequence

This is a sample.

Course Title Hours

First Year

Fall Semester

ENG 101 Academic Writing and Research 1 4
History I 3
GEP Social Sciences (p. 1430) 3
GEP Mathematical Sciences (p. 1428) 3
Foreign Language 201 3
GEP Health and Exercise Studies (p. 1422) 1

Hours 17

Spring Semester

History II 3
GEP Social Sciences (p. 1430) 3
GEP Mathematical Sciences (p. 1428) 3
GEP Natural Sciences (p. 1429) 3
GEP Health and Exercise Studies (p. 1422) 1

Hours 13

Second Year

Fall Semester

Literature I 3
Social Science 3
GEP Natural Sciences (p. 1429) 4
Value Theory 3
Free Elective 3

Hours 16

Spring Semester

Literature II 3
GEP Social Sciences (p. 1430) 3
Select one of the following:

LOG 201 Logic
LOG 335 Symbolic Logic
LOG 435 Advanced Logic & Metamathematics
Philosophy (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of Philosophy and Religious Studies offers a Bachelor of Arts (B.A.) in Philosophy, and a Bachelor of Science (B.S.) in Philosophy, plus three concentrations. These different programs all cover basic core areas of philosophy that are essential to any good philosophy major, but they also allow students to pursue and showcase different areas of emphasis.

The Differences Between the B.A. and the B.S. in Philosophy

The biggest differences between the B.A. in Philosophy and the B.S. in Philosophy arise from differences between the College of Humanities and Social Sciences' requirements for the B.A. and the B.S. These differences can be summarized as follows:

- For the B.A., the College requires more courses in the humanities and social sciences, including a 3-credit 201-level course in a foreign language.
- For the B.S., the College requires more courses in the natural sciences and mathematics, plus a 15-credit science or technology option.

The B.A. in Philosophy is, in general, best suited to:

- students with strong interests in a foreign language, history or literature;
- students who would like to transfer to a philosophy major from another major in the humanities or social sciences; and
- students who would like to combine a major in philosophy with another major in the humanities or social sciences.

The B.S. in Philosophy is, in general, best suited to:

- students with strong interests in mathematics, science, or technology;
- students who would like to transfer to a philosophy major from a major in mathematics, science or technology; and
- students who would like to combine a major in philosophy with another major in mathematics, science or technology.

The only difference between the departmental requirements for the B.A. in Philosophy without a concentration and the B.S. in Philosophy without a concentration is that one course in philosophy of science is required for the B.S. but not for the B.A.

For more information about this program, including contact information and career opportunities, visit our website (https://philrel.chass.ncsu.edu/philosophy/).

Contact Person

Dr. Catherine Driscoll
Director of Undergraduate Advising
434B Withers Hall
Phone: 919-51-7846
Email: catherine_driscoll@ncsu.edu

Plan Requirements

Philosophy (BS): 120 Total Units

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<td><strong>Fall Semester</strong></td>
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<td>PHI 309</td>
<td>Political Philosophy</td>
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<td>Research and Writing in History of Philosophy</td>
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<td>PHI 496</td>
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1 A grade of C- or higher is required.
PHI 495 Research and Writing in History of Philosophy 2 1
PHI 496 Research and Writing in Contemporary Philosophy 1

PHI or LOG Electives (p. 874) 2 9
400-Level PHI/LOG Course (verify requirement) (p. 875) 2

Humanities & Social Sciences
Acad Writing Research (p. 875) 2 4
Arts and Letters (p. 875) 3
History (p. 876) 3
Literature (p. 877) 3
Writing and Communication (p. 881) 3
Social Science (3 Different) (p. 877) 9

General Education Program (GEP) Courses
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 3 18
Total Hours 120

1 Students should consult their academic advisors to determine how to complete this requirement.
2 A grade of C- or higher is required.
3 Students should consult their academic advisors to determine which courses fill this requirement.

Calculus

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### Agricultural Economics Courses

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SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 309 Religion and Society 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
SOC 400 Theories of Social Structure 3
SOC 401 Theories of Social Interaction 3
SOC 402 Urban Sociology 3
SOC 404 Families and Work 3
SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
SOC 413 Criminal Justice Field Work 4
SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics In Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3
ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Writing and Communication

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Foreign Language 200 Level

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Semester Sequence

This is a sample.

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Spring Semester

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Multidisciplinary

[1] Writing and Research
A grade of C- or higher is required.

**Philosophy (BS): Logic, Representation and Reasoning Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of Philosophy and Religious Studies offers a Bachelor of Arts (B.A.) in Philosophy, and a Bachelor of Science (B.S.) in Philosophy, plus three concentrations. These different programs all cover basic core areas of philosophy that are essential to any good philosophy major, but they also allow students to pursue and showcase different areas of emphasis.

The B.S. in Philosophy with a Concentration in Logic, Representation and Reasoning provides excellent preparation for top graduate programs in Philosophy as well as for professional training in fields as diverse as law, library science, management and medicine. Although the major does not train students for a particular career, it develops skills that are useful for work in any field that requires critical, constructive and independent thinking.

For more information about this program, visit our website (https://philrel.chass.ncsu.edu/philosophy/philosophy_major.php).

**Contact Person**

Dr. Catherine Driscoll  
Director of Undergraduate Advising  
434B Withers Hall  
Phone: 919-517-846  
Email: catherine_driscoll@ncsu.edu

**Plan Requirements**

**Philosophy (BS): Logic, Representation and Reasoning Concentration:** 120 Total Units

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<td>LOG 335 Symbolic Logic ¹ or MA 335 Symbolic Logic</td>
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<td>Logic, Language &amp; Cognition (p. 886) ¹</td>
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1. A grade of C- or higher is required.

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**Second Year**

**Fall Semester**

- Literature 3  
- GEP Natural Sciences (p. 1429) 4  
- Logic 3  
- Free Elective 3  
- GEP Mathematical Sciences (p. 1428) 3-4  

**Spring Semester**

- GEP Natural Sciences (p. 1429) 4  
- Arts and Letters 3  
- History 3  
- GEP Social Sciences (p. 1430) 3  
- History of Philosophy 3  

**Third Year**

**Fall Semester**

- GEP Additional Breadth (p. 1417) (Mathematical Sciences/  
  Natural Sciences/Engineering) 3  
- GEP Interdisciplinary Perspectives (p. 1426) Requirement 2-3  
- Value Theory 3  
- Writing/Communication 3  
- Free Electives 3  

**Spring Semester**

- PHI or LOG Elective 6  
- PHI 495 Research and Writing in History of Philosophy 1  
- History of Philosophy 3  
- Philosophy of Science 3  
- Advanced Science/Technology Option Course 3  

**Fourth Year**

**Fall Semester**

- Advanced Science/Technology Option Course II 3  
- PHI 494 Research and Writing in Ethics 1  
- Advanced Science/Technology Option Course III 3  
- Free Electives 3  
- PHI or LOG Elective 3  

**Spring Semester**

- Advanced Science/Technology Option Course IV 3  
- PHI 496 Research and Writing in Contemporary Philosophy 1  
- Contemporary Philosophy 3  
- Advanced Science/Technology Option Course V 3  
- Free Electives 6  

**Total Hours** 120-124
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### Calculus

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<tr>
<td>MA 121</td>
<td>MA 121 - Elements of Calculus</td>
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<tr>
<td>MA 131</td>
<td>MA 131 - Calculus for Life and Management Sciences A</td>
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<td>MA 141</td>
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### Math Electives

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<td>BMA 573 - Mathematical Modeling of Physical and Biological Processes I</td>
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<td>BMA 574 - Mathematical Modeling of Physical and Biological Processes II</td>
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<td>BUS 350</td>
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<td>CSC 416 - Introduction to Combinatorics</td>
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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine how to complete this requirement.
3. Students should consult their academic advisors to determine which courses fill this requirement.
MA 494  Major Paper in Math  1
MA 499  Independent Research in Mathematics  1-6
MA 501  Advanced Mathematics for Engineers and Scientists I  3
MA 502  Advanced Mathematics for Engineers and Scientists II  3
MA 504  Introduction to Mathematical Programming  3
MA 507  Survey of Real Analysis  3
MA 509  Survey of Abstract Algebra  3
MA 510  Selected Topics In Mathematics For Secondary Teachers  1-6
MA 511  Advanced Calculus I  3
MA 512  Advanced Calculus II  3
MA 513  Introduction To Complex Variables  3
MA 515  Analysis I  3
MA 518  Geometry of Curves and Surfaces  3
MA 520  Linear Algebra  3
MA 521  Abstract Algebra I  3
MA 522  Computer Algebra  3
MA 523  Linear Transformations and Matrix Theory  3
MA 524  Combinatorics I  3
MA 526  Algebraic Geometry  3
MA 528  Options and Derivatives Pricing  3
MA 531  Dynamic Systems and Multivariable Control I  3
MA 532  Ordinary Differential Equations I  3
MA 534  Introduction To Partial Differential Equations  3
MA 537  Nonlinear Dynamics and Chaos  3
MA 540  Uncertainty Quantification for Physical and Biological Models  3
MA 544  Computer Experiments In Mathematical Probability  3
MA 546  Probability and Stochastic Processes I  3
MA 547  Financial Mathematics  3
MA 548  Monte Carlo Methods for Financial Math  3
MA 549  Financial Risk Analysis  3
MA 551  Introduction to Topology  3
MA 561  Set Theory and Foundations Of Mathematics  3
MA 565  Graph Theory  3
MA 573  Mathematical Modeling of Physical and Biological Processes I  3
MA 574  Mathematical Modeling of Physical and Biological Processes II  3
MA 580  Numerical Analysis I  3
MA 583  Introduction to Parallel Computing  3
MA 584  Numerical Solution of Partial Differential Equations--Finite Difference Methods  3
MA 587  Numerical Solution of Partial Differential Equations--Finite Element Method  3
MA 591  Special Topics  1-6
MBA 528  Options and Derivatives Pricing  3
ME 515  Mathematics Methods in Atmospheric Sciences  4
OR 504  Introduction to Mathematical Programming  3
OR 505  Linear Programming  3
OR 531  Dynamic Systems and Multivariable Control I  3
OR 565  Graph Theory  3
ST 305  Statistical Methods  4
ST 307  Introduction to Statistical Programming- SAS  1
ST 308  Introduction to Statistical Programming - R  1
ST 311  Introduction to Statistics  3
ST 312  Introduction to Statistics II  3
ST 350  Economics and Business Statistics  3
ST 370  Probability and Statistics for Engineers  3
ST 371  Introduction to Probability and Distribution Theory  3
ST 372  Introduction to Statistical Inference and Regression  3
ST 380  Probability and Statistics for the Physical Sciences  3
ST 401  Experiences in Data Analysis  4
ST 404  Epidemiology and Statistics in Global Public Health  3
ST 405  Applied Nonparametric Statistics  3
ST 412  Long-Term Actuarial Models  3
ST 413  Short-Term Actuarial Models  3
ST 421  Introduction to Mathematical Statistics I  3
ST 422  Introduction to Mathematical Statistics II  3
ST 430  Introduction to Regression Analysis  3
ST 431  Introduction to Experimental Design  3
ST 432  Introduction to Survey Sampling  3
ST 433  Applied Spatial Statistics  3
ST 434  Applied Time Series  3
ST 435  Statistical Methods for Quality and Productivity Improvement  3
ST 437  Applied Multivariate and Longitudinal Data Analysis  3
ST 440  Applied Bayesian Analysis  3
ST 442  Introduction to Data Science  3
ST 445  Introduction to Statistical Computing and Data Management  3
ST 446  Intermediate SAS Programming with Applications  3
ST 491  Statistics in Practice  3
ST 495  Special Topics in Statistics  1-6
ST 497  Professional Experience in Statistics  1-3
ST 498  Independent Study In Statistics  1-6
ST 499  Research Experience in Statistics  1-3
ST 501  Fundamentals of Statistical Inference I  3
ST 502  Fundamentals of Statistical Inference II  3
ST 503  Fundamentals of Linear Models and Regression  3
ST 505  Applied Nonparametric Statistics  3
ST 506  Sampling Animal Populations  3
ST 507  Statistics For the Behavioral Sciences I  3
ST 508  Statistics For the Behavioral Sciences II  3
ST 511  Statistical Methods For Researchers I  3
ST 512  Statistical Methods For Researchers II  3
ST 513  Statistics for Management I  3
ST 514  Statistics For Management and Social Sciences II  3
ST 515  Experimental Statistics for Engineers I  3
ST 516  Experimental Statistics For Engineers II  3
ST 517  Applied Statistical Methods I  3
### Basic Sciences

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<td>Teaching and Learning of Statistical Thinking</td>
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<td>Statistical Principles of Clinical Trials</td>
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<td>ST 533</td>
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<td>Using Technology to Teach Statistics</td>
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<td>Data Science for Statisticians</td>
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<td>Applied Econometrics I</td>
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<td>Data Mining with SAS Enterprise Miner</td>
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### Science Electives

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BI 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>BI 227</td>
<td>Understanding Structural Diversity through Biological Illustration</td>
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<td>BI 270</td>
<td>Current Topics in Biotechnology</td>
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<td>BI 211</td>
<td>Phage Genomics</td>
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<td>CH 101</td>
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<td>CH 102</td>
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<td>General Chemistry I for Students in Chemical Sciences</td>
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<td>Chemistry - A Quantitative Science</td>
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<td>Forest Pathology</td>
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MB 210  Phage Hunters  3
MB 211  Phage Genomics  2
MB 351  General Microbiology  3
MEA 100  Earth System Science: Exploring the Connections  4
MEA 101  Geology I: Physical  3
MEA 110  Geology I Laboratory  1
MEA 130  Introduction to Weather and Climate  3
MEA 135  Introduction to Weather and Climate Laboratory  1
MEA 150  Environmental Issues in Water Resources  4
MEA 200  Introduction to Oceanography  3
MEA 202  Geology II: Historical  3
MEA 210  Oceanography Lab  1
MEA 211  Geology II Laboratory  1
NSGE 295  Natural Sciences Special Topics  1-4
NSGK 295  Natural Sciences and Global Knowledge Special Topics  3

Writing in History or Ethics

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History of Philosophy

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Ethics

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Logic, Language & Cognition

Select a minimum of 3 units

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<td>Philosophy of Language</td>
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<td>PHI 332</td>
<td>Philosophy of Psychology</td>
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<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
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<tr>
<td>PHI 401</td>
<td>Kant's Critique of Pure Reason</td>
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<tr>
<td>PHI 420</td>
<td>Global Justice</td>
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<tr>
<td>PHI 425</td>
<td>Introduction to Cognitive Science</td>
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<tr>
<td>PHI 440</td>
<td>The Scientific Method</td>
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<tr>
<td>PHI 447</td>
<td>Philosophy, Evolution and Human Nature</td>
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<tr>
<td>PHI 475</td>
<td>Ethical Theory</td>
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<tr>
<td>PSY 425</td>
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Additional Logic/Language/Cognition

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<td>Varieties of Logic</td>
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<td>LOG 435</td>
<td>Advanced Logic &amp; Metamathematics</td>
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<td>Special Topics in Logic</td>
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<td>Research and Writing in Contemporary Philosophy</td>
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### Philosophy of Science

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### PHI or LOG Electives

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<td>Representation, Reason and Reality</td>
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<td>PHI 330</td>
<td>Metaphysics</td>
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<td>PHI 331</td>
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<td>PHI 332</td>
<td>Philosophy of Psychology</td>
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<td>Knowledge and Skepticism</td>
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### 400-Level PHI/LOG Course

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### Acad Writing Research

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### Transfer Sequence

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Agricultural Economics

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<tr>
<td>AFS/ENG 349</td>
<td>African Literature in English</td>
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<td>African-American Literature</td>
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<tr>
<td>ENG 206</td>
<td>Studies In Drama</td>
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<tr>
<td>ENG 207</td>
<td>Studies in Poetry</td>
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<td>ENG 208</td>
<td>Studies In Fiction</td>
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<tr>
<td>ENG 209</td>
<td>Introduction to Shakespeare</td>
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<td>ENG/FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>Literature of the Western World I</td>
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<td>Contemporary World Literature I</td>
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<td>ENG/FL 224</td>
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<td>ENG 232</td>
<td>Literature and Medicine</td>
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<td>ENG 246</td>
<td>Literature of the Holocaust</td>
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<tr>
<td>ENG 249</td>
<td>Native American Literature</td>
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<tr>
<td>ENG 251</td>
<td>Major British Writers</td>
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<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<tr>
<td>ENG 260</td>
<td>Reading Literature and Exploring Textuality</td>
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<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG/FL 275</td>
<td>Literature and War</td>
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<tr>
<td>ENG/WGS 305</td>
<td>Women and Literature</td>
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<tr>
<td>ENG 339</td>
<td>Literature and Technology</td>
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<td>ENG 340</td>
<td>Literature, Art, and Society</td>
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<td>ENG 341</td>
<td>Literature and Science</td>
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<tr>
<td>ENG 342</td>
<td>Literature of Space and Place</td>
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<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>ENG 362</td>
<td>Studies in the British Novel</td>
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<tr>
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<td>The American Novel of the 19th Century</td>
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<td>ENG 370</td>
<td>American Fiction, Twentieth Century and Beyond</td>
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<tr>
<td>ENG 372</td>
<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>ENG 377</td>
<td>Fantasy</td>
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<td>ENG 380</td>
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<td>Film and Literature</td>
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<td>Biblical Backgrounds of English Literature</td>
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<td>Classical Backgrounds of English Literature</td>
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<tr>
<td>ENG/FL 394</td>
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<td>ENG 399</td>
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<tr>
<td>ENG/FL 406</td>
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<td>ENG/FL 407</td>
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### Writing and Communication

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<td>Writing About Film</td>
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<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
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<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
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<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
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### Foreign Language 200 Level

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<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<tr>
<td>FLF 201</td>
<td>Intermediate French I</td>
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<td>FLG 201</td>
<td>Intermediate German I</td>
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<td>FLI 201</td>
<td>Intermediate Italian I</td>
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<td>FLJ 201</td>
<td>Intermediate Japanese I</td>
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<tr>
<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<tr>
<td>FLP 201</td>
<td>Intermediate Portuguese I</td>
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<td>FLS 201</td>
<td>Intermediate Spanish I</td>
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<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture</td>
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<tr>
<td>GRK 201</td>
<td>Intermediate Greek I</td>
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<td>LAT 201</td>
<td>Intermediate Latin I</td>
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<td>PER 201</td>
<td>Intermediate Persian I</td>
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### Literature List B

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<td>ENG/FL 220</td>
<td>Studies in Great Works of Western Literature</td>
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<td>ENG/FL 221</td>
<td>Literature of the Western World I</td>
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<tr>
<td>ENG/FL 223</td>
<td>Contemporary World Literature I</td>
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<td>ENG/FL 224</td>
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<td>ENG/FL 394</td>
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<td>Modernism</td>
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<td>ENG/FL 407</td>
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<tr>
<td>FLF 301</td>
<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>FLF 302</td>
<td>Survey of French Literature from Romanticism to the Contemporary Period</td>
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<td>Seminar in French Studies</td>
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<td>FLG 320</td>
<td>Introduction to German Literature</td>
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<td>Twentieth Century German Literature</td>
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<td>FLG 325</td>
<td>German Lyric Poetry</td>
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<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>FLR 304</td>
<td>Russian Literature in Translation: The Twentieth Century</td>
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<td>Literature and Culture of Spain I</td>
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<td>FLS 343</td>
<td>Literature and Culture of Spain III</td>
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<td>FLS 351</td>
<td>Literature and Culture of Latin America I</td>
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<td>FLS 352</td>
<td>Literature and Culture of Latin America II</td>
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<td>FLS 353</td>
<td>Literature and Culture of Latin America III</td>
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<td>FLS 492</td>
<td>Seminar in Hispanic Studies</td>
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<tr>
<td>HON 202</td>
<td>Inquiry, Discovery, and Literature</td>
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### Semester Sequence

This is a sample.

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<thead>
<tr>
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<td>Fall Semester</td>
<td>Academic Writing and Research ¹</td>
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<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td>4</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>Calculus</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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### Second Year

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<td>Fall Semester</td>
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<tr>
<td>GEP Natural Sciences (p. 1429)</td>
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<tr>
<td>LOG/MA 335</td>
<td>Symbolic Logic</td>
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<td>Philosophy</td>
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<tr>
<td>Mathematics Elective</td>
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### Spring Semester

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<tr>
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<tr>
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</tbody>
</table>
### Philosophy (Minor)

**To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!**

The Minor in Philosophy is designed to expose students to three fundamental areas of philosophy: history of philosophy, normative philosophy and contemporary discussion of issues in metaphysics and epistemology. It is a highly desirable minor because it reveals to employers, graduate schools, and professional schools a willingness to engage in theoretical reasoning.

Students can shape their minor in ways that complement their major fields of study. For example, science and engineering majors might include philosophy of science courses (PHI 340 Philosophy of Science and PHI 440 The Scientific Method) among their minor courses. Management students might include PHI 214 Issues in Business Ethics. No courses for the minor may be taken for S/U credit.

### Admissions and Certification of Minor

In both instances, students should contact the person listed below. A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

### Contact Persons

Dr. John Carroll, Minor Adviser  
457 Withers Hall,  
919-515-6140  
john_carroll@ncsu.edu

Joanna King, Student Services Associate  
Department of Philosophy and Religious Studies  
Withers Hall 340  
919.515.6100  
joanna_king@ncsu.edu

**Effective: 8/2011**  
**SIS Code: 16PHM**

### Plan Requirements

- The minor consists of 15 hours of credit (5 courses) including 9 hours of required courses and 6 hours of elective courses.
- A grade of ‘C’ or better will be required for all courses taken to fulfill the minor requirements.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

The department will determine whether courses which have been transferred from other institutions qualify for the minor. No more than two courses from other institutions may count toward the minor.

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>PHI 300</td>
<td>Ancient Philosophy</td>
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<tr>
<td>PHI 301</td>
<td>Early Modern Philosophy</td>
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<tr>
<td>PHI 302</td>
<td>19th Century Philosophy</td>
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<tr>
<td>PHI 401</td>
<td>Kant’s Critique of Pure Reason</td>
<td></td>
</tr>
<tr>
<td>PHI 214</td>
<td>Issues in Business Ethics</td>
<td></td>
</tr>
<tr>
<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<tr>
<td>PHI 309</td>
<td>Political Philosophy</td>
<td></td>
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<tr>
<td>PHI 312</td>
<td>Philosophy of Law</td>
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<tr>
<td>PHI 313</td>
<td>Ethical Problems in the Law</td>
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</tr>
<tr>
<td>PHI 319</td>
<td>Africana Political Philosophy</td>
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1. A grade of C- or higher is required.

### Arts and Letters

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<td>PHI 214</td>
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<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<td>PHI 309</td>
<td>Political Philosophy</td>
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<td>PHI 312</td>
<td>Philosophy of Law</td>
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<td>PHI 313</td>
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<tr>
<td>PHI 319</td>
<td>Africana Political Philosophy</td>
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Religious Studies (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Arts (B.A.) in Religious Studies offered by the Department of Philosophy and Religious Studies provides a reliable understanding of the nature and impact of religion which prepares students for graduate study, professional training and work in many fields.

The NC State major in Religious Studies provides excellent preparation for top graduate programs in Religious Studies as well as for professional training in fields as diverse as education, library science, ministry and social work. The major also provides knowledge and skills that are useful for work in many fields, including diplomacy, educating the public, fundraising, journalism, museum projects and public service.

The majors in Philosophy and Religious Studies are both designed to combine easily with a major in a further discipline that is relevant to a student’s career aspirations. Students who take advantage of this opportunity will enhance their chance of future success.

For more information about this program, including contact information and career opportunities, visit our website (https://philrel.chass.ncsu.edu/religious_studies/religious_studies_major.php).

Contact Person
Dr. Jason Bivins
Director of Religious Studies
447 Withers Hall
Phone: 919-515-6102
Email: jcbivins@ncsu.edu

Plan Requirements

Religious Studies (BA): 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>PHI 325</td>
<td>Bio-Medical Ethics</td>
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<td>PHI 375</td>
<td>Ethics</td>
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<td>PHI 376</td>
<td>History of Ethics</td>
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<td>PHI 475</td>
<td>Ethical Theory</td>
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Select three credit hours in another course other than one in the above categories (history of philosophy, normative philosophy) and excluding logic courses. ¹

Elective Courses: 6

Select six credits of PHI or LOG courses at the 200 level and above.

Total Hours: 15

¹ PHI 205 Introduction to Philosophy and PHI 210 Representation, Reason and Reality may not both be used toward the Minor.

Critical Methods (p. 896) ¹
Advanced Religion Electives (p. 896) ¹
Religion Electives (p. 896) ¹

Humanities & Social Sciences

ENG 101 ¹

History I (p. 897)
History II (p. 897)
Literature I (p. 897)
Literature II (p. 898)
Foreign Language 200 Level (p. 899)
Philosophy

Any PHI course on the approved GEP-Humanities list.

Additional Social Science

Arts and Letters (p. )
Social Science (3 Different) (p. 899)

Free Electives

Free Electives (12 Hr S/U Lmt) ²

Total Hours: 120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

Non-Western Traditions

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<td>Islamic History to 1798</td>
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<td>HI 408</td>
<td>Islam in the Modern World</td>
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<tr>
<td>REL 230</td>
<td>Asian Religions</td>
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<td>REL 331</td>
<td>The Hindu Tradition</td>
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<td>REL 332</td>
<td>The Buddhist Traditions</td>
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</tr>
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Western Traditions

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<td>HI 402</td>
<td>Early Christianity to the Time of Eusebius</td>
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<td>REL 311</td>
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### Religious Studies (BA)

#### Critical Methods

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<tr>
<td>SOC 295</td>
<td>Special Topics in Sociology</td>
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<tr>
<td>SOC 300</td>
<td>Social Research Methods</td>
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<tr>
<td>SOC 301</td>
<td>Human Behavior</td>
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<tr>
<td>SOC 304</td>
<td>Gender and Society</td>
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<tr>
<td>SOC 305</td>
<td>Racial and Ethnic Relations</td>
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</tr>
<tr>
<td>SOC 306</td>
<td>Criminology</td>
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<tr>
<td>SOC 309</td>
<td>Religion and Society</td>
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<tr>
<td>SOC 311</td>
<td>Community Relationships</td>
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<td>SOC 342</td>
<td>International Development</td>
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<td>SOC 350</td>
<td>Food and Society</td>
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<td>SOC 400</td>
<td>Theories of Social Structure</td>
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<td>SOC 401</td>
<td>Theories of Social Interaction</td>
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<tr>
<td>SOC 402</td>
<td>Urban Sociology</td>
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<tr>
<td>SOC 404</td>
<td>Families and Work</td>
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<td>SOC 405</td>
<td>Racism in the U.S.</td>
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<td>Sociology of Sexualities</td>
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<td>SOC 410</td>
<td>Sociology of Organizations</td>
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<td>SOC 413</td>
<td>Criminal Justice Field Work</td>
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<td>SOC 414</td>
<td>Social Class</td>
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<td>SOC 418</td>
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<td>SOC 425</td>
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### Semester Sequence

This is a sample.

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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>History</td>
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<td>3</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>3</td>
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<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<td>History</td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>Philosophy</td>
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<td>3</td>
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### Religious Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Students who take a minor program in Religious Studies are required to complete, with a grade of C or better, fifteen (15) hours of courses in selected fields of Religious Studies. In order to ensure a wide study of the field, students are required to select at least one course in each of the following categories: Historical Methods, Textual Methods, and Critical/Theoretical Methods. As part of these requirements, it is expected that at least one of these classes focus on Western religious traditions and at least one on non-Western traditions. Electives may be filled from any of these courses or from other Religious Studies course offerings. No courses for the minor may be taken for S/U credit.
Admissions and Certification of Minor

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in Departmental Offices and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Persons

Dr. Jason C. Bivins
447 Withers,
919.515.6102
jcbivins@ncsu.edu

SIS Code: 16RSM

Plan Requirements

- 15 hours (5 courses) of course work is required to complete the minor in Religious Studies.
- Students are required to select at least 1 course in Western Religious Traditions and at least 1 course in non-Western religious traditions.
- A minimum grade of ‘C-’ is needed in all courses taken toward the minor.
- A maximum of two (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.

Required Courses

The department will determine whether courses which have been transferred from other institutions qualify for the minor. No more than two courses from other institutions may count toward the minor. Students must select at least one course in each of the following categories: Textual Methods, Historical Methods and Critical/Theoretical methods.

Historical Methods Courses

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<th>Code</th>
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<th>Hours</th>
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<tr>
<td>REL 230</td>
<td>Asian Religions</td>
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<tr>
<td>REL 317</td>
<td>Christianity</td>
<td>3</td>
</tr>
<tr>
<td>REL/HI 320</td>
<td>Religion in American History</td>
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</tr>
<tr>
<td>REL 331</td>
<td>The Hindu Tradition</td>
<td>3</td>
</tr>
<tr>
<td>REL 332</td>
<td>The Buddhist Traditions</td>
<td>3</td>
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<tr>
<td>REL 333</td>
<td>Chinese Religions</td>
<td>3</td>
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<tr>
<td>REL 334</td>
<td>Japanese Religions</td>
<td>3</td>
</tr>
<tr>
<td>REL 340</td>
<td>Islam</td>
<td>3</td>
</tr>
<tr>
<td>REL 350</td>
<td>Introduction to Judaism</td>
<td>3</td>
</tr>
<tr>
<td>REL/HI 402</td>
<td>Early Christianity to the Time of Eusebius</td>
<td>3</td>
</tr>
<tr>
<td>REL/HI 407</td>
<td>Islamic History to 1798</td>
<td>3</td>
</tr>
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<td>REL/HI 408</td>
<td>Islam in the Modern World</td>
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Textual Methods Courses

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<td>REL 312</td>
<td>Introduction to the New Testament</td>
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<tr>
<td>REL 314</td>
<td>Introduction to Intertestamental Literature</td>
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</tr>
<tr>
<td>REL 412</td>
<td>Advanced Readings in the Christian Gospels</td>
<td>3</td>
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<tr>
<td>REL 413</td>
<td>The Life and Letters of the Apostle Paul</td>
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Critical/Theoretical Methods Courses

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<td>REL/SOC 309</td>
<td>Religion and Society</td>
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<tr>
<td>REL 323</td>
<td>Religious Cults, Sects, and Minority Faiths in America</td>
<td>3</td>
</tr>
<tr>
<td>REL 327</td>
<td>Issues in Contemporary Religion</td>
<td>3</td>
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<tr>
<td>REL 383</td>
<td>Religion, Globalism, and Justice</td>
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<tr>
<td>REL 423</td>
<td>Religion and Politics in America</td>
<td>3</td>
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<tr>
<td>REL/STS 471</td>
<td>Darwinism and Christianity</td>
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<td>REL/WGS 472</td>
<td>Women and Religion</td>
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<td>REL 473</td>
<td>Religion, Gender, and Reproductive Technologies</td>
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<td>REL 482</td>
<td>Religion and Conflict</td>
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<td>REL 489</td>
<td>Interpretations of Religion</td>
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Western Traditions

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<tr>
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<tbody>
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<td>REL 311</td>
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<tr>
<td>REL 312</td>
<td>Introduction to the New Testament</td>
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<td>REL 314</td>
<td>Introduction to Intertestamental Literature</td>
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<td>REL 317</td>
<td>Christianity</td>
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<td>REL/HI 320</td>
<td>Religion in American History</td>
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<td>REL 323</td>
<td>Religious Cults, Sects, and Minority Faiths in America</td>
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<tr>
<td>REL 350</td>
<td>Introduction to Judaism</td>
<td>3</td>
</tr>
<tr>
<td>REL/HI 402</td>
<td>Early Christianity to the Time of Eusebius</td>
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<tr>
<td>REL 412</td>
<td>Advanced Readings in the Christian Gospels</td>
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<tr>
<td>REL 413</td>
<td>The Life and Letters of the Apostle Paul</td>
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<td>REL 423</td>
<td>Religion and Politics in America</td>
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Non-Western Traditions

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<tbody>
<tr>
<td>REL 230</td>
<td>Asian Religions</td>
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<td>REL 331</td>
<td>The Hindu Tradition</td>
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<td>Chinese Religions</td>
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<td>REL 334</td>
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<td>REL/HI 407</td>
<td>Islamic History to 1798</td>
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<tr>
<td>REL/HI 408</td>
<td>Islam in the Modern World</td>
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</table>

Department of Psychology

Psychology

Psychology is one of the basic majors in liberal arts and sciences. Psychologists use the methodology of science to study human behavior and experience. A bachelor’s degree in psychology forms an excellent foundation for careers in psychology, as well as business and government. It will also enhance life skills such as parenting and human social interaction. Students can also use this degree as an entry into further education leading to an advanced degree in applied or
experimental psychology, or to such fields as law, medicine, business or social work.

The Department of Psychology at NC State offers a Bachelor of Arts (B.A.) in Psychology as well as an undergraduate Psychology Minor. Psychology majors at NC State have the opportunity to get involved in a variety of ways, including:

- Psychology Club: All undergraduate majors are members of the Psychology Club, which provides a number of enrichment activities
- Psi Chi: The International Honor Society in Psychology that recognizes academic excellence among Psychology students
- Other student organizations with like-minded peers in the College of Humanities and Social Sciences

For more information about this department, including contact information, visit our website (https://psychology.chass.ncsu.edu/).

Department of Psychology
640 Poe Hall
Campus Box 7650
Raleigh, NC 27695-7650
Phone: 919-515-2251

Contact Person
Dr. Chris Mayhorn
Department Head
Phone: 919-513-4856
Email: chris_mayhorn@ncsu.edu (chris_mayhorn@ncsu.edu)

Faculty

Head
C. B. Mayhorn

Associate Head, Director of Graduate Programs
M. B. Wyer

Assistant Head, Director of Undergraduate Programs
D. Grühn

Director of Advising
D. Kotter-Grühn

Distinguished Professor
T. M. Hess

Alumni Distinguished Undergraduate Professor
L.E. Baker-Ward
A.G. Halberstadt

Professors
L. E. Baker-Ward
J. P. Braden
D. J. Gillan
D. O. Gray
A. G. Halberstadt
M. E. Haskett
T. M. Hess
C. B. Mayhorn
A. W. Meade
R. W. Nacoste
L. F. Thompson

Associate Professor
J. C. Allaire
J. C. Begeny
C. C. Brookins
J. L. Burnette
S. B. Craig
S. L. Desmarais
D. Grühn
A. C. McLaughlin
S. D. Neupert
S. B. Pond
S. A. Stage
M. A. Wilson
M. B. Wyer

Assistant Professor
S. Cho
J. Feng
E. C. Hope
E. K. Kim
K. L. S. Mulvey
K. E. Norwalk
Psychology (BA): General Psychology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

A Psychology degree is oriented toward the student who wants a broad understanding of the types of problems with which psychology is concerned and the ways in which psychologists approach and attempt to solve these problems. Curriculum requirements are sufficiently flexible for students to concentrate, if they wish, in another area of study as well as psychology, and thereby prepare themselves for a variety of careers or professional programs. By wise choice of elective courses, a student can prepare for medical, legal, business, or education graduate training, while at the same time acquire a basic background in the social sciences.

For more information about this program, including contact information, visit our website (https://psychology.chass.ncsu.edu/undergraduate/).

Contact Person

Dr. Chris Mayhorn
Department Head
Phone: 919-513-4856
Email: chris_mayhorn@ncsu.edu (chris_mayhorn@ncsu.edu)

Plan Requirements

Psychology (BA): General Psychology Concentration: 120 Total Units

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<tr>
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<td>ST 311 Introduction to Statistics ^1</td>
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<td>PSY 230 Introduction to Psychological Research ^1</td>
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<td>PSY 311 Social Psychology ^1</td>
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<td>Philosophy ^1</td>
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<td>Arts and Letters (p. 911) ^1</td>
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<td><strong>General Education Program (GEP) Courses</strong></td>
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<td>GEP Health and Exercise Studies (p. 1422) ^1</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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Total Hours: 120
1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

### Biology in the Modern World

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<tbody>
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<td>BIO 105</td>
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<td>BIO 106</td>
<td>Biology in the Modern World Laboratory</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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### Basic Natural Science

<table>
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**Semester Sequence**

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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</table>
Psychology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Psychology Department offers a minor in Psychology to majors in any field except Psychology. No courses for the minor may be taken for S/U credit.

Admissions

Students may declare their intention to complete the Psychology minor by consulting with the contact person listed below.

Certification

The contact person listed below will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student's final semester at NC State.

Effective: 8.2016

Contact Person

Dr. Dana Kotter-Gruehn
639 Poe Hall,
919-513-4855
psych_advising@ncsu.edu

SIS Code: 16PCM

Plan Requirements

- No more than 9 hours may be met with transfer credit.
- Completion of 18 credit hours of coursework with a grade of 'C-' or better.
- 6 of the 18 hours must be in the foundational courses of psychology and 9 hours in the core courses of psychology.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

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<td>PSY 230</td>
<td>Introduction to Psychological Research</td>
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<td>PSY 311</td>
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<td>PSY 376</td>
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Total Hours 120

1 A grade of C- or higher is required.
Students who have taken a research methods class in Political Science (PS 371 Research Methodology of Political Science), Sociology (SOC 300 Social Research Methods), or Communication (COM 240 Communication Inquiry) - with a ’C-‘ or better - do not have to take PSY 230 Introduction to Psychological Research for their psychology minor. Instead, they will take an additional 300-level or 400-level Psychology course (with the exception of PSY 499 Individual Study in Psychology).

Department of Sociology and Anthropology

The Department of Sociology and Anthropology offers introductory and advanced courses in anthropology and sociology. The curricula aim to provide majors with an academic background and practical experiences useful for careers in government, business and nonprofit organizations, or for pursuing advanced academic work.

Undergraduate majors may earn one of four degrees: Bachelor of Arts in General Anthropology, Bachelor of Arts in Criminology, Bachelor of Arts in Sociology, and Bachelor of Science in Sociology.

What sets our department apart:

• Our department was the first at NC State to award a doctoral degree, in 1926.
• Our department is one of the largest of its kind in the United States, with around 30 full-time faculty, plus instructors and lecturers, and more than 9,000 students each year.
• The Department Honors Program (https://socant.chass.ncsu.edu/undergraduate/honors/) offers additional academic challenge, intellectual independence, and the opportunity to work more closely with supportive, enthusiastic faculty.
• Each student is assigned a professionally trained Academic Advisor, with whom they work from entry until graduation, allowing the student to build a trusting relationship with an advisor who will the student identify and work toward their academic and professional goals.
• Our majors have countless opportunities to participate in impactful research and engagement that contributes to our understanding of what it means to be human, live in society, to create and recreate ourselves and our cultures.

For more information about our department, visit our website (https://socant.chass.ncsu.edu/).

Department of Sociology and Anthropology
334 1911 Building
Campus Box 8107
Raleigh, NC 27695-8107
Phone: 919-515-3180
Fax: 919-515-2610
Email: socantundergrad@ncsu.edu

Contact Person
William Smith
Department Head
Office: 335 1911 Building
Phone: 919-515-0456
Email: wrs@ncsu.edu

Stephanie Jares
Coordinator of Advising
Phone: 919-515-5565
Email: sjares@ncsu.edu

Faculty
Head
W. R. Smith

Associate Head and Anthropology Program Director
D. T. Case, Director of Undergraduate Programs

Assistant Head
M Crowley

Director of Graduate Programs, Sociology
S. McDonald

Director of Graduate Programs, Anthropology
J. Millhauser

Scheduling Officer
A. Manzoni

Professors
M.P. Atkinson
D. Case
T.N. Greenstein
S. McDonald
T.L. Parcel
M.L. Schwalbe
T. Shriver

Associate professors
S. Bowen
M. Crowley
S. DeCoste
M. DeSouchey
K. Ebert
N. Haenn
Anthropology (BA): General Anthropology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Arts (B.A.) in Anthropology introduces students to anthropology with offerings in three of the subfields of the discipline: archaeology, biological anthropology, and cultural anthropology. Our program focuses on the interrelationships among the cultural, social and biological bases of human behavior in evolutionary and contemporary contexts. The degree emphasizes exposure to different cultures through classic ethnography, and a better understanding of the past through archaeology and human skeletal analysis.

• Anthropology majors are encouraged to take an international perspective as we examine diverse cultures and areas of the world
• Students can join the Anthropology Club, a student organization open to all majors that provides students opportunities to pursue their interest in anthropology through collaboration with professors, peers, and guest speakers
• An anthropology internship is offered through the program
• Theory and methods are a requirement of the program

For more information about this program, visit our website (https://socant.chass.ncsu.edu/undergraduate/anthropology/).

Contact
Stephanie Jares
Coordinator of Advising
Phone: 919-515-5565
Email: sjares@ncsu.edu

Plan Requirements
Anthropology (BA): General Anthropology Concentration: 120 Total Units

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<td>ANT 252</td>
<td>Cultural Anthropology</td>
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<td>ANT 253</td>
<td>Unearthing the Past: Introduction to World Archaeology</td>
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<td>ANT 411</td>
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<td>ANT 483</td>
<td>Theories of Archaeological Research</td>
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Select one of the following: 3
| ANT 389 | Fundamentals of Archaeological Research |
| ANT 416 | Research Methods in Cultural Anthropology |
| ANT 516 | Research Methods in Cultural Anthropology |
| ANT 529 | Advanced Methods in Forensic Anthropology |

**Concentration Requirements**

- ANT Ethnography Elective (p. 919) 3
- ANT Elective 400 Level (p. 919) 3
- ANT General Electives (p. 920) 9

**Humanities and Social Sciences**

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<td>Philosophy</td>
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1. Any PHI course on the approved GEP-Humanities list.
2. Students should consult their academic advisors to determine which courses fill this requirement.

**Additional Social Science**

3

**GEP Courses**

- GEP Mathematical Sciences (p. 1428) 3
- GEP Natural Sciences (p. 1429) 7
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement) 3
- GEP Global Knowledge (p. 1419) (verify requirement) 3
- Foreign Language Proficiency (p. 1417) (verify requirement) 3

**Free Electives**

Free Electives (12 Hr S/U Lmt) 27

| Total Hours | 120 |

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

**Mathematics**

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<td>Introduction to Finite Mathematics with Applications</td>
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<td>MA 121</td>
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<td>MA 131</td>
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**ANT Ethnography Electives**

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<td>Andean South America</td>
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<td>ANT 330</td>
<td>Peoples and Cultures of Africa</td>
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<td>ANT 345</td>
<td>Anthropology of the Middle East</td>
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<td>Peoples and Cultures of Southeast Asia</td>
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<td>ANT 351</td>
<td>Contemporary Culture in Japan</td>
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<td>Peoples and Cultures of the Pacific</td>
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**ANT Electives 400 Level**

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<td>Research Methods in Cultural Anthropology</td>
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<td>ANT 419</td>
<td>Ethnographic Field Methods</td>
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<td>Human Osteology</td>
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<td>Forensic Anthropology Crime Scene Investigation Field Methods</td>
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<td>Bioarchaeology</td>
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<td>ANT 431</td>
<td>Tourism, Culture and Anthropology</td>
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<td>Anthropology of Ecotourism and Heritage Conservation</td>
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<td>ANT 444</td>
<td>Cross-Cultural Perspectives on Women</td>
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ANT 522  Forensic Anthropology Crime Scene Investigation  Field Methods  3
ANT 524  Bioarchaeology  3
ANT 529  Advanced Methods in Forensic Anthropology  4
ANT 531  Tourism, Culture, and Anthropology  3
ANT 533  Anthropology of Ecotourism and Heritage Conservation  3
ANT 544  Cross-Cultural Perspectives on Women  3
ANT 550  Culture, Ecology, and Sustainable Living  3
ANT 560  Urban Anthropology  3
ANT 564  Anthropology of Religion  3
ANT 575  Environmental Archaeology  3
WGS 444  Cross-Cultural Perspectives on Women  3
WGS 544  Cross-Cultural Perspectives on Women  3

**ANT General Electives**

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<td>The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica</td>
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**ANT 522**  Forensic Anthropology Crime Scene Investigation  Field Methods  3
**ANT 524**  Bioarchaeology  3
**ANT 529**  Advanced Methods in Forensic Anthropology  4
**ANT 531**  Tourism, Culture, and Anthropology  3
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**ANT 544**  Cross-Cultural Perspectives on Women  3
**ANT 550**  Culture, Ecology, and Sustainable Living  3
**ANT 560**  Urban Anthropology  3
**ANT 564**  Anthropology of Religion  3
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**ANT General Electives**

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**FL 394** Studies in World Literature 3  
**FL 406** Modernism 3  
**FL 407** Postmodernism 3  
**FL 301** Twentieth Century Hindi & Urdu Fiction 3  
**FL 302** Modern Hindi & Urdu Poetry 3  
**FL 401** Hindi Literature and South Asian Cultural Contexts 3  
**FLN 305** Women and Literature 3  
**FLS 410** Studies in Gender and Genre 3  

**FLS 341** Literature and Culture of Spain I 3  
**FLS 342** Literature and Culture of Spain II 3  
**FLS 343** Literature and Culture of Spain III 3  
**FLS 351** Literature and Culture of Latin America I 3  
**FLS 352** Literature and Culture of Latin America II 3  
**FLS 353** Literature and Culture of Latin America III 3  
**FLS 492** Seminar in Hispanic Studies 3  
**HON 202** Inquiry, Discovery, and Literature 3  
**HON 293** Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge 3  

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**Agricultural Economics**

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<tr>
<td>STS 402</td>
<td>Peace and War in the Nuclear Age</td>
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**Semester Sequence**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)

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<tr>
<td>Math/Statistics/Logic</td>
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</table>
Anthropology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

This minor focuses on anthropology as the comparative study of human beings. As such, anthropology is a broad discipline which includes the physical and cultural aspects of humans. The minor permits flexibility in course selection (15 credit hours). The anthropological sub-disciplines of cultural anthropology, physical anthropology, archaeology, and linguistics are represented in the course offerings. No courses for the minor may be taken for S/U credit.

Admissions

To be admitted to the program, a student must have a GPA of at least 2.0. Students may declare their intention to complete the minor by submitting the Declare a Minor (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) form to the minor advisor. Declaring a minor early will help ensure you have access to courses that may restrict seats to departmental majors and minors. Should students wish to transfer a course from another institution toward the minor, they should consult Stephanie Jares, advisor for the minor.

Certification

The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor can be found outside room 334B in the 1911 Building and should be completed no later than the registration period for the student’s final semester at NC State. Students should see the person listed below for certification of the minor.

Contact Person

Sociology & Anthropology Departmental Office

Stephanie Jares

1911 Building, Office 334B

919.515.3116

sis@ncsu.edu

SIS Code: 16AYM

Plan Requirements

- Completion of 15 hours of coursework in anthropology courses.
- 9 of the 15 hours must be taken at NC State University.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

Criminology (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Criminology is the scientific study of crime from a social and individual perspective that encourages students to think critically about the causation, correction, and prevention of crime.

The Bachelor of Arts (B.A.) in Criminology provides a professional orientation that will be relevant to your occupational goals as well as your participation as a citizen in community affairs. Students will gain a foundation for understanding the causes, correction, and prevention of crime and the agencies involved in criminal justice. More specific areas of study concern deviance, juvenile delinquency, the court system, and correctional facilities.

Our students complete a 120 hour internship with a criminal justice field agency during their senior year. Students also have the opportunity to join the Criminal Justice Club (CJC), a student-maintained club that aims to provide students of all majors an environment in which to further foster their interests, meet like-minded peers, and allow them the opportunity to network within the field.

For more information about this program, visit our website (https://socant.chass.ncsu.edu/undergraduate/criminology/).

Contact

Stephanie Jares
Coordinator of Advising
Phone: 919-515-5565
Email: sjares@ncsu.edu

Plan Requirements

Criminology (BA): 120 Total Units
### Departmental Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<td>SOC 202</td>
<td>Principles of Sociology</td>
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<td>SOC 300</td>
<td>Social Research Methods</td>
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<tr>
<td>SOC 400</td>
<td>Theories of Social Structure</td>
<td>3</td>
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<td>or SOC 401</td>
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<td>Criminal Justice Field Work</td>
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<td>SOC - 300/400 Level (p. 929)</td>
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### Humanities and Social Sciences

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<td>ENG 101</td>
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<td>History I (p. 931)</td>
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<td>History II (p. 931)</td>
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<td>Literature I (p. 931)</td>
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<td>Literature II (p. 931)</td>
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<td>Foreign Language 200 Level (p. 933)</td>
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<td>Philosophy</td>
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<td>SOI 306</td>
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<td>Additional Social Science</td>
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### GEP Courses

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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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### Free Electives

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**Total Hours**: 120

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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

### SOC/Criminology Electives

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<tr>
<td>SOC 425</td>
<td>Juvenile Delinquency</td>
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<tr>
<td>SOC 427</td>
<td>Sociology of Law</td>
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<td>SOC 428</td>
<td>Formal Institutions of Social Control</td>
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<td>SOC 429</td>
<td>Quantitative Data Analysis in Sociology</td>
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<td>SOC 430</td>
<td>Community and Crime</td>
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<tr>
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<td>Violence, Terrorism, and Public Policy</td>
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<td>SOC 445</td>
<td>Inequality, Ideology, and Social Justice</td>
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<td>SOC 465</td>
<td>Social Aspects of Mental Health</td>
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### SOC 300-/400-Level

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<td>ANT 528</td>
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<td>Violence, Terrorism, and Public Policy</td>
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<tr>
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<td>Religion and Society</td>
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<td>Social Research Methods</td>
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<td>Human Behavior</td>
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<td>Gender and Society</td>
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<td>Racial and Ethnic Relations</td>
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<td>Religion and Society</td>
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<td>Community Relationships</td>
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<td>International Development</td>
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<td>SOC 350</td>
<td>Food and Society</td>
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<td>SOC 351</td>
<td>Population and Planning</td>
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<td>SOC 381</td>
<td>Sociology of Medicine</td>
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<td>SOC 395</td>
<td>Special Topics in Sociology</td>
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<td>SOC 400</td>
<td>Theories of Social Structure</td>
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<td>SOC 402</td>
<td>Urban Sociology</td>
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<td>SOC 404</td>
<td>Families and Work</td>
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<td>Racism in the U.S.</td>
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<td>Sociology of Sexualities</td>
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<td>SOC 457</td>
<td>Corporate Power in America</td>
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<td>SOC 465</td>
<td>Social Aspects of Mental Health</td>
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<td>SOC 492</td>
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<td>Special Problems in Sociology</td>
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<td>Special Topics in Sociology</td>
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**PS/Criminology Electives**

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<td>Gender and Politics in the United States</td>
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<td>PS 307</td>
<td>Introduction to Criminal Law in the United States</td>
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<td>PS 308</td>
<td>Supreme Court and Public Policy</td>
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<td>PS 309</td>
<td>Equality and Justice in United States Law</td>
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<td>PS 313</td>
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<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
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<td>PS 335</td>
<td>International Law</td>
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<td>PS 415</td>
<td>Administration of Justice</td>
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<td>PS 418</td>
<td>Gender Law and Policies</td>
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<td>PS 437</td>
<td>U.S. National Security Policy</td>
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<td>PS 445</td>
<td>Comparative Systems of Law and Justice</td>
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<td>PS 507</td>
<td>Civil Liberties in the United States</td>
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<td>PS 531</td>
<td>International Law</td>
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<td>PS 536</td>
<td>Global Environmental Law and Policy</td>
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<td>PS 545</td>
<td>Comparative Systems of Law and Justice</td>
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**SOC 300-Level or Higher**

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<td>Human Paleopathology</td>
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<td>ANT 528</td>
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<tr>
<td>PS 432</td>
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<tr>
<td>REL 309</td>
<td>Religion and Society</td>
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HON 293 Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge 3

Foreign Language 200 Level

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Arts and Letters

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<td>Introduction to Architectural History</td>
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<td>The Arts of a World Capital: London</td>
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<td>Arts, Ideas and Values</td>
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<td>Arts and Cross-Cultural Contacts</td>
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<td>The Arts and the Sacred</td>
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<td>Studies in Rhetoric and Digital Media</td>
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<td>Women &amp; Film</td>
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<td>New German Cinema and Beyond</td>
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<td>Italian Society Through Cinema</td>
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<td>Russian Cinema and Society</td>
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<td>History of Graphic Design</td>
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<td>History of Art: Study Abroad</td>
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<td>Dance and Society</td>
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<td>Concert Dance History</td>
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<td>Current Trends in Dance</td>
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<td>Religion in American History</td>
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<td>Early Christianity to the Time of Eusebius</td>
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<td>Islam in the Modern World</td>
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<td>Introduction to Musical Experiences</td>
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<td>MUS 181</td>
<td>Exploring Music Theory</td>
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<td>Understanding Music: Global Perspectives</td>
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<td>Introduction to Music Literature I</td>
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<td>MUS 206</td>
<td>America's Music</td>
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<td>MUS 310</td>
<td>Music of the 17th and 18th Centuries</td>
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<td>Music of the 19th Century</td>
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<td>Music of the 20th Century</td>
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<td>MUS 330</td>
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MUS/WGS 360  Women In Music  3
REL 200  Introduction to the Study of Religion  3
REL 210  Religious Traditions of the World  3
REL 220  Religion in the Contemporary World  3
REL 230  Asian Religions  3
REL 298  Special Topics in Religious Studies  3
REL/SOC 309  Religion and Society  3
REL 311  Introduction to the Old Testament  3
REL 312  Introduction to the New Testament  3
REL 314  Introduction to Intertextual Literature  3
REL 317  Christianity  3
REL 323  Religious Cults, Sects, and Minority Faiths in America  3
REL 327  Issues in Contemporary Religion  3
REL 331  The Hindu Tradition  3
REL 332  The Buddhist Traditions  3
REL 333  Chinese Religions  3
REL 334  Japanese Religions  3
REL 340  Islam  3
REL 350  Introduction to Judaism  3
REL 383  Religion, Globalism, and Justice  3
REL 412/512  Advanced Readings in the Christian Gospels  3
REL 413/512  The Life and Letters of the Apostle Paul  3
REL 423/523  Religion and Politics in America  3
REL 424/524  Religion and Politics in Global Perspective  3
REL 471/571/STS 471/571  Darwinism and Christianity  3
REL 472/572/  Women and Religion  3
REL 473/573  Religion, Gender, and Reproductive Technologies  3
REL 482/582  Religion and Conflict  3
REL 489/589  Interpretations of Religion  3
REL 496  Seminar in Religious Studies  3
REL 498/598  Special Topics in Religious Studies  1-6
THE 103  Introduction to the Theater  3
THE 203  Theory and Practice of Acting  3
THE 303  Stage Directing  3
THE 334  Advanced Acting  3
THE 340  African American Theatre  3
MA 151  Calculus for Elementary Education I  3
MA 152  Calculus for Elementary Education II  3
MA 205  Elements of Matrix Computations  3
MA 231  Calculus for Life and Management Sciences B  3
MA 241  Calculus II  4
MA 335  Symbolic Logic  3
MSGE 295  Mathematical Sciences Special Topics  3
ST 101  Statistics by Example  3
ST 311  Introduction to Statistics  3
ST 312  Introduction to Statistics II  3
Math Sci Non MA or ST
GC 320  3D Spatial Relations  3
HON 291  Honors Special Topics-Mathematics  3
LOG 201  Logic  3
LOG 335  Symbolic Logic  3
MA 335  Symbolic Logic  3
PHI 250  Thinking Logically  3

Semester Sequence
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

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<td>SOC 400</td>
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Mathematical Sciences

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<td>Precalculus I</td>
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<td>Precalculus Algebra and Trigonometry</td>
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GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) 3

Third Year

Fall Semester
SOC Criminology Elective (SOC 4xx) 3
PS 305 The Justice System in the American Political Process 3
GEP Interdisciplinary Perspectives (p. 1426) 3
Free Electives 6

Spring Semester
SOC Elective (3xx/4xx) 3
SOC Elective (3xx/4xx) 3
GEP Interdisciplinary Perspectives (p. 1426) 2-3
Free Electives 6

Fourth Year

Fall Semester
SOC Criminology Elective (SOC 4xx) 3
Arts and Letters 3
Philosophy 3
Free Electives 6

Spring Semester
PS Criminology Elective 3
SOC Criminology Elective (SOC 4xx) 3
SOC 413 Criminal Justice Field Work 4
Free Elective 4

Total Hours 14-15

Criminology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The criminology minor emphasizes criminological theory and research and is an introduction to the concept of deviance and related issues of criminal behavior. The minor is grounded in sociological theory and methods and allows students flexibility in the choice of specialized criminological study such as, juvenile delinquency, sociology of law, formal institutions of social control, community and crime, and data analysis in criminology. No courses for the minor may be taken for S/U credit.

Admissions

To be admitted to the program, a student must have a GPA of at least 2.0. Students may declare their intention to complete the minor by submitting the Declare a Minor form (http://www.ncsu.edu/registrar/forms/pdf/minor.pdf) to the minor advisor. Declaring a minor early will help ensure you have access to courses that may restrict seats to departmental majors and minors. Should students wish to transfer a course from another institution toward the minor, they should consult Jenny Rasch, advisor for the minor.

Certification

The minor should be declared as soon as the student makes the decision to pursue a minor. Minor coursework must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork to declare the minor can be found outside room 334B in the 1911 Building and should be completed no later than the registration period for the student’s final semester at NC State. Students should see the person listed below for certification of the minor.

Contact Person

Sociology & Anthropology Departmental Office
Stephanie Jares
1911 Building, Office 334B
919.515.3116
sjares@ncsu.edu
SIS code: 16CLM

Plan Requirements

The Criminology minor consists of 16 hours. Any student seeking a minor must consult with a minor advisor on a plan of work, and must file a copy of this plan with the minor advisor at least one semester before graduation.

- A 2.0 GPA is required in the minor course work.
- No courses taken for S/U credit will count toward the minor.
- A minimum of 9 hours required course work must be taken at NC State, 3 hours of which must be 400 level.
- Students completing a minor in Criminology may not also complete a minor in Sociology.
- Students completing a major in Sociology (B.A. or B.S.) may not minor in Criminology.
- A maximum of ONE (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

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<tr>
<th>Code</th>
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Total Hours 16
Sociology (BA): 120 Total Units

**Plan Requirements**

**Sociology (BA): 120 Total Units**

### Departmental Requirements

- **SOC 202** Principles of Sociology 3
- **SOC 300** Social Research Methods 4
- **SOC 400** Theories of Social Structure 3
- or **SOC 401** Theories of Social Interaction 3
- **SOC 400-/500-Level** (p. 936) 9
- **SOC 300-/400-Level** (p. 937) 6
- **SOC 300-Level or Higher** (p. 937) 6
- **SOC Elective** (p. 938) 3

### Humanities and Social Sciences

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<th>Code</th>
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<tr>
<td>ENG 101</td>
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<tr>
<td>History I (p. 938)</td>
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<td>History II (p. 938)</td>
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<td>Literature I (p. 939)</td>
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<td>Literature II (p. 939)</td>
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<tr>
<td>Foreign Language 200 Level (p. 941)</td>
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<tr>
<td>Philosophy</td>
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<td>Arts and Letters (p. 940)</td>
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<tr>
<td>Social Science (3 Different) (p. 942)</td>
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<td>ST 311</td>
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### Natural Sciences

- **GEP Natural Sciences** (p. 1429) 7

### GEP Courses

- **GEP Health and Exercise Studies** (p. 1422) 2
- **GEP Additional Breadth** (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
- **GEP Interdisciplinary Perspectives** (p. 1426) 5
- **GEP U.S. Diversity** (p. 1431) (verify requirement) 3
- **GEP Global Knowledge** (p. 1419) (verify requirement) 3
- ** Foreign Language Proficiency** (p. 1417) (verify requirement) 3

### Free Electives

- Free Electives (12 Hr S/U Lmt) 2 26

Total Hours 111

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

---

1 If a student successfully completes PS 371 Research Methodology of Political Science or PSY 240 Introduction to Behavioral Research I/PSY 241 Introduction to Behavioral Research I Lab with a ‘C’ or better, the SOC 300 Social Research Methods requirement will be waived, but three (3) additional hours of sociology are required at the 300 or 400 level. PSY 230 Introduction to Psychological Research cannot be used as a substitute for SOC 300 Social Research Methods.

2 Note that SOC 300 Social Research Methods has a prerequisite or co-requisite, ST 311 Introduction to Statistics.

**Contact**

Stephanie Jares
Coordinator of Advising
Phone: 919-515-5565
Email: sjares@ncsu.edu

**Humanities and Social Sciences**

- **ENG 101** Academic Writing and Research 1
- History I (p. 938)
- History II (p. 938)
- Literature I (p. 939)
- Literature II (p. 939)
- Foreign Language 200 Level (p. 941)
- Philosophy

**Mathematics**

- ST 311 Introduction to Statistics 3
- Mathematical Sciences (p. 945) 3

**Natural Sciences**

- **GEP Natural Sciences** (p. 1429) 7

**GEP Courses**

- **GEP Health and Exercise Studies** (p. 1422) 2
- **GEP Additional Breadth** (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
- **GEP Interdisciplinary Perspectives** (p. 1426) 5
- **GEP U.S. Diversity** (p. 1431) (verify requirement) 3
- **GEP Global Knowledge** (p. 1419) (verify requirement) 3
- **Foreign Language Proficiency** (p. 1417) (verify requirement) 3

**Free Electives**

- Free Electives (12 Hr S/U Lmt) 2 26

Total Hours 111

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

**SOC 400-/500-Level**

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<td>SOC 400</td>
<td>Theories of Social Structure</td>
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<td>SOC 401</td>
<td>Theories of Social Interaction</td>
<td>3</td>
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<tr>
<td>SOC 402</td>
<td>Urban Sociology</td>
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<tr>
<td>SOC 404</td>
<td>Families and Work</td>
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<td>Racism in the U.S.</td>
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SOC 300-/400-Level

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<td>Social Aspects of Mental Health</td>
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<td>SOC 492</td>
<td>Special Problems in Sociology</td>
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<td>Special Topics in Sociology</td>
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SOC 300-Level or Higher

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SOC 400-Level or Higher

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SOC Electives

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History I

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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>Latin America to 1826</td>
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<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
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<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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History II

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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG 220</td>
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GD 303 Graphic Design Theory and Practice  3
HA 201 History of Art from Caves to the Renaissance  3
HA 202 History of Art from the Renaissance Through the 20th Century  3
HA 203 History of American Art  3
HA/Hi 240 Introduction to Visual Culture  3
HA 298 Special Topics in Art History  3
HA 395 History of Art: Study Abroad  3
HA 401 19th Century European Art from Revolution to Post-Impressionism  3
HA 404 Italian Renaissance Art and Material Culture  3
HA 498 Independent Study in History of Art  1-6
HESM 322 Dance and Society  3
HESM 324 Concert Dance History  3
HESM 326 Current Trends in Dance  3
Hi/REL 320 Religion in American History  3
Hi 402/502 Early Christianity to the Time of Eusebius  3
REL 402/502
Hi 408/508/ Islam in the Modern World  3
REL 408/508
Hi 407/507/ Islamic History to 1798  3
REL 407/507
HON 390 Music and the Celtic World  3
IDS 496 Topics in Film and Interdisciplinary Studies  3
LAR 444 History of Landscape Architecture  3
MUS 105 Introduction to Music in Western Society  3
MUS 180 Introduction to Musical Experiences  3
MUS 181 Exploring Music Theory  3
MUS 200 Understanding Music: Global Perspectives  3
MUS 201 Introduction to Music Literature I  3
MUS 202 Introduction to Music Literature II  3
MUS 206 America’s Music  3
MUS 310 Music of the 17th and 18th Centuries  3
MUS 315 Music of the 19th Century  3
MUS 320 Music of the 20th Century  3
MUS 330 Survey of Musical Theater  3
MUS 350 Music of Asia  3
MUS/WGS 360 Women In Music  3
REL 200 Introduction to the Study of Religion  3
REL 210 Religious Traditions of the World  3
REL 220 Religion in the Contemporary World  3
REL 230 Asian Religions  3
REL 298 Special Topics in Religious Studies  3
REL/SOC 309 Religion and Society  3
REL 311 Introduction to the Old Testament  3
REL 312 Introduction to the New Testament  3
REL 314 Introduction to Intertestamental Literature  3
REL 317 Christianity  3
REL 323 Religious Cults, Sects, and Minority Faiths in America  3
REL 327 Issues in Contemporary Religion  3
REL 331 The Hindu Tradition  3
REL 332 The Buddhist Traditions  3
REL 333 Chinese Religions  3
REL 334 Japanese Religions  3
REL 340 Islam  3
REL 350 Introduction to Judaism  3
REL 383 Religion, Globalism, and Justice  3
REL 412/512 Advanced Readings in the Christian Gospels  3
REL 413/513 The Life and Letters of the Apostle Paul  3
REL 423/523 Religion and Politics in America  3
REL 424/524 Religion and Politics in Global Perspective  3
REL 471/571/ Darwinism and Christianity  3
STS 471/571
REL 472/572/ Women and Religion  3
REL 473/573 Religion, Gender, and Reproductive Technologies  3
REL 482/582 Religion and Conflict  3
REL 489/589 Interpretations of Religion  3
REL 496 Seminar in Religious Studies  3
REL 498/598 Special Topics in Religious Studies  1-6
THE 103 Introduction to the Theater  3
THE 203 Theory and Practice of Acting  3
THE 303 Stage Directing  3
THE 334 Advanced Acting  3
THE 340 African American Theatre  3

Foreign Language 200 Level

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### Mathematical Sciences

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# Sociology (BS)

Sociology is the study of social life, social change and the social causes and consequences of human behavior. Sociologists investigate the structure of groups, organizations, societies and how people interact within these contexts.

The Bachelor of Science (B.S.) in Sociology introduces students to the scientific study of social life, social change, and the social causes and consequences of human behavior. Courses address social groups, social interaction and the institutional processes necessary to understand patterns of behavior, social inequality, social change and resistance, and how social systems work.

- Sociology students have the opportunity to join the Taylor Sociology Club, a student organization which provides students the opportunity to pursue their sociological interests and promotes an understanding of the discipline of sociology.
- NC State also has an active chapter of Alpha Kappa Delta, an international sociology honor society that serves to promote academic scholarship and interest in the sociological understanding of human life.

For more information about this program, visit our website (https://socant.chass.ncsu.edu/undergraduate/sociology/).

## Contact

Stephanie Jares  
Coordinator of Advising  
Phone: 919-515-5565  
Email: sjares@ncsu.edu

## Plan Requirements

**Sociology (BS): 120 Total Units**

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**Major Residency Requirements**: Minimum of 15 hours of sociology at NC State. At least 9 of these hours at the 400 level or above completed at NC State

### Semester Sequence

This is a sample.

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or SOC 401  Theories of Social Interaction
ANT 251  Physical Anthropology 3
or ANT 261  Technology in Society and Culture
ANT 252  Cultural Anthropology 3
or ANT 253  Unearthing the Past: Introduction to World Archaeology

Societal Challenge Electives (p. 947)  6
Applied Sociology Elective (p. 947)  3
Select one of the following:
SOC 429  Quantitative Data Analysis in Sociology
SOC 492  External Learning Experience
SOC 493  Special Problems in Sociology
SOC 200-level Elective (p. 947)  3
SOC 300-level Electives (p. 947)  6
SOC 400-level Elective (p. 948)  3

Mathematics and Sciences
ST 311  Introduction to Statistics 3
Calculus (p. 948)  3
Math Elective 6
One additional math or statistics courses chosen from College approved list. 3 credits.
Basic Sciences (p. 948)  12
Science Elective (p. 948)  4

Advanced Sciences/Technology Requirement
Advanced Sciences/Technology Requirement 2  15

Humanities and Social Sciences
ENG 101  Academic Writing and Research 1 4
Philosophy 3
Any PHI course on the approved GEP-Humanities list.
Arts and Letters (p. 949)  3
History (p. 950)  3
Literature (p. 3)
Writing and Communication (p. 955)  3
Social Science (p. 952)  9

GEP Courses
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP Interdisciplinary Perspectives (p. 1426)  5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2  2
Total Hours 123

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

### Societal Challenge Electives

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<td>Food and Society</td>
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<td>Community and Crime</td>
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<td>Sociology of Agriculture and Rural Society</td>
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<td>ANT 475</td>
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## Calculus

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## Basic Sciences

### Biological Sciences (Max: 4 Units)

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**Arts and Letters**

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**History**

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## Literature List A

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ARE 412  Advanced Agribusiness Marketing  3  
ARE 413  Applied Agribusiness Marketing  3  
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ARE 420  Taxation in Agriculture, Production, and Agribusiness  3  
ARE 425  Contracts and Organizations in Agriculture  3  
ARE 433  U.S. Agricultural Policy  3  
ARE 444  Ethics in Agribusiness  3  
ARE 448  International Agricultural Trade  3  
ARE 455  Agribusiness Analytics  3  
ARE 470  Agribusiness Entrepreneurship Clinical Skills Development  3  
ARE 475  Food Policy  3  
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ARE 493  Special Problems/Research Exploration  1-6  
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ARE 495  Special Topics in Agricultural and Resource Economics  1-6  
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EC 490  Research Seminar in Economics  3  
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EC 498  Independent Study in Economics  1-6  
AFS 409  Black Political Participation in America  3  
LPS 315  Public Leadership  3  
PS 101  Internet Research  1  
PS 102  Data Analysis  1  
PS 103  Designing Political Web Pages  1  
PS 201  American Politics and Government  3  
PS 202  State and Local Government  3  
PS 203  Introduction to Nonprofits  3  
PS 204  Problems of American Democracy  3  
PS 231  Introduction to International Relations  3  
PS 236  Issues in Global Politics  3  
PS 241  Introduction to Comparative Politics  3  
PS 298  Special Topics in Political Science  1-6  
PS 301  The Presidency and Congress  3  
PS 302  Campaigns and Elections in the US Political System  3  
PS 303  Race in U.S. Politics  3  
PS 305  The Justice System in the American Political Process  3  
PS 306  Gender and Politics in the United States  3  
PS 307  Introduction to Criminal Law in the United States  3  
PS 308  Supreme Court and Public Policy  3  
PS 309  Equality and Justice in United States Law  3  
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PS 312  Introduction to Public Administration  3  
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</tr>
<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
<td>3</td>
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<tr>
<td>FLI 201</td>
<td>Intermediate Italian I</td>
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</tr>
<tr>
<td>FLJ 201</td>
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<td>FLN 201</td>
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</tr>
<tr>
<td>FLP 201</td>
<td>Intermediate Portuguese I</td>
<td>3</td>
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<tr>
<td>FLR 201</td>
<td>Intermediate Russian I</td>
<td>3</td>
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<tr>
<td>FLS 201</td>
<td>Intermediate Spanish I</td>
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<tr>
<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture</td>
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<td>GRK 201</td>
<td>Intermediate Greek I</td>
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<tr>
<td>LAT 201</td>
<td>Intermediate Latin I</td>
<td>3</td>
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<tr>
<td>PER 201</td>
<td>Intermediate Persian I</td>
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### Foreign Language 200 Level

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<td>FLA 201</td>
<td>Intermediate Arabic I</td>
<td>3</td>
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<tr>
<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<tr>
<td>FLF 201</td>
<td>Intermediate French I</td>
<td>3</td>
</tr>
<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
<td>3</td>
</tr>
<tr>
<td>FLI 201</td>
<td>Intermediate Italian I</td>
<td>3</td>
</tr>
<tr>
<td>FLJ 201</td>
<td>Intermediate Japanese I</td>
<td>3</td>
</tr>
<tr>
<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
<td>3</td>
</tr>
<tr>
<td>FLP 201</td>
<td>Intermediate Portuguese I</td>
<td>3</td>
</tr>
<tr>
<td>FLR 201</td>
<td>Intermediate Russian I</td>
<td>3</td>
</tr>
<tr>
<td>FLS 201</td>
<td>Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture</td>
<td>3</td>
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<tr>
<td>GRK 201</td>
<td>Intermediate Greek I</td>
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### Semester Sequence

This is a sample.

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<thead>
<tr>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>2</td>
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<tr>
<td>SOC 202</td>
<td>Principles of Sociology</td>
<td>3</td>
</tr>
<tr>
<td>Basic Science w/ Lab</td>
<td>4</td>
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</table>
### Second Year

#### Fall Semester
- Literature 3
- Physical/Technical Anthropology Elective 3
- Basic Science w/ Lab 4
- GEP Social Sciences (p. 1430) 3

#### Spring Semester
- SOCE 300 Social Research Methods 4
- Arts and Letters 3
- Math Elective 3
- GEP Social Sciences (p. 1430) 3
- Advanced Science/Technology Requirement 3

#### Hours
- 14

### Third Year

#### Fall Semester
- SOC Elective (3**) 3
- Philosophy 3
- GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
- Advanced Science/Technology Requirement 3
- Writing & Communication 3

#### Spring Semester
- SOC Elective (3***) 3
- Societal Challenges Elective 3
- GEP Interdisciplinary Perspectives (p. 1426) 3
- GEP Health and Exercise Studies (p. 1422) 1

#### Hours
- 15

### Fourth Year

#### Fall Semester
- Societal Challenges Elective 3
- SOC Elective (4***) 3
- Sociological Theory Elective 3
- Advanced Science/Technology Requirement 3
- GEP Social Sciences (p. 1430) 3

#### Spring Semester
- Sociological Data Internship or Analysis 3
- Applied Sociology Elective 3
- Advanced Science/Technology Requirement 3

#### Hours
- 15

### Plan Requirements

- Any student seeking a minor must consult with a minor advisor on a plan of work, and must file a copy of this plan with the minor advisor at least one semester before graduation.
- A 2.0 GPA is required in the minor course work.
- No courses taken for S/U credit will count toward the minor.

### Residency Requirement
A minimum of 18 hours at NC State in departmental requirements.
A minimum of 9 hours required course work must be taken at NC State, 3 hours of which must be 400 level.

Students completing a minor in Sociology may not also complete a minor in Criminology.

Students completing a major in Criminology (B.A. or B.S.) may not minor in Sociology.

A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>SOC 202</td>
<td>Principles of Sociology</td>
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<tr>
<td>SOC 300</td>
<td>Social Research Methods</td>
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</table>

Elective Courses

Select two SOC 300-level courses | 6
Select one SOC 400-level courses | 3

Total Hours | 16

1 If a student successfully completes PS 371 Research Methodology of Political Science or PSY 240 Introduction to Behavioral Research I/PSY 241 Introduction to Behavioral Research I Lab with a "C-" or better, the SOC 300 Social Research Methods requirement will be waived, but three (3) additional hours of sociology are required at the 300 or 400 level. PSY 230 Introduction to Psychological Research can not be used as a substitute for SOC 300 Social Research Methods.

2 Note that SOC 300 Social Research Methods has a prerequisite or co-requisite, ST 311 Introduction to Statistics.

Interdisciplinary Studies

Home to six major programs, nine minors and three dual degree programs, Interdisciplinary Studies (IDS) offers students boundary-crossing curricula of study that provide the skills and tools to think critically about our increasing dynamic society. Drawing on faculty from throughout the College of Humanities and Social Sciences and the University, these diverse courses of study make our students innovative and uniquely prepared to address the grand challenges our nation and our world face today. Interdisciplinary Studies offers myriad major courses of study, allowing our students to engage with world cultures, garner skills in flexible thinking, and prepare to engage the professional world as informed citizens. Students are exposed to complex and diverse perspectives, building the skills and tools necessary for a successful professional career or graduate study.

Here are some of our department highlights:

- Over half of our majors graduate with honors from either a scholars program or a dual degree program
- Our students can choose from over 40 Study Abroad programs offered by the College that allow students to engage across disciplines and global competencies
- Faculty from all corners of the university are a part of the Interdisciplinary Studies program
- The Interdisciplinary Studies Council, composed of directors and coordinators within the unit, serves in an advisory role for our IDS major programs and concentrations

For more information about this department, including contact information, please see our website (http://ids.chass.ncsu.edu).

Interdisciplinary Studies (IDS) - Humanities and Social Sciences
1911 Building, Suite 106
10 Current Drive
Campus Box 7107
Raleigh, NC 27695-7107
Phone: 919-515-6864

Dr. D. Seth Murray
Director of Undergraduate Programs
Phone: 919-515-0450
Email: dsmurray@ncsu.edu

Dr. Carol Ann Lewald
Director of Undergraduate Advising
Phone: 919-515-0449
Email: calewald@ncsu.edu

Faculty

Assistant Dean for Interdisciplinary Studies
and International Programs
B. M. Kelley

Director of Undergraduate Programs
D. S. Murray

Director of Undergraduate Advising
C. A. Lewald

Undergraduate Programs Specialist
B. Cheek

Graduate Programs Specialist
C. Wilkins

Programs

- Africana Studies Program (p. 958)
- Arts Studies Program (p. 977)
- Film Studies Program (p. 1014)
- Interdisciplinary Studies (p. 1014)
- International Studies Program (p. 1031)
- Jewish Studies (Minor) (p. 1109)
- Native American Studies (Minor) (p. 1110)
- Nonprofit Studies (Minor) (p. 1110)
- Science, Technology, and Society Program (p. 1111)
- Women's and Gender Studies Program (p. 1131)
Africana Studies Program

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Interdisciplinary Studies department offers a Bachelor of Arts (B.A.) with concentrations in Africana Studies and Africana Studies Community Studies, as well as a minor in Africana Studies.

Our contemporary world requires people to be global citizens. Regardless of your personal, professional and career goals, you will need to possess an understanding of the people, places and cultures within and beyond the United States. And more importantly, you will need to possess the ability to act positively and productively on this diverse world. An interdisciplinary studies degree concentration in Africana Studies will teach you how to both THINK and DO in our ever-changing and increasingly diverse global society.

People with a background in Africana Studies go on to be successful in a myriad of professional areas, such as law, science and technology, government and politics, and the corporate world, or to earn advanced degrees in numerous fields.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/africana.php).

Contact
Dr. Craig Brookins
Africana Studies Program Director
Email: biadnow@ncsu.edu

Faculty
Program Coordinator
Craig C. Brookins, Associate Professor, Psychology

Core Faculty
Erin Banks, Lecturer
Natalie Bullock-Brown, Lecturer
Marc K. Dudley, Associate Professor, English
Kim Ebert, Assistant Professor, Sociology
Stephen Ferguson, Associate Professor, Philosophy & History
Frances D. Graham, Lecturer
Blair L.M. Kelley, Associate Professor, History
Moses Khisa, Assistant Professor, Political Science
James Kiwanuka-Tondo, Associate Professor, Communication
Haddy M. Njie, Assistant Teaching Professor, International Studies
Darrell D. Stover, Lecturer
Melvin E. Thomas, Associate Professor, Sociology
Kimberly Vincent, Teaching Assistant Professor, History

Plans

- Africana Studies (Minor) (p. 958)
- Interdisciplinary Studies (BA): Africana Studies Community Studies Concentration (p. 959)
- Interdisciplinary Studies (BA): Africana Studies Concentration (p. 968)

Africana Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Africana Studies minor provides a comparative and interdisciplinary study of the Black experience in Africa and the Americas. Three required courses include an introduction to African Civilizations (AFS 240 African Civilization), Introduction to African American Studies (AFS 241 Introduction to African American Studies), and Introduction to the African Diaspora (AFS 342 Introduction to the African Diaspora). Two elective courses may be selected from a list of designated courses in such disciplines as anthropology, communication, English, history, political science, psychology, social work, and sociology. The minor is designed to bring together students from diverse backgrounds and curricula who share a common interest in the global experience of African people. No courses for the minor may be taken for S/U credit.

Admissions
Students interested in pursuing the African-American Studies minor should consult with Dr. Haddy Njie as listed below.

Certification
A University Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Dr. Njie will certify completion of the minor. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person
Dr. Haddy Njie

1911 Building, Office 107-C
hmnjie@ncsu.edu

Plan Requirements

- Completion of 15 credit hours.
- A minimum grade of ‘C’ (2.0) or better must be achieved in each course counting towards the minor.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>AFS 240</td>
<td>African Civilization</td>
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<tr>
<td>AFS 241</td>
<td>Introduction to African American Studies</td>
<td>3</td>
</tr>
<tr>
<td>AFS 342</td>
<td>Introduction to the African Diaspora</td>
<td>3</td>
</tr>
</tbody>
</table>
Students completing Africana Studies courses will:

- become knowledgeable of the major theories of the disciplines represented in Africana Studies.
- learn the principal themes and issues in the history of Black people.
- acquire an understanding of Black art, literature, music and performance.
- be able to identify the role of key thinkers, movements, and ideas relevant to the experience of African people.
- have the capacity to critically analyze the internal and external factors affecting the development of peoples throughout the African Diaspora.
- develop the skills necessary to act positively and productively in our increasingly diverse world.

People with a background in Africana Studies go on to be successful in a myriad of professional areas, such as law, science and technology, government and politics, and the corporate world, or to earn advanced degrees in numerous fields.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/africana.php).

**Contact**

Dr. Craig Brookins
Africana Studies Program Director
Email: biadnow@ncsu.edu

**Plan Requirements**

**Interdisciplinary Studies (BA): Africana Studies Community Studies Concentration: 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td></td>
<td>Humanities and Social Sciences</td>
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<td></td>
<td><strong>Acad Writing Research</strong> (p. 960)</td>
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<tr>
<td></td>
<td><strong>History I</strong> (p. 960)</td>
<td>3</td>
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<td></td>
<td><strong>History II</strong> (p. 960)</td>
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</tr>
<tr>
<td></td>
<td><strong>Literature I</strong> (p. 960)</td>
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<td></td>
<td><strong>Literature II</strong> (p. 960)</td>
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<tr>
<td></td>
<td><strong>Philosophy</strong></td>
<td>3</td>
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<tr>
<td></td>
<td>Any PHI course on the approved GEP-Humanities list.</td>
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<td>Arts and Letters (p. 962)</td>
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<td></td>
<td>Social Science (p. 963)</td>
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<td>Additional Social Science</td>
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<td>Foreign Language 200 Level (p. 966)</td>
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<tr>
<td>AFS 240</td>
<td>African Civilization</td>
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<tr>
<td>AFS 241</td>
<td>Introduction to African American Studies</td>
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<tr>
<td>AFS 342</td>
<td>Introduction to the African Diaspora</td>
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<tr>
<td>AFS 440</td>
<td>Senior Seminar in Africana Studies</td>
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<td>AFS 490</td>
<td>Africana Studies and Community Involvement</td>
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<td>IDS 498</td>
<td>Independent Study in Interdisciplinary Studies</td>
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<td>Africana or Africa Diaspora Electives (p. 967)</td>
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<td>Africana or Diaspora - 400 Level Elective (p. 967)</td>
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<td>GEP 1428</td>
<td>GEP Mathematical Sciences</td>
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<td>GEP 1429</td>
<td>GEP Natural Sciences</td>
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<td>GEP 1422</td>
<td>GEP Health and Exercise Studies</td>
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<td>GEP 1417</td>
<td>(Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP 1426</td>
<td>GEP Interdisciplinary Perspectives</td>
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<tr>
<td>GEP 1431</td>
<td>GEP U.S. Diversity (p. 1431)</td>
<td>(verify requirement)</td>
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<tr>
<td>GEP 1419</td>
<td>GEP Global Knowledge (p. 1419)</td>
<td>(verify requirement)</td>
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**Interdisciplinary Studies (BA): Africana Studies Community Studies Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The Africana Studies curriculum is designed to explore the cross-cultural, international, and multidisciplinary perspectives of the African diaspora. By studying the black experiences throughout the world, students will develop an African-centered lens to examine how the intersections of race, ethnicity, gender, and class affect the human experience. The core courses aim to develop students’ ability to tackle global issues in an ever-changing world.

Students completing Africana Studies courses will:

- become knowledgeable of the major theories of the disciplines represented in Africana Studies.
- learn the principal themes and issues in the history of Black people.
- acquire an understanding of Black art, literature, music and performance.
- be able to identify the role of key thinkers, movements, and ideas relevant to the experience of African people.
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

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<th>Code</th>
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<td>ENG 101</td>
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<td>FLE 101</td>
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Transfer Sequence

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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>100 Level English Composition</td>
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History I

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<tbody>
<tr>
<td>AFS/HI 275</td>
<td>Introduction to History of South and East Africa</td>
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<tr>
<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
<td>3</td>
</tr>
<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
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<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
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<tr>
<td>HI 217</td>
<td>Caribbean History</td>
<td>3</td>
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<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
<td>3</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>HI 270</td>
<td>Modern Middle East</td>
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History II

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<tbody>
<tr>
<td>HI 205</td>
<td>Western Civilization Since 1400</td>
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<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
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<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
<td>3</td>
</tr>
<tr>
<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<tr>
<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
<td>3</td>
</tr>
<tr>
<td>HI 251</td>
<td>American History I</td>
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<td>HI 252</td>
<td>American History II</td>
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<td>HI 253</td>
<td>Early American History</td>
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Literature I

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<tbody>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
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<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
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Literature II

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>AFS 248</td>
<td>Survey of African-American Literature</td>
<td>3</td>
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<tr>
<td>AFS 349</td>
<td>African Literature in English</td>
<td>3</td>
</tr>
<tr>
<td>AFS 448/548/ENG 448/558</td>
<td>African-American Literature</td>
<td>3</td>
</tr>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 207</td>
<td>Studies in Poetry</td>
<td>3</td>
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<td>ENG 208</td>
<td>Studies In Fiction</td>
<td>3</td>
</tr>
<tr>
<td>ENG 209</td>
<td>Introduction to Shakespeare</td>
<td>3</td>
</tr>
<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
</tr>
<tr>
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**Multidisciplinary**

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<td>AFS 491</td>
<td>Study Abroad in Africana Studies</td>
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<td>Topics in African-American Studies</td>
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<td>REL 343</td>
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### Africana Diaspora (400-Level)

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<td>Issues in the African Diaspora</td>
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<td>AFS 448</td>
<td>African-American Literature</td>
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<td>AFS 455</td>
<td>History of the Civil Rights Movement</td>
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<td>AFS 548</td>
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<td>AFS 555</td>
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<td>SW 413</td>
<td>African American Families: History, Tradition, and Community</td>
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### Semester Sequence

This is a sample.

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<td>FLx 201 or FLx 212</td>
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¹ This is a sample.
Interdisciplinary Studies (BA): Africana Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Africana Studies curriculum is designed to explore the cross-cultural, international, and multidisciplinary perspectives of the African diaspora. By studying the black experiences throughout the world, students will develop an African-centered lens to examine how the intersections of race, ethnicity, gender, and class affect the human experience. The core courses aim to develop students' ability to tackle global issues in an ever-changing world.

Students completing Africana Studies courses will:

• become knowledgeable of the major theories of the disciplines represented in Africana Studies.
• learn the principal themes and issues in the history of Black people.
• acquire an understanding of Black art, literature, music and performance.
• be able to identify the role of key thinkers, movements, and ideas relevant to the experience of African people.
• have the capacity to critically analyze the internal and external factors affecting the development of peoples throughout the African Diaspora.
• develop the skills necessary to act positively and productively in our increasingly diverse world.

People with a background in Africana Studies go on to be successful in a myriad of professional areas, such as law, science and technology, government and politics, and the corporate world, or to earn advanced degrees in numerous fields.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/africana.php).

Contact

Dr. Craig Brookins
Africana Studies Program Director
Email: biadnow@ncsu.edu

Plan Requirements

Interdisciplinary Studies (BA): Africana Studies Concentration: 120 Total Units

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<td></td>
<td>Acad Writing Research (p. 969)</td>
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<td>History I (p. 969)</td>
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<td>Philosophy</td>
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1 C- or better
**History I**

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<td>Introduction to History of West Africa</td>
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<td>Hi 207</td>
<td>Ancient Mediterranean World</td>
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<td>Hi 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>Hi 215</td>
<td>Latin America to 1826</td>
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<td>Hi 216</td>
<td>Latin America Since 1826</td>
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<td>Hi 217</td>
<td>Caribbean History</td>
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<td>Hi 232</td>
<td>The World from 1200 to 1750</td>
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<tr>
<td>Hi 233</td>
<td>The World Since 1750</td>
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<tr>
<td>Hi 263</td>
<td>Asian Civilizations to 1800</td>
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<td>Hi 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>Hi 270</td>
<td>Modern Middle East</td>
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**History II**

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<td>Hi 205</td>
<td>Western Civilization Since 1400</td>
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<td>Hi 208</td>
<td>The Middle Ages</td>
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<td>Hi 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Hi 210</td>
<td>Modern Europe 1815-Present</td>
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<td>Hi 221</td>
<td>British History to 1688</td>
<td>3</td>
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<td>Hi 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<td>Hi 251</td>
<td>American History I</td>
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<td>American History II</td>
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<tr>
<td>Hi 253</td>
<td>Early American History</td>
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**Literature I**

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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<td>ENG 221</td>
<td>Literature of the Western World I</td>
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<td>ENG 222</td>
<td>Literature of the Western World II</td>
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<td>ENG 251</td>
<td>Major British Writers</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>English Literature I</td>
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<td>English Literature II</td>
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<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>FLG 320</td>
<td>Introduction to German Literature</td>
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<td>Classical Japanese Literature in Translation</td>
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<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>FLS 341</td>
<td>Literature and Culture of Spain I</td>
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<td>FLS 351</td>
<td>Literature and Culture of Latin America I</td>
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<td>HON 202</td>
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**Literature II**

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**Acad Writing Research**

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**Transfer Sequence**

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AFS 349 African Literature in English 3
AFS 448/548 African-American Literature 3
ENG 448/558 3
CLA 210 Classical Mythology 3
CLA 320 Masterpieces of Classical Lit 3
ENG 207 Studies in Poetry 3
ENG 208 Studies In Fiction 3
ENG 209 Introduction to Shakespeare 3
ENG 220 Studies in Great Works of Western Literature 3
ENG 221 Literature of the Western World I 3
ENG 222 Literature of the Western World II 3
ENG 223 Contemporary World Literature I 3
ENG 224 Contemporary World Literature II 3
ENG 232 Literature and Medicine 3
ENG 246 Literature of the Holocaust 3
ENG 248 Survey of African-American Literature 3
ENG 249 Native American Literature 3
ENG 251 Major British Writers 3
ENG 252 Major American Writers 3
ENG 261 English Literature I 3
ENG 262 English Literature II 3
ENG 265 American Literature I 3
ENG 266 American Literature II 3
ENG 267 LGBTQI literature in the U.S. 3
ENG 275 Literature and War 3
ENG 305 Women and Literature 3
ENG 339 Literature and Technology 3
ENG 340 Literature, Art, and Society 3
ENG 341 Literature and Science 3
ENG 342 Literature of Space and Place 3
ENG 349 African Literature in English 3
ENG 361 Studies in British Poetry 3
ENG 362 Studies in the British Novel 3
ENG 369 The American Novel of the 19th Century 3
ENG 370 American Fiction, Twentieth Century and Beyond 3
ENG 372 American Poetry, Twentieth Century and Beyond 3
ENG 376 Science Fiction 3
ENG 377 Fantasy 3
ENG 380 Modern Drama 3
ENG 382 Film and Literature 3
ENG 385 Biblical Backgrounds of English Literature 3
ENG 390 Classical Backgrounds of English Literature 3
ENG 392 Major World Author 3
ENG 393 Studies in Literary Genre 3
ENG 394 Studies in World Literature 3
ENG 399 Contemporary Literature 3
ENG 406 Modernism 3
ENG 407 Postmodernism 3
ENG 410 Studies in Gender and Genre 3
ENG 420 Major American Author 3
ENG 439 Studies in English Renaissance Literature 3
ENG 448 African-American Literature 3
ENG 451 Chaucer 3
ENG 453 The Romantic Period 3
ENG 460 Major British Author 3
ENG 462 18th-Century English Literature 3
ENG 463 The Victorian Period 3
ENG 464 British Literature and the Founding of Empire 3
ENG 465 British Literature and the Dissolution of Empire 3
ENG 466 Transatlantic Literatures 3
ENG 468 Studies in Nineteenth-Century American Literature 3
ENG 470 American Literature, Twentieth Century and Beyond 3
ENG 476 Southern Literature 3
ENG 486 Shakespeare, The Earlier Plays 3
ENG 487 Shakespeare, The Later Plays 3
ENG 551 Chaucer 3
FL 219 Studies in Great Works of Non-Western Literature 3
FL 220 Studies in Great Works of Western Literature 3
FL 221 Literature of the Western World I 3
FL 222 Literature of the Western World II 3
FL 223 Contemporary World Literature I 3
FL 224 Contemporary World Literature II 3
FL 246 Literature of the Holocaust 3
FL 275 Literature and War 3
FL 392 Major World Author 3
FL 393 Studies in Literary Genre 3
FL 394 Studies in World Literature 3
FL 406 Modernism 3
FL 407 Postmodernism 3
FLN 301 Twentieth Century Hindi & Urdu Fiction 3
FLN 302 Modern Hindi & Urdu Poetry 3
FLN 401 Hindi Literature and South Asian Cultural Contexts 3
WGS 305 Women and Literature 3
WGS 410 Studies in Gender and Genre 3

Literature II List B
ENG 219 Studies in Great Works of Non-Western Literature 3
ENG 220 Studies in Great Works of Western Literature 3
ENG 221 Literature of the Western World I 3
ENG 222 Contemporary World Literature I 3
ENG 223 Contemporary World Literature II 3
ENG 246 Literature of the Holocaust 3
ENG 392 Major World Author 3
ENG 393 Studies in Literary Genre 3
ENG 394 Studies in World Literature 3
ENG 406 Modernism 3
ENG 407 Postmodernism 3
FL 219 Studies in Great Works of Non-Western Literature 3
FL 220 Studies in Great Works of Western Literature 3
FL 221 Literature of the Western World I 3
FL 223 Contemporary World Literature I 3
FL 224 Contemporary World Literature II 3
FL 246 Literature of the Holocaust 3
FL 392 Major World Author 3
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### Arts and Letters

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REL 383  Religion, Globalism, and Justice 3
REL 412/512  Advanced Readings in the Christian Gospels 3
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REL 423/523  Religion and Politics in America 3
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NC State University
Interdisciplinary Studies (BA): Africana Studies Concentration

Africa or Diaspora

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Africana Diaspora (Min: 12 Units, 6 Units from 400-level)

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<td>AFS 346</td>
<td>Black Popular Culture</td>
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<td>African-American History Through the Civil War, 1619-1865</td>
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<td>African American Cinema</td>
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<td>AFS 442</td>
<td>Issues in the African Diaspora</td>
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<td>African-American Literature</td>
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<td>History of the Civil Rights Movement</td>
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<td>Study Abroad in Africana Studies</td>
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<tr>
<td>ENG 248</td>
<td>Survey of African-American Literature</td>
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<td>IDS 498</td>
<td>Independent Study in Interdisciplinary Studies</td>
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<td>MUS 230</td>
<td>Introduction to African-American Music</td>
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<td>MUS 260</td>
<td>History of Jazz</td>
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<td>PHI 319</td>
<td>Africana Political Philosophy</td>
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<td>PS 443</td>
<td>Seminar in Latin American &amp; Caribbean Politics</td>
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<td>PS 543</td>
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<td>PSY 345</td>
<td>Psychology and the African American Experience</td>
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<td>SW 413</td>
<td>African American Families: History, Tradition, and Community</td>
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<td>THE 340</td>
<td>African American Theatre</td>
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Semester Sequence

This is a sample.

Course | Title                                      | Hours |
|--------|--------------------------------------------|-------|
| Fall Semester

<table>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>AFS 240</td>
<td>African Civilization</td>
<td>3</td>
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<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
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<tr>
<td>FLx 201 or FLx 212</td>
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Arts Studies Program

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Interdisciplinary Studies department offers a Bachelor of Arts (B.A.) in Arts Studies with concentrations in Film Studies, Music, Theater, and Visual Arts, as well as an Arts Studies Minor.

Arts Studies, a unique creative program at NC State, is designed to expand student perspectives through an interdisciplinary approach to the arts. Students learn flexible and critical thinking skills that prepare them for a satisfying career in the arts.

The program of study requires students to integrate the history, analysis and practice of an art form with linking courses that connect the arts to other areas including politics, science, technology, and more. The students also participate in an interdisciplinary capstone course. Students choose one of four foundational areas: visual art, film, music, or theater. The degree prepares students to pursue advanced studies in diverse academic fields, including those leading to work as a practicing artist, and for careers in arts management, arts entrepreneurship, arts education, nonprofit arts administration.

Why study the arts?

• Arts Studies majors learn skills that apply to many fields, which are relevant in a changing, interdisciplinary, global world
• Our students find work in museums and art galleries, sound studios, arts nonprofits and community arts programs
• Graduates of the program follow their passion to make art and teach others and start their own arts businesses
• Graduates become artistic directors for large companies and startups.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/africana.php).

Contact
Dr. Rodney Waschka
Arts Studies Program Director
Email: waschka@ncsu.edu

Faculty

Director
Rodney A. Waschka, Professor, Arts Studies and Music

Core Faculty
Alison E. Arnold, Teaching Assistant Professor, Arts Studies and Music
Gary D. Beckman, Director of Entrepreneurial Studies in the Arts
James C. Boyles, Teaching Assistant Professor, History
Franklin D. Cason, Assistant Professor, Film Studies, English
Paul Garcia, Lecturer
Ora Gelley, Assistant Professor, Film Studies
Arts Studies (BA): Film Studies Concentration

Plans
- Arts Studies (BA): Film Studies Concentration (p. 978)
- Arts Studies (BA): Music Concentration (p. 986)
- Arts Studies (BA): Theater Concentration (p. 995)
- Arts Studies (BA): Visual Arts Concentration (p. 1004)
- Arts Studies (Minor) (p. 1012)

Arts Studies (BA): Film Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Arts Studies majors learn skills that apply to many fields, which are relevant in a changing, interdisciplinary, global world. Our students find work in museums and art galleries, sound studios, arts nonprofits and community arts programs. Graduates of the program follow their passion to make art and teach others and start their own arts businesses. They become artistic directors for large companies and start-ups.

Graduates with a Bachelor of Arts (B.A.) in Arts Studies: Film Studies Concentration have gone on to careers in film and television and in education. The analytical and communication skills our program develops enables our graduates to work successfully in creative, educational, and business environments. Many of our students go on to obtain advanced degrees (MA, MLIS, PhD) in complementary fields of study.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/africana.php).

Contact
Dr. Andrew Johnston
Film Program Coordinator
Office: Tompkins Hall 230
Phone: 919-515-4150
Email: andrew.johnston@ncsu.edu

Plan Requirements
Arts Studies (BA): Film Studies Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>COM 444</td>
<td>Film Production</td>
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<tr>
<td>ENG 330</td>
<td>Screenwriting</td>
<td>3</td>
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<tr>
<td>Linking Courses (p. 979)</td>
<td>1</td>
<td>6</td>
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<td>ARS 494</td>
<td>Topics in Arts Studies</td>
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<tr>
<td>Advised Elective</td>
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<tr>
<td>Humanities and Social Sciences</td>
<td>(p. 979)</td>
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<td>History I (p. 979)</td>
<td>(verify requirement)</td>
<td>3</td>
</tr>
<tr>
<td>History II (p. 979)</td>
<td>(verify requirement)</td>
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<td>Literature I (p. 979)</td>
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<td>Foreign Language 200 Level (p. 981)</td>
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<td>Philosophy</td>
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<td>Arts and Letters (p. 981)</td>
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<td>Social Science (p. 982)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431)</td>
<td>(verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419)</td>
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<td>Foreign Language Proficiency (p. 1417)</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

History & Analysis

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<td>African American Cinema</td>
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<tr>
<td>COM 364</td>
<td>History of Film to 1940</td>
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<td>COM 374</td>
<td>History of Film From 1940</td>
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<tr>
<td>ENG 282</td>
<td>Introduction to Film</td>
<td>3</td>
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<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td>3</td>
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<tr>
<td>ENG 364</td>
<td>History of Film to 1940</td>
<td>3</td>
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<tr>
<td>ENG 374</td>
<td>History of Film From 1940</td>
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<td>ENG 375</td>
<td>African American Cinema</td>
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<td>ENG 378</td>
<td>Women &amp; Film</td>
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<tr>
<td>ENG 384</td>
<td>Introduction to Film Theory</td>
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<tr>
<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
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<tr>
<td>IDS 496</td>
<td>Topics in Film and Interdisciplinary Studies</td>
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</table>

Marsha Gordon, Professor, Film Studies
Andrew R. Johnston, Assistant Professor, Film Studies, English
Olga A. Kleiankina, Teaching Assistant Professor, Music
Tom Koch, Teaching Assistant Professor, Music
Noel J. Leaf, Teaching Assistant Professor, Music
John Wesley Parker, Teaching Assistant Professor, Music
Victoria N. Ralston, Lecturer
J Mark Scearce, Director of Music
Mia Self, Lecturer

IDS 496
### Linking Courses

<table>
<thead>
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<tr>
<td>ARS 251</td>
<td>The Arts of a World Capital: London</td>
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<td>ARS 252</td>
<td>The Arts of Vienna 1900</td>
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<td>ARS 257</td>
<td>Technology in the Arts</td>
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<td>ARS 259</td>
<td>The Arts and Politics</td>
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<tr>
<td>ARS 351</td>
<td>Arts, Ideas and Values</td>
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<td>ARS 353</td>
<td>Arts and Cross-Cultural Contacts</td>
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<td>ARS 354</td>
<td>The Arts and the Sacred</td>
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<td>EMA 365</td>
<td>Foundations in Arts Entrepreneurship</td>
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<tr>
<td>ENG 382</td>
<td>Film and Literature</td>
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<td>STS 257</td>
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### Acad Writing Research

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<td>FLE 101</td>
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<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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### History I

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<td>AFS/HI 275</td>
<td>Introduction to History of South and East Africa</td>
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<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>HI 216</td>
<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
<td>3</td>
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<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
<td>3</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>Modern Middle East</td>
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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<tr>
<td>HI 251</td>
<td>American History I</td>
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### Literature I

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<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
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<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
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</tr>
<tr>
<td>ENG 222</td>
<td>Literature of the Western World II</td>
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<tr>
<td>ENG 251</td>
<td>Major British Writers</td>
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<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG 262</td>
<td>English Literature II</td>
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<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>FL 221</td>
<td>Literature of the Western World I</td>
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<td>Literature of the Western World II</td>
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<td>FL 301</td>
<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<td>Introduction to German Literature</td>
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<td>German Lyric Poetry</td>
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<td>FLJ 342</td>
<td>Classical Japanese Literature in Translation</td>
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<td>FLJ 344</td>
<td>Early Modern Japanese Literature in Translation</td>
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<td>FLS 303</td>
<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>FLS 340</td>
<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>FLS 341</td>
<td>Literature and Culture of Spain I</td>
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<td>FLS 351</td>
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<td>HON 202</td>
<td>Inquiry, Discovery, and Literature</td>
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<tr>
<td>HON 293</td>
<td>Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge</td>
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### Literature II

#### Literature II List A

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<td>AFS 349</td>
<td>African Literature in English</td>
<td>3</td>
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<tr>
<td>AFS 448/548/ ENG 448/558</td>
<td>African-American Literature</td>
<td>3</td>
</tr>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<td>ENG 207</td>
<td>Studies in Poetry</td>
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<td>ENG 208</td>
<td>Studies In Fiction</td>
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<td>ENG 209</td>
<td>Introduction to Shakespeare</td>
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<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
<td>3</td>
</tr>
<tr>
<td>ENG 222</td>
<td>Literature of the Western World II</td>
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ENG 219 Studies in Great Works of Non-Western Literature 3
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FL 392 Major World Author 3
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FL 406 Modernism 3
FL 407 Postmodernism 3
FL 301 Survey of French Literature from the Middle Ages through the Enlightenment
FL 302 Survey of French Literature from Romanticism to the Contemporary Period
FLF 492 Seminar in French Studies 3
FLG 320 Introduction to German Literature 3
FLG 323 Twentieth Century German Literature 3
FLG 325 German Lyric Poetry 3
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- **ARE 332** Human Resource Management for Agribusiness 3
- **ARE 336** Introduction to Resource and Environmental Economics 3
- **ARE 345** Global Agribusiness Management 3
- **ARE 370** Agribusiness New Venture Development 3
- **ARE 395** Special Topics in Agricultural and Resource Economics (300 level) 1-6
- **ARE 404** Advanced Agribusiness Management 3
- **ARE 412** Advanced Agribusiness Marketing 3
- **ARE 413** Applied Agribusiness Marketing 3
- **ARE 415** Introduction to Commodity Futures Markets 3
- **ARE 420** Taxation in Agriculture, Production, and Agribusiness 3
- **ARE 425** Contracts and Organizations in Agriculture 3
- **ARE 433** U.S. Agricultural Policy 3
- **ARE 444** Ethics in Agribusiness 3
- **ARE 448** International Agricultural Trade 3
- **ARE 455** Agribusiness Analytics 3
- **ARE 470** Agribusiness Entrepreneurship Clinical Skills Development 3
- **ARE 475** Food Policy 3
- **ARE 490** Career Seminar in Agriculture & Resource Economics 1
- **ARE 492** External Learning Experience 1-6
- **ARE 493** Special Problems/Research Exploration 1-6
- **ARE 494** Agribusiness Study Abroad 1-6
- **ARE 495** Special Topics in Agricultural and Resource Economics 1-6
- **ARE 590** Special Topics in ARE 1-99
- **EC 301** Intermediate Microeconomics 3
- **EC 336** Introduction to Resource and Environmental Economics 3

### Economics

- **ARE 301** Intermediate Microeconomics 3
- **ARE 302** Introduction to Resource and Environmental Economics 3
- **EC 201** Principles of Microeconomics 3
- **EC 202** Principles of Macroeconomics 3
- **EC 205** Fundamentals of Economics 3
- **EC 302** Intermediate Macroeconomics 3
- **EC 305** A Closer Look at Capitalism 3
- **EC 336** Introduction to International Economics 3
- **EC 351** Econometrics I 3
- **EC 404** Money, Financial Markets, and the Economy 3
- **EC 410** Public Finance 3
- **EC 413** Industrial Organization 3
- **EC 431** Labor Economics 3
- **EC 437** Health Economics 3
- **EC 449** International Finance 3
- **EC 451** Econometrics II 3
- **EC 468** Game Theory 3
- **EC 474** Economics of Financial Institutions and Markets 3

### Agribusiness (AGB)

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<td>ANT 261</td>
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<td>PS 432</td>
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<td>Population and Planning</td>
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<td>Inequality, Ideology, and Social Justice</td>
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<td>Corporate Power in America</td>
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### Semester Sequence

This is a sample.

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<td>Production Foundation Course</td>
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1. C- or better

### Arts Studies (BA): Music Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

Arts Studies majors learn skills that apply to many fields, which are relevant in a changing, interdisciplinary, global world. Our students find work in museums and art galleries, sound studios, arts nonprofits and community arts programs. Graduates of the program follow their passion to make art and teach others and start their own arts businesses. They become artistic directors for large companies and start-ups.

The Arts Studies Program together with the Music Department sponsors the Arts NOW Series. The Series includes performances of and lectures about contemporary performance works that include music. Guest performers, composers, dancers, and video artists appearing in the series range from regionally based artists to international guests from Europe, Asia, and South America.

For more information about this program, visit our website [here](https://music.arts.ncsu.edu/).

### Contact

Dr. Daniel Monek  
Music Department Head  
Phone: 919-515-1692  
Email: dgmonek@ncsu.edu
## Plan Requirements

**Arts Studies (BA): Music Concentration:** 120 Total Units

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<thead>
<tr>
<th>Code</th>
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<td>MUS 495</td>
<td>Special Topics in Music</td>
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<td>WGS 360</td>
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### Departmental Requirements

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<td>Performance Courses (p. 987)</td>
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<td>Linking Courses (p. 987)</td>
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### Humanities and Social Sciences

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<td>Foreign Language 200 Level (p. 989)</td>
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<td>Philosophy</td>
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Any PHI course on the approved GEP-Humanities list.

### GEP Courses

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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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### Free Electives

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Total Hours: 120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

## History & Analysis

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<td>MUS 103</td>
<td>Theory and Musicianship I</td>
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<td>MUS 153</td>
<td>Theory and Musicianship II</td>
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<tr>
<td>MUS 201</td>
<td>Introduction to Music Literature I</td>
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<tr>
<td>MUS 202</td>
<td>Introduction to Music Literature II</td>
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<tr>
<td>MUS 260</td>
<td>History of Jazz</td>
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<tr>
<td>MUS 310</td>
<td>Music of the 17th and 18th Centuries</td>
<td>3</td>
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<td>MUS 315</td>
<td>Music of the 19th Century</td>
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<td>MUS 320</td>
<td>Music of the 20th Century</td>
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<td>MUS 330</td>
<td>Survey of Musical Theater</td>
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<td>MUS 350</td>
<td>Music of Asia</td>
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## Performance Courses

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<td>Music Composition with Computers</td>
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<tr>
<td>MUS 107</td>
<td>Class Piano I</td>
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<tr>
<td>MUS 112</td>
<td>Men's Choir</td>
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<td>MUS 113</td>
<td>Women's Choir</td>
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<tr>
<td>MUS 114</td>
<td>Chamber Singers</td>
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<td>MUS 115</td>
<td>State Chorale</td>
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<td>MUS 121</td>
<td>Raleigh Civic Symphony</td>
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<td>MUS 122</td>
<td>Raleigh Civic Chamber Orchestra</td>
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<td>MUS 131</td>
<td>Marching Band</td>
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<td>MUS 132</td>
<td>Varsity Band</td>
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<td>MUS 134</td>
<td>Wind Ensemble</td>
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<td>MUS 140</td>
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<td>MUS 141</td>
<td>Jazz Combo II</td>
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<td>MUS 143</td>
<td>Jazz Combo I</td>
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<td>Vocal Techniques</td>
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<td>MUS 300</td>
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## Linking Courses

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<td>ARS 252</td>
<td>The Arts of Vienna 1900</td>
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<td>ARS 257</td>
<td>Technology in the Arts</td>
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<td>ARS 259</td>
<td>The Arts and Politics</td>
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<td>ARS 351</td>
<td>Arts, Ideas and Values</td>
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<td>ARS 353</td>
<td>Arts and Cross-Cultural Contacts</td>
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<td>ARS 354</td>
<td>The Arts and the Sacred</td>
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<td>EMA 365</td>
<td>Foundations in Arts Entrepreneurship</td>
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<td>ENG 382</td>
<td>Film and Literature</td>
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<td>ENG 492</td>
<td>Special Topics in Film Styles and Genres</td>
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<td>Topics in Film and Interdisciplinary Studies</td>
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## History I

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<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>Survey of African-American Literature</td>
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<td>African Literature in English</td>
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<td>African-American Literature</td>
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<td>CLA 210</td>
<td>Classical Mythology</td>
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<td>Masterpieces of Classical Literature</td>
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<td>ENG 207</td>
<td>Studies in Poetry</td>
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PSY 540 Human Factors in Systems Design 3
PSY 541 Overview of Human Factors Psychology 3
PSY 558 Psychology and the African Experience 3
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PSY 584 Advanced Developmental Psychology 3
PSY 590 Special Topics in Psychology 3
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Sociology
AFS 305 Racial and Ethnic Relations 3
ANT 261 Technology in Society and Culture 3
ANT 428 Human Paleopathology 3
ANT 528 Human Paleopathology 3
GEO 220 Cultural Geography 3
PS 432 Violence, Terrorism, and Public Policy 3
REL 309 Religion and Society 3
SOC 202 Principles of Sociology 3
SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 211 Community and Health 3
SOC 212 Race in America 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
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SOC 304 Gender and Society 3
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SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
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SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
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SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
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SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
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SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
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WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

Multidisciplinary
ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Semester Sequence
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Second Year
Fall Semester
- History & Analysis Foundation Course: 3
- History II: 3
- Literature I: 3
- GEP Mathematical Sciences (p. 1428): 3
- GEP Social Sciences (p. 1430): 3

Spring Semester
- History & Analysis Foundation Course: 3
- History & Analysis Foundation Course: 3
- Literature II: 3
- Social Science: 3
- GEP Interdisciplinary Perspectives (p. 1426): 3

Third Year
Fall Semester
- Production Foundation Course: 3
- Arts & Letters: 3
- Philosophy: 3
- GEP Social Sciences (p. 1430): 3
- Free Electives: 3
- GEP Health and Exercise Studies (p. 1422): 1

Spring Semester
- Advised Elective: 3
- Linking Foundation Course: 3
- GEP Interdisciplinary Perspectives (p. 1426): 2
- Free Electives: 7

Fourth Year
Fall Semester
- Production Foundation Course: 3
- Linking Foundation Course: 3
- GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering): 3
- Free Electives: 6

Spring Semester
- ARS 494: Topics in Arts Studies: 3
- Free Electives: 11

Total Hours: 120

Arts Studies majors learn skills that apply to many fields, which are relevant in a changing, interdisciplinary, global world. Our students find work in museums and art galleries, sound studios, arts nonprofits and community arts programs. Graduates of the program follow their passion to make art and teach others and start their own arts businesses. They become artistic directors for large companies and start-ups.

Students in the Bachelor of Arts (B.A.) in Arts Studies: Theater Concentration enroll in Theatre courses in acting, directing, introduction to theatre and all areas of technical theatre, including stagecraft, costume, makeup, lighting and scenic design.

For more information about this program, visit our website (https://theatre.arts.ncsu.edu/).

Contact
Mia Self
Assistant Director, University Theatre
Phone: 919-515-3147
Email: mlself3@ncsu.edu

Plan Requirements
Arts Studies (BA): Theater Concentration: 120 Total Units

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## Free Electives (12 Hr S/U Lmt)

27

### Total Hours

120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

### History & Analysis

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<td>Shakespeare, The Earlier Plays</td>
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<td>ENG 487</td>
<td>Shakespeare, The Later Plays</td>
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<td>THE 340</td>
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<td>Stagecraft</td>
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<td>Arts and Cross-Cultural Contacts</td>
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<td>The Arts and the Sacred</td>
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<td>Foundations in Arts Entrepreneurship</td>
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### Transfer Sequence

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### History I

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<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>Masterpieces of Classical Lit</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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ANT 522 Forensic Anthropology Crime Scene Investigation Field Methods 3
ANT 524 Bioarchaeology 3
ANT 528 Human Paleopathology 3
ANT 529 Advanced Methods in Forensic Anthropology 4
ANT 531 Tourism, Culture, and Anthropology 3
ANT 533 Anthropology of Ecotourism and Heritage Conservation 3
ANT 544 Cross-Cultural Perspectives on Women 3
ANT 550 Culture, Ecology, and Sustainable Living 3
ANT 560 Urban Anthropology 3
ANT 561 Wealth, Poverty and International Aid 3
ANT 564 Anthropology of Religion 3
ANT 571 Understanding Latino Migration 3
ANT 575 Environmental Archaeology 3
ANT 583 Theories of Archaeological Research 3

ANT 585 Skeletal Biology in Anthropology 3
ANT 587 Cultural Resource Management 3
ANT 595 Special Topics in Anthropology 1-6
ANT 598 Independent Study in ANT 1-3
FLJ 351 Contemporary Culture in Japan 3
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WGS 444 Cross-Cultural Perspectives on Women 3
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Agricultural Economics
ARE 121 Agricultural Finance 3
ARE 201 Introduction to Agricultural & Resource Economics 3
ARE 201A Introduction to Agricultural & Resource Economics 3
ARE 215 Small Business Accounting 3
ARE 260 Marketing and Risk Management in the Pork Industry 1
ARE 270 Principles of Agribusiness Entrepreneurship 3
ARE 290 Professional Development in Agricultural Business Management 3
ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 1-6
ARE 301 Intermediate Microeconomics 3
ARE 303 Farm Management 3
ARE 304 Agribusiness Management 3
ARE 306 Agricultural Law 3
ARE 309 Environmental Law & Economic Policy 3
ARE 311 Agricultural Markets 3
ARE 312 Agribusiness Marketing 3
ARE 321 Agricultural Financial Management 3
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ARE 332 Human Resource Management for Agribusiness 3
ARE 336 Introduction to Resource and Environmental Economics 3
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ARE 370 Agribusiness New Venture Development 3
ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
ARE 404 Advanced Agribusiness Management 3
ARE 412 Advanced Agribusiness Marketing 3
ARE 413 Applied Agribusiness Marketing 3
ARE 415 Introduction to Commodity Futures Markets 3
ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
ARE 425 Contracts and Organizations in Agriculture 3
ARE 433 U.S. Agricultural Policy 3
ARE 444 Ethics in Agribusiness 3
ARE 448 International Agricultural Trade 3
ARE 455 Agribusiness Analytics 3
ARE 470 Agribusiness Entrepreneurship Clinical Skills Development 3
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SOC 401  Theories of Social Interaction  3
SOC 402  Urban Sociology  3
SOC 404  Families and Work  3
SOC 405  Racism in the U.S.  3
SOC 410  Sociology of Organizations  3
SOC 413  Criminal Justice Field Work  4
SOC 414  Social Class  3
SOC 415  Sociology of Education  3
SOC 425  Juvenile Delinquency  3
SOC 427  Sociology of Law  3
SOC 428  Formal Institutions of Social Control  3
SOC 429  Quantitative Data Analysis in Sociology  3
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SOC 465  Social Aspects of Mental Health  3
SOC 492  External Learning Experience  1-6
SOC 493  Special Problems in Sociology  1-6
SOC 495  Special Topics in Sociology  1-3
SOC 498  Independent Study in Sociology  1-6
SOC 508  Social Organization  3
SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics In Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

Multidisciplinary
ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

Semester Sequence

This is a sample.

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Foreign Language 201  3
History & Analysis Foundation Course  3
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GEP Health and Exercise Studies (p. 1422)  1

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Arts Studies (BA): Visual Arts Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Arts Studies majors learn skills that apply to many fields, which are relevant in a changing, interdisciplinary, global world. Our students find work in museums and art galleries, sound studios, arts nonprofits and community arts programs. Graduates of the program follow their passion to make art and teach others and start their own arts businesses. They become artistic directors for large companies and start-ups.

Students in the Bachelor of Art (B.A.) in Arts Studies: Visual Arts Concentration will engage in interdisciplinary, scholarly work based in theory, analysis, history, and materials exploration.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/arts/visualart.php).

Contact
Tori Ralston
Professor
Email: vnralsto@ncsu.edu

Plan Requirements
Arts Studies (BA): Visual Arts Concentration: 120 Total Units

Free Electives 11

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1 C- or better

History & Analysis

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Linking Courses

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### Social Science

**Anthropology**

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**Multidisciplinary**

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## Semester Sequence

This is a sample.

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<td>Arts &amp; Letters</td>
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### Total Hours

**120**

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1. C- or better

## Arts Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! CHASS offers an academic minor in Arts Studies to all majors in the University. This interdisciplinary minor is designed to enrich the student’s university experience, to serve as a foundation for learning and understanding in the arts beyond the university years and to provide a line of thinking and skill development that may contribute to the development provided by the student’s courses in the major or that by be only loosely related to the major. This minor provides the student with a fundamental understanding of the historical, theoretical and practical disciplines of the arts. No courses for the minor may be taken for S/U credit.

### Admissions

Students may declare their intention to complete the Arts Studies minor by contacting Dr. Rodney Waschka, advisor for the minor, as listed below. Formal admission to the minor occurs when the Arts Studies Council has approved the student’s selection of coursework for the minor.

### Certification

Dr. Waschka will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

### Contact Person

Dr. Rodney Waschka  
101B Winston Hall  
919.515.5464  
rodney_waschka@ncsu.edu

**SIS Code: 16ARTM**

### Plan Requirements

- 18 credit hours must be taken to complete this minor.
- Students design their minor from the following courses in consultation with the minor advisor.
- The courses selected for the minor must balance work in 3 areas: history, criticism and theory, and application (studio or performance courses).
• Each Art Studies Minor program will be reviewed and approved by the Arts Studies Advisory Council.
• A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

Elective Courses
The following list of courses is illustrative, not exhaustive. Students may find other courses that they wish to include in their Arts Studies minor program. Students should be aware that some of the below courses have one or more prerequisites and that some of them are restricted to students in a certain major. Enrolling in the Arts Studies minor does not guarantee students that they will be accepted in these courses.

Aesthetics

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Art and Design

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<td>ADN 112</td>
<td>Introduction to Three-Dimensional Design</td>
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<td>ADN 311</td>
<td>Art + Design Laboratory I</td>
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<td>ADN 384</td>
<td>Painting I</td>
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<td>ADN 386</td>
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<td>Art + Design Laboratory II</td>
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<td>Introduction to Environment and Behavior for Designers</td>
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<td>Perception and Behavior for Designers</td>
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<td>TDE 351</td>
<td>Ceramics: The Art and Craft of Clay</td>
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Dance

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<td>Problems of Dance Performance</td>
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<td>Tap Dance</td>
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<td>HESD 264</td>
<td>Ballet I</td>
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Film Studies

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<td>Film Production</td>
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<td>ENG 282</td>
<td>Introduction to Film</td>
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<td>Film and Literature</td>
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<td>Special Topics in Film Styles and Genres</td>
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History of Art and Design

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<td>Graphic Design Theory and Practice</td>
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<td>History of Art from Caves to the Renaissance</td>
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<td>History of Art From the Renaissance Through the 20th Century</td>
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<td>History of American Art</td>
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<td>Introduction to Visual Culture</td>
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<td>Special Topics in Art History</td>
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<td>History of Art: Study Abroad</td>
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<td>19th Century European Art from Revolution to Post-Impressionism</td>
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Music

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<td>Understanding Music: Global Perspectives</td>
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<td>Music Composition</td>
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Photography

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<td>History of the Art of Photography</td>
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Theatre

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<tr>
<td>THE 103</td>
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<td>THE 203</td>
<td>Theory and Practice of Acting</td>
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<td>THE 293</td>
<td>Theater Practicum</td>
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concentration. You can combine courses from multiple disciplines to develop a clear vision for your education and attain your personal and professional goals. You can combine courses from multiple disciplines to create a one-of-a-kind Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree. The Self-Design program will help you identify a faculty sponsor/mentor. This sponsor will assist the student to develop an academically sound major in a chosen interdisciplinary area. If the student is not able to identify a faculty sponsor, Dr. Sharon Setzer (sharon_setzer@ncsu.edu), Coordinator for the Self-Design Major program, can help students identify an appropriate faculty sponsor.

Toward the end of your coursework, you will complete a capstone course requiring you to use skills and knowledge obtained during the degree to design and implement a service-learning experience to benefit an organization in the community. Please see the Self-Design Plans to see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Interdisciplinary Studies (IDS) Self-Design B.A. or B.S. options exist to allow undergraduate students to design a major in an area of academic interest that crosses disciplinary boundaries and creates a unique educational experience.

Admission to the Self-Design Major program is by application only. The first step for the student who wishes to enter the program is to identify a faculty sponsor/mentor. This sponsor will assist the student to develop an academically sound major in a chosen interdisciplinary area. If the student is not able to identify a faculty sponsor, Dr. Sharon Setzer (sharon_setzer@ncsu.edu), Coordinator for the Self-Design Major program, can help students identify an appropriate faculty sponsor.

Toward the end of your coursework, you will complete a capstone course requiring you to use skills and knowledge obtained during the degree to design and implement a service-learning experience to benefit an organization in the community. Please see the Self-Design FAQ (https://ids.chass.ncsu.edu/studies/selfdesign/FAQ.php) page (question 7) for a more detailed description.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/selfdesign.php).

Plan Requirements

### Interdisciplinary Studies (BA): Self Design Concentration: 120 Total Units

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<tr>
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<td>Foundation Courses 1,2</td>
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## Film Studies Program

### Minor in Film Studies

The Departments of English, Communication, and Foreign Languages & Literatures offer a Minor in Film Studies (p. 694). The Minor provides an introduction to the film medium, some background in cinema history, and the opportunity for in-depth study of selected topics in genres, directors, and film styles.

For more information on the film program at NC State visit the Film Studies website (https://english.chass.ncsu.edu/film/).

### Faculty

#### Core Faculty

Franklin D. Cason, Assistant Professor, Film Studies, English

Andrew R. Johnston, Assistant Professor, Film Studies, English

Andrea C. Mensch, Lecturer

Devin Orgeron, Associate Professor

Ora Gelley, Associate Professor

Marsha Gordon, Associate Professor

Thomas A. Wallis, Lecturer

### Interdisciplinary Studies

The Interdisciplinary Studies program also allows students the opportunity to create a one-of-a-kind Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) degree. The Self-Design program will help you develop a clear vision for your education and attain your personal and professional goals. You can combine courses from multiple disciplines as you take on a multidisciplinary approach to solving problems in our complex world.

### Plans

- Interdisciplinary Studies (BA): Self Design Concentration (p. 1014)
- Interdisciplinary Studies (BS) (p. 1022)

### Interdisciplinary Studies (BA): Self Design Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Interdisciplinary Studies (IDS) Self-Design B.A. or B.S. options exist to allow undergraduate students to design a major in an area of academic interest that crosses disciplinary boundaries and creates a unique educational experience.

Admission to the Self-Design Major program is by application only. The first step for the student who wishes to enter the program is to identify a faculty sponsor/mentor. This sponsor will assist the student to develop an academically sound major in a chosen interdisciplinary area. If the student is not able to identify a faculty sponsor, Dr. Sharon Setzer (sharon_setzer@ncsu.edu), Coordinator for the Self-Design Major program, can help students identify an appropriate faculty sponsor.

Toward the end of your coursework, you will complete a capstone course requiring you to use skills and knowledge obtained during the degree to design and implement a service-learning experience to benefit an organization in the community. Please see the Self-Design FAQ (https://ids.chass.ncsu.edu/studies/selfdesign/FAQ.php) page (question 7) for a more detailed description.

For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/selfdesign.php).
## GEP Courses
- GEP Mathematical Sciences (p. 1428): 6
- GEP Natural Sciences (p. 1429): 7
- GEP Health and Exercise Studies (p. 1422): 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts): 3
- GEP Interdisciplinary Perspectives (p. 1426): 5
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

## Free Electives
- Free Electives (12 Hr S/U Lmt): 30

## Total Hours
- 120

---

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

## Acad Writing Research

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<td>ENG 101</td>
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## Transfer Sequence

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<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
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## History I

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<td>Introduction to History of South and East Africa</td>
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<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>HI 216</td>
<td>Latin America Since 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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## History II

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<td>HI 208</td>
<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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## Literature I

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<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
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<td>ENG 222</td>
<td>Literature of the Western World II</td>
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<td>ENG 251</td>
<td>Major British Writers</td>
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<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>FLF 301</td>
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<td>FLG 325</td>
<td>German Lyric Poetry</td>
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<td>Early Modern Japanese Literature in Translation</td>
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<td>FLR 303</td>
<td>Russian Literature in Translation: The Nineteenth Century</td>
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<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>Literature and Culture of Spain I</td>
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<td>Inquiry, Discovery, and Literature</td>
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## Literature II

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<td>AFS 349</td>
<td>African Literature in English</td>
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<td>AFS 448/548/ENG 448/558</td>
<td>African-American Literature</td>
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<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
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<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
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<td>ENG 207</td>
<td>Studies in Poetry</td>
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<td>ENG 208</td>
<td>Studies In Fiction</td>
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<td>ENG 209</td>
<td>Introduction to Shakespeare</td>
<td>3</td>
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<td>ENG 220</td>
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## Literature II List A

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<tr>
<td>ENG 232</td>
<td>Literature and Medicine</td>
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<td>ENG 246</td>
<td>Literature of the Holocaust</td>
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<td>ENG 248</td>
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<td>ENG 249</td>
<td>Native American Literature</td>
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<td>ENG 251</td>
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<td>ENG 261</td>
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<td>LGBTQI Literature in the U.S.</td>
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<td>Literature and War</td>
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<td>Women and Literature</td>
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<td>ENG 339</td>
<td>Literature and Technology</td>
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<td>ENG 340</td>
<td>Literature, Art, and Society</td>
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<td>ENG 341</td>
<td>Literature and Science</td>
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<td>Literature of Space and Place</td>
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<td>American Fiction, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>The Romantic Period</td>
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<td>18th-Century English Literature</td>
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<td>Victorian Period</td>
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<td>Transatlantic Literatures</td>
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<td>Southern Literature</td>
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<td>Shakespeare, The Earlier Plays</td>
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<td>Shakespeare, The Later Plays</td>
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<td>Literature and War</td>
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Are 215 Small Business Accounting 3
Are 260 Marketing and Risk Management in the Pork Industry 1
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Are 370 Agribusiness New Venture Development 3
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Lps 315 Public Leadership 3
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Foreign Language 200 Level

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<td>Intermediate Italian I</td>
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<td>Intermediate Japanese I</td>
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<td>Intermediate Korean I</td>
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<td>Intermediate French I</td>
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Semester Sequence

This is a sample.

Course Title Hours

First Year
Fall Semester
ENG 101 Academic Writing and Research 4
GEP Mathematical Sciences (p. 1428) 3
GEP Natural Sciences (p. 1429) 4
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 1

Hours 15

Spring Semester
GEP Mathematical Sciences (p. 1428) 3
Natural Science 4
GEP Social Sciences (p. 1430) 3
Free Elective 3
GEP Health and Exercise Studies (p. 1422) 1

Hours 14

Second Year
Fall Semester
Calculus 3
GEP Natural Sciences (p. 1429) 4
Literature 3
Philosophy 3
Free Elective 3

Hours 16

Spring Semester
Science Elective 4
Arts & Letters 3
History 3
IDS-SD Foundation Course 3
GEP Social Sciences (p. 1430) 3

Hours 16

Third Year
Fall Semester
Advanced Writing & Speaking 3
Free Electives 3
GEP Interdisciplinary Perspectives (p. 1426) 3
IDS-SD Concentration 3
IDS-SD Concentration 3

Hours 15

Spring Semester
GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) 3
IDS-SD Concentration 3
IDS-SD Concentration 3
Advanced Science/Technology Option 3
Advanced Science/Technology Option 3

Hours 15

Fourth Year
Fall Semester
Advanced Science/Technology Option 3
Advanced Science/Technology Option 3
IDS-SD Concentration 3
IDS-SD Concentration 3
Free Electives 3

Hours 15

Spring Semester
IDS 490 Interdisciplinary Methods and Issues 3
Advanced Science/Technology Option 3
IDS-SD Concentration 3
GEP Interdisciplinary Perspectives (p. 1426) 2
Free Electives 3

Hours 14

Total Hours 120

Interdisciplinary Studies (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Interdisciplinary Studies (IDS) Self-Design B.A. or B.S. options exist to allow undergraduate students to design a major in an area of academic interest that crosses disciplinary boundaries and creates a unique educational experience.

Admission to the Self-Design Major program is by application only. The first step for the student who wishes to enter the program is to identify a faculty sponsor/mentor. This sponsor will assist the student to develop an academically sound major in a chosen interdisciplinary area. If the student is not able to identify a faculty sponsor, Dr. Sharon Setzer (sharon_setzer@ncsu.edu), Coordinator for the Self-Design Major program, can help students identify an appropriate faculty sponsor.

Toward the end of your coursework, you will complete a capstone course requiring you to use skills and knowledge obtained during the degree to design and implement a service-learning experience to benefit an organization in the community. Please see the Self-Design FAQ (https://...
Plan Requirements

Interdisciplinary Studies (BS): 120 Total Units

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<td>Calculus for Life and Management Sciences A</td>
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### Basic Science

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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### Biological Sciences (Max: 4 Units)

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<td>Introduction to Weather and Climate</td>
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<td>MEA 135</td>
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<td>MEA 150</td>
<td>Environmental Issues in Water Resources</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>MEA 202</td>
<td>Geology II: Historical</td>
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<td>MEA 210</td>
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### Chemistry (Max: 4 Units)

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### Earth Sciences (Max: 4 Units)

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For more information about this program, visit our website (https://ids.chass.ncsu.edu/studies/selfdesign.php). For a more detailed description, please visit the FAQ page (https://ids.chass.ncsu.edu/studies/selfdesign/FAQ.php).
### Arts and Letters

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<td>African American Cinema</td>
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<td>Introduction to Architectural History</td>
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- ARE 201 Introduction to Agricultural & Resource Economics 3
- ARE 201A Introduction to Agricultural & Resource Economics 3
- ARE 215 Small Business Accounting 3
- ARE 260 Marketing and Risk Management in the Pork Industry 1
- ARE 270 Principles of Agribusiness Entrepreneurship 3
- ARE 290 Professional Development in Agricultural Business Management 3
- ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) 1-6
- ARE 301 Intermediate Microeconomics 3
- ARE 303 Farm Management 3
- ARE 304 Agribusiness Management 3
- ARE 306 Agricultural Law 3
- ARE 309 Environmental Law & Economic Policy 3
- ARE 311 Agricultural Markets 3
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- ARE 395 Special Topics in Agricultural and Resource Economics (300 level) 1-6
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- ARE 420 Taxation in Agriculture, Production, and Agribusiness 3
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**Economics**
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- EC 302 Intermediate Macroeconomics 3
- EC 305 A Closer Look at Capitalism 3
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**Psychology**

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PSY 311 Social Psychology 3
PSY 312 Applied Psychology 3
PSY 313 Positive Psychology 3
PSY 340 Ergonomics 3
PSY 345 Psychology and the African American Experience 3
PSY 360 Community Psychology Principles and Practice 3
PSY 370 Personality 3
PSY 376 Developmental Psychology 3
PSY 400 Perception 3
PSY 406 Psychology of Gender 3
PSY 410 Learning and Motivation 3
PSY 411 The Psychology of Interdependence and Race 3
PSY 416 Psychology of Emotion 3
PSY 420 Cognitive Processes 3
PSY 425 Introduction to Cognitive Science 3
PSY 430 Biological Psychology 3
PSY 431 Health Psychology 3
PSY 436 Introduction to Psychological Measurement 3
PSY 465 Advanced Methods in Psychology 3
PSY 470 Abnormal Psychology 3
PSY 475 Child Psychology 3
PSY 476 Psychology of Adolescent Development 3
PSY 491 Special Topics in Psychology 3
PSY 495 Community-Based Applied Psychology 4
PSY 498 Psychology Honors Seminar 3
PSY 499 Individual Study in Psychology 1-6
PSY 500 Visual Perception 3
PSY 502 Physiological Psychology 3
PSY 504 Evolutionary Psychology 3
PSY 508 Cognitive Processes 3
PSY 510 Advanced Problems In Psychology 1-3
PSY 511 Advanced Social Psychology 3
PSY 525 Introduction To Cognitive Science 3
PSY 535 Tests and Measurements 3
PSY 540 Human Factors In Systems Design 3
PSY 541 Overview of Human Factors Psychology 3
PSY 558 Psychology and the African Experience 3
PSY 582 Adolescent Development 3
PSY 584 Advanced Developmental Psychology 3
PSY 590 Special Topics in Psychology 3
PSY 591 History and Systems Of Psychology 1-3
WGS 406 Psychology of Gender 3

Sociology

SOC 203 Current Social Problems 3
SOC 203A Current Social Problems 3
SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 211 Community and Health 3
SOC 212 Race in America 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 301 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305 Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 309 Religion and Society 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
SOC 400 Theories of Social Structure 3
SOC 401 Theories of Social Interaction 3
SOC 402 Urban Sociology 3
SOC 404 Families and Work 3
SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
SOC 413 Criminal Justice Field Work 4
SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
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**Multidisciplinary**

- ENG 210  Introduction to Language and Linguistics  3
- GEO 220  Cultural Geography                         3
- SOC 220  Cultural Geography                         3
- STS 402  Peace and War in the Nuclear Age          3

**Literature**

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<td>Studies in Poetry</td>
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<td>Introduction to Shakespeare</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Reading Literature and Exploring Textuality</td>
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<td>Literature and Technology</td>
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<td>Literature, Art, and Society</td>
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<td>Studies in the British Novel</td>
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<td>The American Novel of the 19th Century</td>
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<td>American Fiction, Twentieth Century and Beyond</td>
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<td>American Poetry, Twentieth Century and Beyond</td>
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<td>Science Fiction</td>
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<td>Fantasy</td>
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<td>Film and Literature</td>
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<td>Classical Backgrounds of English Literature</td>
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<td>ENG/FL 394</td>
<td>Studies in World Literature</td>
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<td>Major American Author</td>
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<td>Studies in English Renaissance Literature</td>
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<td>Chaucer</td>
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<td>The Romantic Period</td>
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<td>18th-Century English Literature</td>
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<td>The Victorian Period</td>
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<td>British Literature and the Founding of Empire</td>
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<td>British Literature and the Dissolution of Empire</td>
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<td>Transatlantic Literatures</td>
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<td>Studies in Nineteenth-Century American Literature</td>
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<td>American Literature, Twentieth Century and Beyond</td>
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<td>Shakespeare, The Earlier Plays</td>
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**Literature List B**

- ENG/FL 219     | Studies in Great Works of Non-Western Literature    | 3     |
- ENG/FL 220     | Studies in Great Works of Western Literature        | 3     |
- ENG/FL 221     | Literature of the Western World I                   | 3     |
- ENG/FL 222     | Contemporary World Literature I                     | 3     |
- ENG/FL 223     | Contemporary World Literature II                    | 3     |
- ENG/FL 234     | Studies in World Literature                         | 3     |
- ENG/FL 406     | Modernism                                           | 3     |
- ENG/FL 407     | Postmodernism                                       | 3     |
- FLF 301        | Survey of French Literature from the Middle Ages    | 3     |
- FLF 302        | Survey of French Literature from Romanticism to     | 3     |
|                | the Contemporary Period                             |       |
- FLF 492        | Seminar in French Studies                           | 3     |
- FLG 320        | Introduction to German Literature                   | 3     |
- FLG 323        | Twentieth Century German Literature                 | 3     |
- FLG 325        | German Lyric Poetry                                 | 3     |
- FLR 303        | Russian Literature in Translation: The Nineteenth   | 3     |
|                | Century                                             |       |
- FLR 304        | Russian Literature in Translation: The Twentieth    | 3     |
|                | Century                                             |       |
- FLS 341        | Literature and Culture of Spain                     | 3     |
- FLS 342        | Literature and Culture of Spain                     | 3     |
- FLS 343        | Literature and Culture of Spain                     | 3     |
- FLS 351        | Literature and Culture of Latin America I           | 3     |
- FLS 352        | Literature and Culture of Latin America II          | 3     |
- FLS 353        | Literature and Culture of Latin America III         | 3     |
### Writing and Communication

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<td>Argumentation and Advocacy</td>
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<td>ENG 287</td>
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<td>Poetry Writing</td>
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<td>Writing About Film</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>Communication for Engineering and Technology</td>
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<td>Communication for Business and Management</td>
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<td>Spanish: Language, Technology, Culture</td>
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### Semester Sequence

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|        | **Second Year**                            |       |
|        | **Fall Semester**                          |       |
| Calculus |                                    | 3     |
| GEP Natural (p. 1429) |                                   | 4     |
| Literature I |                                   | 3     |
| Philosophy |                                    | 3     |
| Free Elective |                                    | 3     |
|        | **Spring Semester**                         |       |
| Science Elective |                                   | 4     |
| Arts & Letters |                                    | 3     |
| History |                                    | 3     |
| IDS (self-design) Concentration |                                   | 3     |
| GEP Social (p. 1430) |                                   | 3     |
|        | **Third Year**                             |       |
| Advanced Writing & Speaking |                                   | 3     |
| Free Elective |                                    | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) |                        | 3     |
| IDS (self-design) Concentration |                                   | 3     |
| IDS (self-design) Concentration |                                   | 3     |

|        | **Fourth Year**                            |       |
|        | **Fall Semester**                          |       |
| Advanced Science/Technology Option |                                   | 3     |
| IDS (self-design) Concentration |                                   | 3     |
| IDS (self-design) Concentration |                                   | 3     |
| Free Elective |                                    | 3     |
|        | **Spring Semester**                         |       |
| IDS 490 | Interdisciplinary Methods and Issues        | 3     |
| Advanced Science/Technology Option |                                   | 3     |
| IDS (self-design) Concentration |                                   | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) |                        | 2     |
| Free Elective |                                    | 3     |
|        | **Total Hours**                            |       |

1. C- or better
International Studies Program

Faculty
Director
Seth Murray, Teaching Associate Professor

Core Faculty
Shea C. McManus, Assistant Professor, Anthropology
Raja Abillama, Lecturer
Nora Haenn, Associate Professor, Anthropology
Carol Ann Lewald, Teaching Assistant Professor
Haddy M. Njie, Teaching Assistant Professor

Plans

- International Studies (BA): Africa Concentration (p. 1031)
- International Studies (BA): East and Southeast Asia Concentration (p. 1040)
- International Studies (BA): Europe Concentration (p. 1049)
- International Studies (BA): Global Cultural Studies Concentration (p. 1059)
- International Studies (BA): Global Relations Concentration (p. 1069)
- International Studies (BA): Global Sustainability and Development Concentration (p. 1079)
- International Studies (BA): Latin America Concentration (p. 1088)
- International Studies (BA): South Asia and Middle East Concentration (p. 1097)
- International Studies (Minor) (p. 1106)

International Studies (BA): Africa Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

Plan Requirements

International Studies (BA): Africa Concentration: 120 Total Units

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<td>IS 393</td>
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Free Electives

Free Electives (12 Hr S/U Lmt) ²

Total Hours  120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

Africa

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<td>Introduction to History of West Africa</td>
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<td>Introduction to the African Diaspora</td>
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<td>African American Religions</td>
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<td>Issues in the African Diaspora</td>
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<td>History of the Republic of South Africa</td>
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<td>Advanced Conversation: Contemporary French Cultures</td>
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<td>New German Cinema and Beyond</td>
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<td>The Sounds of Spanish</td>
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<td>Spanish for Native and Heritage Speakers</td>
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<td>Spanish for Tourism in the Hispanic World</td>
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### History I

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<td>Studies In Fiction</td>
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**Multidisciplinary**

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## Semester Sequence

This is a sample.

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methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

**International Studies (BA): East and Southeast Asia Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular area of study in East and Southeast Asia.

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**Plan Requirements**

**International Studies (BA): East and Southeast Asia Concentration:**

120 Total Units

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^1 C- or better

^2 Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

^3 Study Abroad: International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

^4 Major Residency Requirements – Minimum of 15 hours of international studies at NC State.

^5 Major Grade Point Average (GPA) Requirements- A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.

---

**East and Southeast Asia**

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<td>Contemporary Culture in Japan</td>
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Acad Writing Research

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Transfer Sequence

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<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>Latin America to 1826</td>
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<td>Latin America Since 1826</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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### Literature I

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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Major British Writers</td>
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**Wealth, Poverty and International Aid**

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**Independent Study in ANT**

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**Contemporary Culture in Japan**

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**Cultural Resource Management**

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**Understanding Latino Migration**

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**Understanding Latino Migration**

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**Technology in Society and Culture**

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**Cross-Cultural Perspectives on Women**

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**Cross-Cultural Perspectives on Women**

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**Agricultural Economics**

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**Introduction to Agricultural & Resource Economics**

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**Sociology**

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**Multidisciplinary**

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<td>STS 402</td>
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**Semester Sequence**

This is a sample.

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| **Spring Semester**                                   |       |
| Literature I                                         | 3     |
| GEP Mathematical Sciences (p. 1428)                   | 3     |
| GEP Social Sciences (p. 1430)                        | 3     |
| GEP Health and Exercise Studies (p. 1422)            | 1     |
| Free Electives                                       | 6     |
| **Hours**                                           | 16    |
Second Year

Fall Semester
IS Area Studies 3
Foreign Language 3xx 3
GEP Natural Sciences (p. 1429) 4
Free Elective 3
GEP Social Sciences (p. 1430) 3

| Hours | 16 |

Spring Semester
History I 3
Literature II 3
GEP Natural Sciences (p. 1429) 3
Philosophy 3
GEP Social Sciences (p. 1430) 3

| Hours | 16 |

Third Year

Fall Semester
IS 393 Theories of Globalization 3
IS Area Studies 3
Free Electives 9
GEP Health and Exercise Studies (p. 1422) 1

| Hours | 15 |

Spring Semester
IS Advised Elective 3
IS Advised Elective 3
GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering) 3
History II 3
Free Elective 3

| Hours | 15 |

Fourth Year

Fall Semester
Arts & Letters 3
IS Area Studies 3
IS Area Studies 3
Free Electives 6

| Hours | 15 |

Spring Semester
IS 491 Senior Seminar in International Studies 3
GEP Social Sciences (p. 1430) 3
IS Area Studies 3
Free Elective 3

| Hours | 12 |

| Total Hours | 120 |

- **Study Abroad:** International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

- **Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

- **Major Grade Point Average (GPA) Requirements** – A 2.0 major and cumulative gpa is required for graduation. All major courses must receive a grade of C- or better.

### International Studies (BA): Europe Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)! The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

### Plan Requirements

#### International Studies (BA): Europe Concentration: 120 Total Units

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<tr>
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<td>IS 491</td>
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</table>

1. C- or better
2. Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

---

**International Studies (BA): Europe Concentration**

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### Plan Requirements

#### International Studies (BA): Europe Concentration: 120 Total Units

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Europe

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<td>The Arts of Vienna 1900</td>
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<td>Studies in Great Works of Western Literature</td>
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FLI 318  Italian Society Through Cinema  3
FLR 303  Russian Literature in Translation: The Nineteenth Century  3
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FLR 318  Russian Cinema and Society  3
FLS 337  Spanish for Tourism in the Hispanic World  3
FLS 340  Introduction to Hispanic Literatures and Cultures  3
FLS 341  Literature and Culture of Spain I  3
FLS 342  Literature and Culture of Spain II  3
FLS 343  Literature and Culture of Spain III  3
FLS 360  Hispanic Cinema  3
FLS 411  Topics in the Culture of Spain  3
FLS 413  Spain and the Americas in Transatlantic Perspective  3

FIS 492  Seminar in Hispanic Studies  3
FIS 592  Seminar in Hispanic Studies  3
HA 404  Italian Renaissance Art and Material Culture  3
HI 205  Western Civilization Since 1400  3
HI 210  Modern Europe 1815-Present  3
HI 221  British History to 1688  3
HI 222  History of British Cultures and Societies From 1688  3
HI 307  Jewish History  3
HI 324  History of Common Law and Constitution  3
HI 332  Germany and the World Wars  3
HI 410  Italian Renaissance  3
HI 418  Fascist Italy and Nazi Germany  3
HI 419  Modern European Imperialism  3
HI 421  European Intellectual History: The Eighteenth Century  3
HI 423  Women in European Enlightenment  3
HI 425  Tudor and Stuart England  3
HI 429  20th Century Britain  3
HI 430  Modern France  3
HI 483  Science and Religion in European History  3
HI 484  Science in European Culture  3
HI 518  Fascist Italy and Nazi Germany  3
HI 521  European Intellectual History: The Eighteenth Century  3
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HI 525  Tudor and Stuart England  3
HI 530  Modern France  3
HI 584  Science in European Culture  3
PS 341  European Politics  3
REL 317  Christianity  3
REL 350  Introduction to Judaism  3

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
### Foreign Language 300

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Arts and Letters

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**Agricultural Economics**

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International Studies (BA): Europe Concentration

Political Science

AFS 409  Black Political Participation in America  3
LPS 315  Public Leadership  3
PS 101  Internet Research  1
PS 102  Data Analysis  1
PS 103  Designing Political Web Pages  1

Economics

ARE 413  Applied Agribusiness Marketing  3
ARE 415  Introduction to Commodity Futures Markets  3
ARE 420  Taxation in Agriculture, Production, and Agribusiness  3
ARE 425  Contracts and Organizations in Agriculture  3
ARE 433  U.S. Agricultural Policy  3
ARE 444  Ethics in Agribusiness  3
ARE 448  International Agricultural Trade  3
ARE 455  Agribusiness Analytics  3
ARE 470  Agribusiness Entrepreneurship Clinical Skills Development  3
ARE 475  Food Policy  3
ARE 490  Career Seminar in Agriculture & Resource Economics  3
ARE 492  External Learning Experience  1-6
ARE 493  Special Problems/Research Exploration  1-6
ARE 494  Agribusiness Study Abroad  1-6
ARE 495  Special Topics in Agricultural and Resource Economics  1-6
ARE 590  Special Topics in ARE  1-99
EC 301  Intermediate Microeconomics  3
EC 336  Introduction to Resource and Environmental Economics  3

Public Opinion Research Methodology  3
The Classical Liberal Tradition  3
Public Choice and Political Institutions  3
Seminar in Political Theory  3
Comparative Systems of Law and Justice  3
Seminar in Latin American & Caribbean Politics  3
U.S. National Security Policy  3
Global Problems and Policies  3
Violence, Terrorism, and Public Policy  3
The United Nations and Global Order  3
Gender Law and Policies  3
The United Nations and Global Order  3
Violence, Terrorism, and Public Policy  3
Global Problems and Policies  3
U.S. National Security Policy  3
Seminar in Latin American & Caribbean Politics  3
Comparative Systems of Law and Justice  3
Seminar in Political Theory  3
Public Choice and Political Institutions  3
The Classical Liberal Tradition  3
Public Opinion Research Methodology  3
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**Psychology**

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### Semester Sequence

This is a sample.

#### Course Title Hours

**First Year**

**Fall Semester**

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<td>ENG 101</td>
<td>Academic Writing and Research 1</td>
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<tr>
<td>GEP</td>
<td>Mathematical Sciences (p. 1428)</td>
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<tr>
<td>IS 200</td>
<td>Introduction to International Studies</td>
<td>3</td>
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<tr>
<td>FL 201</td>
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<tr>
<td>GEP</td>
<td>Interdisciplinary Perspectives (p. 1426)</td>
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**Spring Semester**

| Literature I                                    | 3     |
| GEP      | Mathematical Sciences (p. 1428)                           | 3     |
| GEP      | Social Sciences (p. 1430)                                 | 3     |
| GEP      | Health and Exercise Studies (p. 1422)                     | 1     |
| Free Electives                                  | 6     |

**Hours**

15

**Second Year**

**Fall Semester**

| IS Area Studies                                 | 3     |
| Foreign Language 3xx                            | 3     |
| GEP      | Natural Sciences (p. 1429)                               | 4     |
| Free Elective                                   | 3     |
| GEP      | Social Sciences (p. 1430)                                | 3     |

**Hours**

16

**Spring Semester**

| History I                                       | 3     |
| Literature II                                  | 3     |
| GEP      | Natural Sciences (p. 1429)                               | 3     |
| Philosophy                                     | 3     |
| GEP      | Social Sciences (p. 1430)                                | 3     |

**Hours**

15

**Third Year**

**Fall Semester**

| IS 393   | Theories of Globalization                                | 3     |
| IS Area Studies                                 | 3     |
| Free Electives                                  | 9     |
| GEP      | Health and Exercise Studies (p. 1422)                    | 1     |

**Hours**

16

**Spring Semester**

| IS Advised Elective                             | 3     |
| IS Advised Elective                             | 3     |
| GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3     |
| History II                                     | 3     |
The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

### Plan Requirements

**International Studies (BA): Global Cultural Studies**

<table>
<thead>
<tr>
<th>Code</th>
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To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

**Global Cultural Studies Concentration**

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<td>IS 491</td>
<td>Senior Seminar in International Studies</td>
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**Humanities and Social Sciences**

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<td>Arts and Letters</td>
<td>(p. 1064)</td>
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**GEP Courses**

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<td>GEP Natural Sciences</td>
<td>(p. 1429)</td>
<td>7</td>
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<tr>
<td>GEP Health and Exercise Studies</td>
<td>(p. 1422)</td>
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<td>GEP Additional Breadth</td>
<td>(p. 1417)</td>
<td>Mathematical Sciences/Natural Sciences/Engineering</td>
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<td>GEP Interdisciplinary Perspectives</td>
<td>(p. 1426)</td>
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<td>GEP U.S. Diversity</td>
<td>(p. 1431)</td>
<td>(verify requirement)</td>
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<td>GEP Global Knowledge</td>
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**Free Electives**

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<td>IS 391</td>
<td>Free Electives (12 Hr S/U Lmt)</td>
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### Additional Social Science

A grade of C- or higher is required.

**Students should consult their academic advisors to determine which courses fill this requirement.**

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1. C- or better
2. Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

- **Study Abroad**: International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

- **Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

- **Major Grade Point Average (GPA) Requirements** - A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.
List 1

FLS 342 Literature and Culture of Spain II 3
FLS 343 Literature and Culture of Spain III 3
FLS 351 Literature and Culture of Latin America I 3
FLS 352 Literature and Culture of Latin America II 3
FLS 353 Literature and Culture of Latin America III 3
FLS 360 Hispanic Cinema 3
FLS 411 Topics in the Culture of Spain 3
FLS 412 Topics in the Culture of Latin America and the Caribbean 3
FLS 413 Spain and the Americas in Transatlantic Perspective 3

HSS 392 International and Crosscultural Communication 3
REL 343 African American Religions 3
WGS 444/544 Cross-Cultural Perspectives on Women 3

List 2

AFS 275 Introduction to History of South and East Africa 3
AFS 276 Introduction to History of West Africa 3
AFS 475/575 History of the Republic of South Africa 3
AFS 476/576 Leadership in Modern Africa 3
AFS 479/579 Africa (sub-Saharan) in the Twentieth Century 3
HA 201 History of Art from Caves to the Renaissance 3
HA 202 History of Art From the Renaissance Through the 20th Century 3
HA 401 19th Century European Art from Revolution to Post-Impressionism 3
HA 404 Italian Renaissance Art and Material Culture 3
HA 410 History of the Art of Photography 3
HI 210 Modern Europe 1815-Present 3
HI 215 Latin America to 1826 3
HI 216 Latin America Since 1826 3
HI 222 History of British Cultures and Societies From 1688 3
HI 263 Asian Civilizations to 1800 3
HI 264 Modern Asia: 1800 to Present 3
HI 270 Modern Middle East 3
HI 275 Introduction to History of South and East Africa 3
HI 276 Introduction to History of West Africa 3
HI 332 Germany and the World Wars 3
HI 402 Early Christianity to the Time of Eusebius 3
HI 407 Islamic History to 1798 3
HI 408 Islam in the Modern World 3
HI 410 Italian Renaissance 3
HI 412 The Sexes and Society in Early-Modern Europe 3
HI 414 From Kings to Revolution: The History of Early-Modern France 3
HI 415 The French Revolution 3
HI 418 Fascist Italy and Nazi Germany 3
HI 425 Tudor and Stuart England 3
HI 429 20th Century Britain 3
HI 430 Modern France 3
HI 467 Modern Mexico 3
HI 469 Latin American Revolutions in the Twentieth Century 3
HI 471 Revolutionary China 3
HI 473 Japan's Empire in Asia, 1868-1945 3
HI 474 Modern India 3
HI 475 History of the Republic of South Africa 3
HI 476 Leadership in Modern Africa 3
HI 477 Women in the Middle East 3
HI 478 Islam and Christianity in Sub-Saharan Africa 3
HI 479 Africa (sub-Saharan) in the Twentieth Century 3
HI 484 Science in European Culture 3
HI 512 The Sexes and Society in Early-Modern Europe 3
HI 514 From Kings to Revolution: The History of Early-Modern France 3
HI 515 The French Revolution 3
HI 518 Fascist Italy and Nazi Germany 3
HI 525 Tudor and Stuart England 3
HI 530 Modern France 3
HI 569 Latin American Revolutions in the Twentieth Century 3
HI 571 Revolutionary China 3
HI 573 Japan's Empire in Asia, 1868-1945 3
HI 575 History of the Republic of South Africa 3
HI 576 Leadership in Modern Africa 3
HI 579 Africa (sub-Saharan) in the Twentieth Century 3
HI 584 Science in European Culture 3
IDS 496 Topics in Film and Interdisciplinary Studies 3
MUS 105 Introduction to Music in Western Society 3
MUS 200 Understanding Music: Global Perspectives 3
MUS 310 Music of the 17th and 18th Centuries 3
MUS 315 Music of the 19th Century 3
MUS 320 Music of the 20th Century 3
MUS 330 Survey of Musical Theater 3
MUS 350 Music of Asia 3
PHI 300 Ancient Philosophy 3
PHI 301 Early Modern Philosophy 3
PHI 302 19th Century Philosophy 3
PHI 310 Existentialism 3
PHI 331 Philosophy of Language 3
PHI 403 Continental Philosophy After 1900 3
REL 210 Religious Traditions of the World 3
REL 230 Asian Religions 3
REL 317 Christianity 3
REL 331 The Hindu Tradition 3
REL 332 The Buddhist Traditions 3
REL 333 Chinese Religions 3
REL 334 Japanese Religions 3
REL 340 Islam 3
REL 402 Early Christianity to the Time of Eusebius 3
REL 407 Islamic History to 1798 3
REL 408 Islam in the Modern World 3
STS 301 Science and Civilization 3

Foreign Language 300

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<td>FLA 318</td>
<td>Egyptian Culture through Film</td>
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<td>FLA 330</td>
<td>Media Arabic</td>
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<td>Intermediate Chinese III</td>
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<td>FLC 302</td>
<td>Intermediate Chinese IV</td>
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<td>Modern Chinese Popular Culture</td>
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<td>Survey of French Literature from the Middle Ages</td>
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<td>FLF 302</td>
<td>Survey of French Literature from Romanticism to</td>
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<td>the Contemporary Period</td>
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<td>FLF 306</td>
<td>French Business Communication</td>
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<td>FLF 307</td>
<td>Business French</td>
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<td>FLF 308</td>
<td>Advanced Conversation: Contemporary French</td>
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<td>FLF 309</td>
<td>French Phonetics and Pronunciation</td>
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<td>The Heritage of French Cinema</td>
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<td>French Cultures and Contexts</td>
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<td>FLG 325</td>
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<td>Spanish for Native and Heritage Speakers</td>
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<td>Major British Writers</td>
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<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>ENG 261</td>
<td>English Literature I</td>
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<td>ENG 262</td>
<td>English Literature II</td>
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<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
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<tr>
<td>FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<tr>
<td>FL 220</td>
<td>Studies in Great Works of Western Literature</td>
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<tr>
<td>FL 221</td>
<td>Literature of the Western World I</td>
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<tr>
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<tr>
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<td>Introduction to German Literature</td>
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<td>FLJ 342</td>
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<td>HON 202</td>
<td>Inquiry, Discovery, and Literature</td>
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### Literature I

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<td>Masterpieces of Classical Lit</td>
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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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- ARE 201 Introduction to Agricultural & Resource Economics  
- ARE 201A Introduction to Agricultural & Resource Economics  
- ARE 215 Small Business Accounting  
- ARE 260 Marketing and Risk Management in the Pork Industry  
- ARE 270 Principles of Agribusiness Entrepreneurship  
- ARE 290 Professional Development in Agricultural Business Management  
- ARE 295 Special Topics in Agricultural & Resource Economics (200 Level)  
- ARE 301 Intermediate Microeconomics  
- ARE 303 Farm Management  
- ARE 304 Agribusiness Management  
- ARE 306 Agricultural Law  
- ARE 309 Environmental Law & Economic Policy  
- ARE 311 Agricultural Markets  
- ARE 312 Agribusiness Marketing  
- ARE 321 Agricultural Financial Management  
- ARE 323 Agribusiness Finance  
- ARE 332 Human Resource Management for Agribusiness  
- ARE 336 Introduction to Resource and Environmental Economics  
- ARE 345 Global Agribusiness Management  
- ARE 370 Agribusiness New Venture Development  
- ARE 395 Special Topics in Agricultural and Resource Economics (300 level)  
- ARE 404 Advanced Agribusiness Management  
- ARE 412 Advanced Agribusiness Marketing

**Economics**

- EC 201 Principles of Microeconomics  
- EC 202 Principles of Macroeconomics  
- EC 205 Fundamentals of Economics  
- EC 302 Intermediate Macroeconomics  
- EC 305 A Closer Look at Capitalism  
- EC 348 Introduction to International Economics  
- EC 351 Econometrics I  
- EC 404 Money, Financial Markets, and the Economy  
- EC 410 Public Finance  
- EC 413 Industrial Organization  
- EC 431 Labor Economics  
- EC 437 Health Economics  
- EC 449 International Finance  
- EC 451 Econometrics II  
- EC 468 Game Theory  
- EC 474 Economics of Financial Institutions and Markets  
- EC 480 Introduction to Economic Research  
- EC 490 Research Seminar in Economics  
- EC 495 Special Topics in Economics  
- EC 498 Independent Study in Economics

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- AFS 409 Black Political Participation in America  
- LPS 315 Public Leadership  
- PS 101 Internet Research  
- PS 102 Data Analysis  
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**Multidisciplinary**
International Studies (BA): Global Relations Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

**Plan Requirements**

**International Studies (BA): Global Relations: 120 Total Units**

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¹ C- or better

- Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

- **Study Abroad**: International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

- **Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

- **Major Grade Point Average (GPA) Requirements** - A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.
IS 393  Theories of Globalization  
3
IS 491  Senior Seminar in International Studies  
3
IS Advised Electives  
6
Global Relations (p. 1070)  
15
Foreign Language 300 (p. 1070)  
3

**Humanities and Social Sciences**

Acad Writing Research (p. 1071)  
4
History I (p. 1071)  
3
History II (p. 1071)  
3
Literature I (p. 1071)  
3
Literature II (p. 1072)  
3
Foreign Language 200 Level (p. 1073)  
3
Philosophy  
3

Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 1073)  
3
Social Science (p. 1074)  
9
Additional Social Science  
3

**GEP Courses**

GEP Mathematical Sciences (p. 1428)  
6
GEP Natural Sciences (p. 1429)  
7
GEP Health and Exercise Studies (p. 1422)  
2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)  
3
GEP Interdisciplinary Perspectives (p. 1426)  
2
GEP U.S. Diversity (p. 1431) (verify requirement)  

GEP Global Knowledge (p. 1419) (verify requirement)  
Foreign Language Proficiency (p. 1417) (verify requirement)  

**Free Electives**

Free Electives (12 Hr S/U Lmt)  
30

Total Hours  
120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

**Global Relations**

**Code**  **Title**  **Hours**
ANT 252  Cultural Anthropology  
3
ANT 254  Language and Culture  
3
ANT 444  Cross-Cultural Perspectives on Women  
3
ANT 544  Cross-Cultural Perspectives on Women  
3
ARS 353  Arts and Cross-Cultural Contacts  
3
COM 392  International and Crosscultural Communication  
3
COM 447  Communication and Globalization  
3
GEO 200  Principles of Geography  
3
GEO 220  Cultural Geography  
3
HI 233  The World Since 1750  
3
HI 419  Modern European Imperialism  
3
HI 453  United States-Latin American Relations Since 1823  
3
HI 454  History of U.S. Foreign Relations, 1900-Present  
3
HI 465  Oil and Crisis in the Gulf  
3
HI 486  Science and Empire  
3
HI 519  Modern European Imperialism  
3
HI 553  United States-Latin American Relations Since 1823  
3
HI 586  Science and Empire  
3
HSS 392  International and Crosscultural Communication  
3
PHI 420  Global Justice  
3
PS 231  Introduction to International Relations  
3
PS 236  Issues in Global Politics  
3
PS 241  Introduction to Comparative Politics  
3
PS 331  U.S. Foreign Policy  
3
PS 335  International Law  
3
PS 336  Global Environmental Politics  
3
PS 339  Politics of the World Economy  
3
PS 431  The United Nations and Global Order  
3
PS 432  Violence, Terrorism, and Public Policy  
3
PS 433  Global Problems and Policies  
3
PS 445  Comparative Systems of Law and Justice  
3
PS 545  Comparative Systems of Law and Justice  
3
REL 210  Religious Traditions of the World  
3
REL 383  Religion, Globalism, and Justice  
3
REL 482  Religion and Conflict  
3
SOC 220  Cultural Geography  
3
SOC 342  International Development  
3
SOC 432  Violence, Terrorism, and Public Policy  
3
STS 322  Technological Catastrophes  
3
STS 323  World Population and Food Prospects  
3
STS 402  Peace and War in the Nuclear Age  
3
WGS 444  Cross-Cultural Perspectives on Women  
3
WGS 544  Cross-Cultural Perspectives on Women  
3

**Foreign Language 300**

**Code**  **Title**  **Hours**
FLA 301  Advanced Intermediate Arabic I  
3
FLA 318  Egyptian Culture through Film  
3
FLA 330  Media Arabic  
3
FLC 301  Intermediate Chinese III  
3
FLC 302  Intermediate Chinese IV  
3
FLC 351  Modern Chinese Popular Culture  
3
FLF 301  Survey of French Literature from the Middle Ages through the Enlightenment  
3
FLF 302  Survey of French Literature from Romanticism to the Contemporary Period  
3
FLF 306  French Business Communication  
3
FLF 307  Business French  
3
FLF 308  Advanced Conversation: Contemporary French Cultures  
3
FLF 309  French Phonetics and Pronunciation  
3
FLF 310  Advanced Written Communication  
3
FLF 315  French Civilization and Culture  
3
FLF 318  The Heritage of French Cinema  
3
FLF 321  French Cultures and Contexts  
3
FLG 301  Advanced German  
3
FLG 302  German Oral and Written Expression  
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<td>HI 263</td>
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<td>HI 264</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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**Literature I**

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<td>ENG 219</td>
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PSY 590  Special Topics 1-6
PSY 598  Special Topics In Political Science 1-6
SOC 413  Criminal Justice Field Work 4
SOC 432  Violence, Terrorism, and Public Policy 3
WGS 306  Gender and Politics in the United States 3
WGS 418  Gender Law and Policies 3

**Psychology**

AFS 345  Psychology and the African American Experience 3
EDP 304  Educational Psychology 3
EDP 476  Psychology of Adolescent Development 3
EDP 582  Adolescent Development 3
ISE 540  Human Factors In Systems Design 3
PHI 425  Introduction to Cognitive Science 3
PHI 525  Introduction To Cognitive Science 3
PSY 200  Introduction to Psychology 3
PSY 208  Psychobiology of Success 3
PSY 230  Introduction to Psychological Research 3
PSY 240  Introduction to Behavioral Research I 3
PSY 241  Introduction to Behavioral Research I Lab 1
PSY 242  Introduction to Behavioral Research II 3
PSY 243  Introduction to Behavioral Research II Lab 2
PSY 307  Industrial and Organizational Psychology 3
PSY 311  Social Psychology 3
PSY 312  Applied Psychology 3
PSY 313  Positive Psychology 3
PSY 340  Ergonomics 3
PSY 345  Psychology and the African American Experience 3
PSY 360  Community Psychology Principles and Practice 3
PSY 370  Personality 3
PSY 376  Developmental Psychology 3
PSY 400  Perception 3
PSY 406  Psychology of Gender 3
PSY 410  Learning and Motivation 3
PSY 411  The Psychology of Interdependence and Race 3
PSY 416  Psychology of Emotion 3
PSY 420  Cognitive Processes 3
PSY 425  Introduction to Cognitive Science 3
PSY 430  Biological Psychology 3
PSY 431  Health Psychology 3
PSY 436  Introduction to Psychological Measurement 3
PSY 465  Advanced Methods in Psychology 3
PSY 470  Abnormal Psychology 3
PSY 475  Child Psychology 3
PSY 476  Psychology of Adolescent Development 3
PSY 491  Special Topics in Psychology 3
PSY 495  Community-Based Applied Psychology 4
PSY 498  Psychology Honors Seminar 3
PSY 499  Individual Study in Psychology 1-6
PSY 500  Visual Perception 3
PSY 502  Physiological Psychology 3
PSY 504  Evolutionary Psychology 3
PSY 508  Cognitive Processes 3
PSY 510  Advanced Problems In Psychology 1-3
PSY 511  Advanced Social Psychology 3
PSY 525  Introduction To Cognitive Science 3
PSY 535  Tests and Measurements 3
PSY 540  Human Factors In Systems Design 3
PSY 541  Overview of Human Factors Psychology 3
PSY 558  Psychology and the African Experience 3
PSY 582  Adolescent Development 3
PSY 584  Advanced Developmental Psychology 3
PSY 590  Special Topics in Psychology 3
PSY 591  History and Systems Of Psychology 1-3
WGS 406  Psychology of Gender 3

**Sociology**

AFS 305  Racial and Ethnic Relations 3
ANT 261  Technology in Society and Culture 3
ANT 428  Human Paleopathology 3
ANT 528  Human Paleopathology 3
GEO 220  Cultural Geography 3
PS 432  Violence, Terrorism, and Public Policy 3
REL 309  Religion and Society 3
SOC 202  Principles of Sociology 3
SOC 208  Current Social Problems 3
SOC 523A  Current Social Problems 3
SOC 523  Community and Health 3
SOC 521  Race in America 3
SOC 220  Cultural Geography 3
SOC 241  Sociology of Agriculture and Rural Society 3
SOC 241A  Sociology of Agriculture and Rural Society 3
SOC 295  Special Topics in Sociology 1-3
SOC 300  Social Research Methods 4
SOC 301  Human Behavior 3
SOC 304  Gender and Society 3
SOC 305  Racial and Ethnic Relations 3
SOC 306  Criminology 3
SOC 308  Community Relationships 3
SOC 342  International Development 3
SOC 350  Food and Society 3
SOC 351  Population and Planning 3
SOC 381  Sociology of Medicine 3
SOC 395  Special Topics in Sociology 1-3
SOC 400  Theories of Social Structure 3
SOC 401  Theories of Social Interaction 3
SOC 402  Urban Sociology 3
SOC 404  Families and Work 3
SOC 405  Racism in the U.S. 3
### Semester Sequence

This is a sample.

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1 C- or better

Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.
International Studies (BA): Global Sustainability and Development Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

Plan Requirements

International Studies (BA): Global Sustainability and Development:
120 Total Units

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*Humanities and Social Sciences*

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- **Any PHI course on the approved GEP-Humanities list.**

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*GEP Courses*

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GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

**Free Electives**

- **Free Electives (12 Hr S/U Lmt)** 2 30

Total Hours 120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.
### Foreign Language 300

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#### Transfer Sequence

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<tr>
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<td>Religion and Society</td>
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<td>SOC 509</td>
<td>Population Problems</td>
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<td>Developing Societies</td>
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<td>SOC 533</td>
<td>The Community</td>
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<td>Sociology of Family</td>
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**Semester Sequence**

This is a sample.

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<td>Cultural Geography</td>
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<td>STS 402</td>
<td>Peace and War in the Nuclear Age</td>
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### First Year

#### Fall Semester

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<td>IS 200</td>
<td>Introduction to International Studies</td>
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#### Hours

15

#### Spring Semester

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<td>GEP</td>
<td>Mathematical Sciences (p. 1428)</td>
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<td>GEP</td>
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#### Hours

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### Second Year

#### Fall Semester

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<td>GEP</td>
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#### Hours

16

#### Spring Semester

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#### Hours

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### Third Year

#### Fall Semester

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<tr>
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<td>Health and Exercise Studies (p. 1422)</td>
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#### Hours

16

#### Spring Semester

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<tr>
<td>IS Advised Elective</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)</td>
<td>3</td>
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<tr>
<td>History II</td>
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**Multidisciplinary**
International Studies (BA): Latin America Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

Plan Requirements

International Studies (BA): Latin America Concentration: 120 Total Units

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<thead>
<tr>
<th>Code</th>
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<tr>
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<td>Introduction to International Studies</td>
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<td>Theories of Globalization</td>
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<td>IS 491</td>
<td>Senior Seminar in International Studies</td>
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<tr>
<td>Latin America (p. 1088)</td>
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<tr>
<td>Foreign Language 300 (p. 1089)</td>
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**Humanities and Social Sciences**

- Acad Writing Research (p. 1089) | 1           | 4     |
- History I (p. 1089)              | 3           | 3     |
- History II (p. 1089)             | 3           | 3     |
- Literature I (p. 1090)           | 3           | 3     |
- Literature II (p. 1090)          | 3           | 3     |
- Foreign Language 200 Level (p. 1091) | 3              | 3     |
- Philosophy                       | 3           | 3     |
- Any PHI course on the approved GEP-Humanities list.
- Arts and Letters (p. 1091)        | 3           | 3     |
- Social Science (p. 1093)          | 9           | 3     |
- Additional Social Science         | 3           | 3     |

**GEP Courses**

- GEP Mathematical Sciences (p. 1428) | 6           | 6     |
- GEP Natural Sciences (p. 1429)      | 7           | 7     |
- GEP Health and Exercise Studies (p. 1422) | 2            | 2     |
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3           | 3     |
- GEP Interdisciplinary Perspectives (p. 1426) | 2            | 2     |
- GEP U.S. Diversity (p. 1431) (verify requirement) | 3           | 3     |
- GEP Global Knowledge (p. 1419) (verify requirement) | 3           | 3     |
- Foreign Language Proficiency (p. 1417) (verify requirement) | 3           | 3     |

**Free Electives**

- Free Electives (12 Hr S/U Lmt) | 2          | 30    |

Total Hours 120

---

1. C- or better
2. Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

- **Study Abroad**: International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program, students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to NC State and may count toward the major and/or the GE requirements.

- **Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

- **Major Grade Point Average (GPA) Requirements** – A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.

---

**Latin America**

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<td>Andean South America</td>
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<td>FLS 337</td>
<td>Spanish for Tourism in the Hispanic World</td>
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<td>FLS 340</td>
<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>FLS 351</td>
<td>Literature and Culture of Latin America I</td>
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<td>FLS 352</td>
<td>Literature and Culture of Latin America II</td>
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<td>FLS 353</td>
<td>Literature and Culture of Latin America III</td>
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<td>FLS 360</td>
<td>Hispanic Cinema</td>
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<td>FLS 412</td>
<td>Topics in the Culture of Latin America and the Caribbean</td>
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<td>FLS 413</td>
<td>Spain and the Americas in Transatlantic Perspective</td>
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<td>Seminar in Hispanic Studies</td>
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<td>FLS 592</td>
<td>Seminar in Hispanic Studies</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>Latin America Since 1826</td>
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Foreign Language 300

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<td>United States-Latin American Relations Since 1823</td>
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<td>HI 454</td>
<td>History of U.S. Foreign Relations, 1900-Present</td>
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<td>HI 467</td>
<td>Modern Mexico</td>
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<td>HI 469</td>
<td>Latin American Revolutions in the Twentieth Century</td>
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<td>United States-Latin American Relations Since 1823</td>
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<td>HI 569</td>
<td>Latin American Revolutions in the Twentieth Century</td>
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<td>Seminar in Latin American &amp; Caribbean Politics</td>
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FLS 332 | Spanish Oral and Written Expression II                    | 3     |
FLS 333 | The Sounds of Spanish                                     | 3     |
FLS 335 | Spanish for Native and Heritage Speakers                  | 3     |
FLS 336 | Spanish for Business                                      | 3     |
FLS 337 | Spanish for Tourism in the Hispanic World                 | 3     |
FLS 340 | Introduction to Hispanic Literatures and Cultures         | 3     |
FLS 341 | Literature and Culture of Spain I                         | 3     |
FLS 342 | Literature and Culture of Spain II                        | 3     |
FLS 343 | Literature and Culture of Spain III                       | 3     |
FLS 351 | Literature and Culture of Latin America I                 | 3     |
FLS 352 | Literature and Culture of Latin America II                | 3     |
FLS 353 | Literature and Culture of Latin America III               | 3     |
FLS 360 | Hispanic Cinema                                           | 3     |
FLS 395 | Study Abroad Programs in Spanish                          | 3     |
FLS 399 | Intensive Spanish Oral Proficiency Workshop               | 1     |
FLS 405 | Spanish-English Comparative Grammar                       | 3     |

Acad Writing Research

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Transfer Sequence

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History I

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<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
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<td>HI 215</td>
<td>Latin America to 1826</td>
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<td>HI 217</td>
<td>Caribbean History</td>
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<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>The Middle Ages</td>
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<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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<td>HI 221</td>
<td>British History to 1688</td>
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<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
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<td>American History I</td>
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**Literature I**

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<td>Masterpieces of Classical Lit</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Major British Writers</td>
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<td>Beyond Britain: Literature from Colonies of the</td>
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**Sociology**

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**Multidisciplinary**

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**Semester Sequence**

This is a sample.

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### Third Year
#### Fall Semester
- **IS 393** Theories of Globalization 3
- IS Area Studies 3
- Free Electives 9
- GEP Health and Exercise Studies (p. 1422) 1

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#### Spring Semester
- IS Advised Elective 3
- IS Advised Elective 3
- GEP Additional Breadth (p. 1417) Mathematical Sciences/Natural Sciences/Engineering 3
- History II 3
- Free Elective 3

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### Fourth Year
#### Fall Semester
- Arts & Letters 3
- IS Area Studies 3
- IS Area Studies 3
- Free Electives 6

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#### Spring Semester
- IS 491 Senior Seminar in International Studies 3
- IS Area Studies 3
- GEP Social Sciences (p. 1430) 3
- Free Elective 3

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1. C- or better

Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

**Study Abroad:** International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

**Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

**Major Grade Point Average (GPA) Requirements** - A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.

### International Studies (BA): South Asia and Middle East Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The International Studies curriculum is designed to educate students within a global context. The program of study requires students to integrate theoretical knowledge about broad global processes and methods used to study them with in-depth examination of a particular world region or major theme in international studies. The curriculum is designed to expose students to a variety of disciplinary approaches. It prepares students to pursue advanced studies in diverse academic fields, and for careers in global corporations, international organizations, and in the government or non-profit sectors.

### Plan Requirements

#### International Studies (BA): South Asia and Middle East Concentration: 120 Total Units

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#### Humanities and Social Sciences

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| Any PHI course on the approved GEP-Humanities list. |
| Arts and Letters (p. 3) | 3 |
| Social Science (p. 1102) | 9 |
| Additional Social Science | 3 |

#### GEP Courses

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#### Free Electives
Free Electives (12 Hr S/U Lmt)  

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FLN 201 Intermediate Hindi-Urdu I 3
FLP 201 Intermediate Portuguese I 3
FLR 201 Intermediate Russian I 3
FLS 201 Intermediate Spanish I 3
FLS 212 Spanish: Language, Technology, Culture 3
GRK 201 Intermediate Greek I 3
LAT 201 Intermediate Latin I 3
PER 201 Intermediate Persian I 3

FLF 318 The Heritage of French Cinema 3
FLG 318 New German Cinema and Beyond 3
FLI 318 Italian Society Through Cinema 3
FLR 318 Russian Cinema and Society 3
FLS 360 Hispanic Cinema 3
GD 203 History of Graphic Design 3
GD 303 Graphic Design Theory and Practice 3
HA 201 History of Art from Caves to the Renaissance 3
HA 202 History of Art From the Renaissance Through the 20th Century 3

HA 203 History of American Art 3
HA/HI 240 Introduction to Visual Culture 3
HA 298 Special Topics in Art History 3
HA 395 History of Art: Study Abroad 3
HA 401 19th Century European Art from Revolution to Post-Impressionism 3
HA 404 Italian Renaissance Art and Material Culture 3
HA 498 Independent Study in History of Art 1-6
HESM 322 Dance and Society 3
HESM 324 Concert Dance History 3
HESM 326 Current Trends in Dance 3
HI/REL 320 Religion in American History 3
HI 402/502/REL 402/502 Early Christianity to the Time of Eusebius 3
HI 408/508/REL 408/508 Islam in the Modern World 3
HI 407/507/REL 407/507 Islamic History to 1798 3
HON 390 Music and the Celtic World 3
IDS 496 Topics in Film and Interdisciplinary Studies 3
LAR 444 History of Landscape Architecture 3
MUS 105 Introduction to Music in Western Society 3
MUS 180 Introduction to Musical Experiences 3
MUS 181 Exploring Music Theory 3
MUS 200 Understanding Music: Global Perspectives 3
MUS 201 Introduction to Music Literature I 3
MUS 202 Introduction to Music Literature II 3
MUS 206 America's Music 3
MUS 310 Music of the 17th and 18th Centuries 3
MUS 315 Music of the 19th Century 3
MUS 320 Music of the 20th Century 3
MUS 330 Survey of Musical Theater 3
MUS 350 Music of Asia 3
MUS/WGS 360 Women in Music 3
REL 200 Introduction to the Study of Religion 3
REL 210 Religious Traditions of the World 3
REL 220 Religion in the Contemporary World 3
REL 230 Asian Religions 3
REL 298 Special Topics in Religious Studies 3
REL/SOC 309 Religion and Society 3
REL 311 Introduction to the Old Testament 3
REL 312 Introduction to the New Testament 3
REL 314 Introduction to Intertestamental Literature 3

Arts and Letters

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REL 323  Religious Cults, Sects, and Minority Faiths in America 3
REL 327  Issues in Contemporary Religion 3
REL 331  The Hindu Tradition 3
REL 332  The Buddhist Traditions 3
REL 333  Chinese Religions 3
REL 334  Japanese Religions 3
REL 340  Islam 3
REL 350  Introduction to Judaism 3
REL 383  Religion, Globalism, and Justice 3
REL 412/512  Advanced Readings in the Christian Gospels 3
REL 413/513  The Life and Letters of the Apostle Paul 3
REL 423/523  Religion and Politics in America 3
REL 424/524  Religion and Politics in Global Perspective 3
REL 471/571/STS 471/571  Darwinism and Christianity 3
REL 472/572/  Women and Religion 3
REL 473/573  Religion, Gender, and Reproductive Technologies 3
REL 482/582  Religion and Conflict 3
REL 489/589  Interpretations of Religion 3
REL 496  Seminar in Religious Studies 3
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THE 303  Stage Directing 3
THE 334  Advanced Acting 3
THE 340  African American Theatre 3

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**Agricultural Economics**

- ARE 121: Agricultural Finance 3
- ARE 201: Introduction to Agricultural & Resource Economics 3
- ARE 201A: Introduction to Agricultural & Resource Economics 3
- ARE 215: Small Business Accounting 3
- ARE 260: Marketing and Risk Management in the Pork Industry 1
- ARE 270: Principles of Agribusiness Entrepreneurship 3
- ARE 290: Professional Development in Agribusiness Management 3
- ARE 295: Special Topics in Agricultural & Resource Economics (200 Level) 1-6
- ARE 301: Intermediate Microeconomics 3
- ARE 303: Farm Management 3
- ARE 304: Agribusiness Management 3
- ARE 306: Agricultural Law 3
- ARE 309: Environmental Law & Economic Policy 3
- ARE 311: Agricultural Markets 3
- ARE 312: Agribusiness Marketing 3
- ARE 321: Agricultural Financial Management 3
- ARE 323: Agribusiness Finance 3
- ARE 332: Human Resource Management for Agribusiness 3
- ARE 336: Introduction to Resource and Environmental Economics 3
- ARE 345: Global Agribusiness Management 3
- ARE 370: Agribusiness New Venture Development 3
- ARE 395: Special Topics in Agricultural and Resource Economics (300 level) 1-6
- ARE 404: Advanced Agribusiness Management 3
- ARE 412: Advanced Agribusiness Marketing 3
- ARE 413: Applied Agribusiness Marketing 3
- ARE 415: Introduction to Commodity Futures Markets 3
- ARE 420: Taxation in Agriculture, Production, and Agribusiness 3
- ARE 425: Contracts and Organizations in Agriculture 3
- ARE 433: U.S. Agricultural Policy 3
- ARE 444: Ethics in Agribusiness 3
- ARE 448: International Agricultural Trade 3
- ARE 455: Agribusiness Analytics 3
- ARE 470: Agribusiness Entrepreneurship Clinical Skills Development 3
- ARE 475: Food Policy 3
- ARE 490: Career Seminar in Agriculture & Resource Economics 1
- ARE 492: External Learning Experience 1-6
- ARE 493: Special Problems/Research Exploration 1-6
- ARE 494: Agribusiness Study Abroad 1-6
- ARE 495: Special Topics in Agricultural and Resource Economics 1-6
- ARE 590: Special Topics in ARE 1-99

**Economics**

- EC 301: Intermediate Microeconomics 3
- EC 336: Introduction to Resource and Environmental Economics 3

**Political Science**

- AFS 409: Black Political Participation in America 3
- LPS 315: Public Leadership 3
- PS 101: Internet Research 1
- PS 102: Data Analysis 1
- PS 103: Designing Political Web Pages 1
- PS 201: American Politics and Government 3
- PS 202: State and Local Government 3
- PS 203: Introduction to Nonprofits 3
- PS 204: Problems of American Democracy 3
- PS 231: Introduction to International Relations 3
- PS 236: Issues in Global Politics 3
- PS 241: Introduction to Comparative Politics 3
- PS 298: Special Topics in Political Science 1-6
- PS 301: The Presidency and Congress 3
- PS 302: Campaigns and Elections in the US Political System 3
- PS 303: Race in U.S. Politics 3
- PS 305: The Justice System in the American Political Process 3
- PS 306: Gender and Politics in the United States 3
- PS 307: Introduction to Criminal Law in the United States 3
- PS 308: Supreme Court and Public Policy 3
- PS 309: Equality and Justice in United States Law 3
- PS 310: Public Policy 3
- PS 312: Introduction to Public Administration 3
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**Sociology**

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<td>Families and Work</td>
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<td>Racism in the U.S.</td>
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<td>Sociology of Sexualities</td>
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<td>Criminal Justice Field Work</td>
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<td>Juvenile Delinquency</td>
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<td>Sociology of Law</td>
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<td>Formal Institutions of Social Control</td>
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<td>Quantitative Data Analysis in Sociology</td>
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<td>Community and Crime</td>
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<td>Inequality, Ideology, and Social Justice</td>
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<td>SOC 492</td>
<td>External Learning Experience</td>
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<td>Special Problems in Sociology</td>
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<td>SOC 508</td>
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<td>Population Problems</td>
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<td>Gender and Society</td>
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**Multidisciplinary**

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**Semester Sequence**

This is a sample.

### First Year

**Fall Semester**

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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Spring Semester**

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</table>
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 1
Free Electives 6

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<td>History I</td>
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<td>Literature II</td>
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<td>Philosophy</td>
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<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)</td>
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<td>History II</td>
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<td>IS 491 Senior Seminar in International Studies</td>
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<td>Free Elective</td>
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</table>

Although some courses are listed in more than one category, no course may satisfy more than one requirement. IS majors may take no more than four 200 level courses in their departmental requirements.

**Study Abroad:** International major students are required to complete six (6) credit hours of study abroad coursework. Prior to enrolling in a study abroad program students are required to consult with their International Studies advisor in order to ascertain that the courses they plan on taking overseas may be transferred for credit to the NC State and may count toward the major and/or the GE requirements.

**Major Residency Requirements** – Minimum of 15 hours of international studies at NC State.

**Major Grade Point Average (GPA) Requirements** - A 2.0 major and cumulative GPA is required for graduation. All major courses must receive a grade of C- or better.

**International Studies (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

The International Studies Minor is offered to all students in the University who want to add a significant international dimension to their departmental majors. This minor program enables students to explore international topics, issues and research from cross-cultural, transnational perspectives. The program will provide some tools that students can use to understand better the global context of the modern world and to learn the international dimensions of their chosen fields of study.

**Admissions**

Students must submit an “Application for Minor” form to the CHASS Dean’s Office, 106Q Caldwell, at any time prior to the end of the pre-registration period of the student’s final semester. Students interested in pursuing the International Studies minor should contact the person listed below.

**Certification**

Prior to the end of the first week of the student’s final semester, the student must sign the application form, indicating all grades received for the courses completed in the minor program and the courses to be taken during the student’s final semester. Also, the form must indicate that the student has completed or is completing the foreign language requirement, which is FLx 202. The contact person below will certify the completion of the minor.

**Contact Person**

Dr. Haddy Njie
107-C 1911 Building
919.515.0448
hnjie@ncsu.edu

**SIS Code:** 16ISM

**Plan Requirements**

- Completion of 15 credit hours of coursework
- Have successfully completed or completing the foreign language proficiency requirement FLx 202. FLx 202 does not count as a course for the minor.
A grade of ‘C-‘ or better is required in all courses in the minor program.

Only one (1) course at the 200-level from the three elective courses is permitted.

A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements. Students cannot obtain a minor in their major.

A maximum of 6 transfer credit hours may be applied towards the International Studies minor.

No courses for the minor may be taken for S/U credit.

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<tr>
<th>Code</th>
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<td>HI 233</td>
<td>The World Since 1750</td>
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<td>HI 419</td>
<td>Modern European Imperialism</td>
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<tr>
<td>HI 453</td>
<td>United States-Latin American Relations Since 1823</td>
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<td>HI 454</td>
<td>History of U.S. Foreign Relations, 1900-Present</td>
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<td>HI 465</td>
<td>Oil and Crisis in the Gulf</td>
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<td>HI 478</td>
<td>Islam and Christianity in Sub-Saharan Africa</td>
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<td>Introduction to Music in Western Society</td>
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<td>Music of the 20th Century</td>
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<td>Global Justice</td>
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<td>Introduction to International Relations</td>
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<tr>
<td>PS 236</td>
<td>Issues in Global Politics</td>
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<td>Introduction to Comparative Politics</td>
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<td>PS 331</td>
<td>U.S. Foreign Policy</td>
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<td>PS 335</td>
<td>International Law</td>
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<td>PS 336</td>
<td>Global Environmental Politics</td>
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<td>Politics of the World Economy</td>
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<td>The United Nations and Global Order</td>
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<td>PS 433</td>
<td>Global Problems and Policies</td>
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<td>Comparative Systems of Law and Justice</td>
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<td>Religion, Globalism, and Justice</td>
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<td>International Development</td>
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<td>STS 322</td>
<td>Technological Catastrophes</td>
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<td>World Population and Food Prospects</td>
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<td>Language and Culture</td>
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<td>ANT/SOC 261</td>
<td>Technology in Society and Culture</td>
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<td>ANT 412</td>
<td>Applied Anthropology</td>
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<td>ANT 431</td>
<td>Tourism, Culture and Anthropology</td>
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<td>ANT 433</td>
<td>Anthropology of Ecotourism and Heritage Conservation</td>
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<td>Cross-Cultural Perspectives on Women</td>
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<td>ANT 450</td>
<td>Culture, Ecology, and Sustainable Living</td>
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<td>Urban Anthropology</td>
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<td>Arts and Cross-Cultural Contacts</td>
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<td>International and Crosscultural Communication</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>Principles of Geography</td>
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<td>Fundamentals of Global Public Health</td>
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<td>HA 201</td>
<td>History of Art from Caves to the Renaissance</td>
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<td>HI 208</td>
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<td>The World from 1200 to 1750</td>
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**Group B: Area Studies Type**

**African Studies**

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<td>African Civilization</td>
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<td>Introduction to African American Studies</td>
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<td>Introduction to the African Diaspora</td>
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<td>African American Religions</td>
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<td>Issues in the African Diaspora</td>
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<td>Peoples and Cultures of Africa</td>
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<td>ENG/AFS 349</td>
<td>African Literature in English</td>
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<td>Introduction to History of South and East Africa</td>
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<td>Introduction to History of West Africa</td>
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<td>History of the Republic of South Africa</td>
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<td>Leadership in Modern Africa</td>
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<td>Africa (sub-Saharan) in the Twentieth Century</td>
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<td>Islam and Christianity in Sub-Saharan Africa</td>
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<td>REL 340</td>
<td>Islam</td>
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**East and Southeast Asia (formally “East Asian Studies”)**

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<td>ANT/FLJ 351</td>
<td>Contemporary Culture in Japan</td>
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<td>Classical Japanese Literature in Translation</td>
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<td>Early Modern Japanese Literature in Translation</td>
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<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>HI 371</td>
<td>Modern Japan, 1850 to Present</td>
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<td>Japan's Empire in Asia, 1868-1945</td>
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<td>The Buddhist Traditions</td>
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### South Asia and Middle East (formally “South and West Asian Studies”)

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<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>HI 264</td>
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<td>Visual Culture of Modern South Asia</td>
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<td>Civilization of the Ancient Near East</td>
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<td>HI/REL 407</td>
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### European Studies

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<td>Literature of the Holocaust</td>
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<td>Major British Writers</td>
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<td>English Literature I</td>
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<td>Russian Cinema and Society</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>History of British Cultures and Societies From 1668</td>
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<td>From Roman Empire to Middle Ages</td>
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<td>Trials of Faith: Religious Reformation in Early-Modern Europe</td>
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<td>The Sexes and Society in Early-Modern Europe</td>
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<td>From Kings to Revolution: The History of Early-Modern France</td>
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<td>The French Revolution</td>
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<td>Modern European Imperialism</td>
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<td>Women in European Enlightenment</td>
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<td>Modern France</td>
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<td>Science and Religion in European History</td>
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**Latin America Studies**

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<td>United States-Latin American Relations Since 1823</td>
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<td>History of U.S. Foreign Relations, 1900-Present</td>
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<td>Modern Mexico</td>
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<td>Latin American Revolutions in the Twentieth Century</td>
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**Jewish Studies (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The undergraduate minor in Jewish studies treats the history, religious traditions, culture, language, and literature of the Jewish people. Students in this interdisciplinary program will have the opportunity to deepen their understanding and appreciation of Judaism from a wide range of academic disciplines, including Religious Studies, History, Language, Literature, and Film Studies.

**Admissions**

Students interested in declaring a minor (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) in Jewish Studies should consult with the program coordinator listed below.

**Certification**

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Students will receive official recognition on their transcripts for the completed minor.

**Contact Persons**

Prof. William Adler  
Distinguished University Professor of Religious Studies  
Coordinator of Jewish Studies  
Department of Philosophy and Religious Studies  
Box 8103443 Withers  
Tel.: 919-515-6334  
Email: William_Adler@ncsu.edu

Bruce Cheek  
Student Services  
Interdisciplinary Studies  
106 D 1911 Building  
Box 7107  
Tel.: 919-515-6964  
Email: bruce_cheek@ncsu.edu

**SIS Code: 16JSTM**

**Effective Spring 2019**

**Plan Requirements**

- The minor consists of 15 hours of credit (5 courses).
- An overall minor GPA of at least 2.0 is required.
- A maximum of one (1) course may be double-counted towards both major departmental requirements and minor electives.
- No more than two courses from other institutions may count toward the minor. The department will determine whether courses which have been transferred from other institutions qualify for the minor.
Native American Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The minor in Native American Studies offered by the Division of Interdisciplinary Studies within the College of Humanities and Social Sciences will be open to all students at North Carolina State University who share an interest in studying the experiences of Native Americans in the Americas. This minor provides a cross-disciplinary course of study for students from diverse backgrounds and from different curricula to explore Native American cultures and histories.

Admissions

Students may declare their intention to complete the Native American Studies minor. Should students wish to transfer courses from other institutions toward the minor, students should consult with Dr. Judy Kertesz, advisor for the minor.

Certification

To be certified as having completed the minor in Native American Studies, students must have a minimum 2.0 grade point average across all courses used toward the minor. The minor will be certified prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Judy Kertesz
369 Withers Hall
Campus Box 8108
919.513.2111
jkertes@ncsu.edu

Effective Date: 11/2011

SIS Code: 16NAMSTM

Plan Requirements

- Completion of 15 hours of coursework.
- Students must earn a cumulative grade point average of 2.0 or better for all courses taken to fulfill the minor.
- No course in the minor can be taken for pass-fail (S/U) credit.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

Nonprofit Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The interdisciplinary minor in Nonprofit Studies is designed to prepare undergraduate students for careers in the nonprofit sector, in both paid and volunteer positions. This curriculum provides students with an understanding of the role of the nonprofit sector in society and builds students’ knowledge, skills, and abilities in effective nonprofit leadership. Through multiple service-learning experiences and a nonprofit internship requirement, students are offered a variety of hands-on experiences designed to facilitate an understanding of the issues and challenges faced by nonprofit organizations and prepare students for nonprofit leadership positions in the 21st century. The minor in Nonprofit Studies is a strong complementary course of study for students with majors offered across the NC State campus including Communication, English, History, Political Science, Psychology, Social Work; Parks, Recreation and Tourism; Forestry; Business Management; Art and Design; Education and more. The minor in Nonprofit Studies enables students to explore the interconnections between their chosen field and the nonprofit sector. No courses for the minor may be taken for S/U credit.

Admissions

Please email nonprofitminor@ncsu.edu for information.

Certification

Prior to the end of the first week of the student’s final semester, the student must sign the application form, indicating all grades received for the courses completed in the minor program and any courses to be taken during the student’s final semester. The form must also indicate that the student has completed or is completing the internship and capstone course requirement. The Director of the Institute for Nonprofits, as listed below, will certify the completion of the minor.

Contact Person

Institute for Nonprofits
Science, Technology, and Society Program

Faculty

Director
Matthew Morse Booker, Associate Professor, History

Core Faculty

Sarah L. Ash, Professor, Nutrition Sciences
Ross Bassett, Professor, History
William Bauer, Teaching Assistant Professor, Philosophy
Mary K. Cunningham, Associate Professor, Religious Studies
Veljko Dubljevic, Assistant Professor, Philosophy/STS
Keith R. Earnshaw, Teaching Assistant Professor
Daniel N. Graham, Teaching Assistant Professor
Joseph R. Herkert, Professor Emeritus and Lecturer
William J. Kinsella, Associate Professor, Communication
Carol Ann Lewald, Teaching Assistant Professor
Bob P. Patterson, Professor
Victoria N. Ralston, Lecturer
Patsy A. Sibley, Teaching Assistant Professor
Mary Tjiattas, Teaching Assistant Professor
Julie K. Wesp, Assistant Professor, Sociology / STS
Thomas M. Wiggins, Lecturer

Plans

• Science, Technology and Society (BA) (p. 1112)
• Science, Technology and Society (BS) (p. 1121)
• Science, Technology, and Society (Minor) (p. 1130)

Honors in Science, Technology, and Society

The Honors Program in STS offers an enriching and challenging educational experience to qualified majors. Admission to the program requires at least a 3.25 overall GPA and 3.25 major GPA, including STS 214 Introduction to Science, Technology, and Society and at least 6 other hours of course work in the major requirements. Honors students must complete the Honors Option in STS 403 Seminar in Science, Technology, and Society with a course grade of B+ or better; three hours of course work in the major requirements taken from among graduate courses and independent study courses; and three additional hours of course work in the major requirements taken from among honors courses, honors option courses, graduate courses, and independent study courses. Graduation requires a 3.25 GPA overall and a 3.40 GPA in the major. Successful completion of the program is noted on the
Science, Technology and Society (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The Science, Technology, and Society (STS) curriculum seeks to explore the myriad of ways in which science and technology shape our society. The only program of its kind in North Carolina, the core courses of STS aim to understand the connections between science, technology, economics and commerce, domestic policy and international relations, the environment, health and medicine, and other crucial areas inform basic questions of equity, justice, and sustainability. With these connections in mind, STS students examine how science and technology emerge, how they engage with society, how they change through social processes, and how society changes under their influence.

Plan Requirements

Science, Technology and Society (BA): 120 Total Units

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**Humanities and Social Sciences**

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**GEP Courses**

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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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**GEP Global Knowledge (p. 1419) (verify requirement)**

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**Free Electives**

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Total Hours 120

¹ A grade of C- or higher is required.
² Students should consult their academic advisors to determine which courses fill this requirement.

**Breadth**

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<td>Rise of Modern Science</td>
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<td>HI 341</td>
<td>Technology in History</td>
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<tr>
<td>HI 360</td>
<td>U.S. Agricultural History</td>
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<td>American Environmental History</td>
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<td>HI 481/581</td>
<td>History of the Life Sciences</td>
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<td>Science and Religion in European History</td>
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<td>Science and Empire</td>
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<td>Bio-Medical Ethics</td>
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<td>Philosophy of Science</td>
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**Assessment and Policy**

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<td>Genetics in Human Affairs</td>
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<td>Humans and the Environment</td>
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<td>U.S. Environmental Law and Politics</td>
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<td>PS 336</td>
<td>Global Environmental Politics</td>
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<td>STS 322</td>
<td>Technological Catastrophes</td>
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<td>STS 323</td>
<td>World Population and Food Prospects</td>
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<td>STS 402</td>
<td>Peace and War in the Nuclear Age</td>
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**Other STS Courses**

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<td>Unearthing the Past: Introduction to World Archaeology</td>
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<td>Technology in Society and Culture</td>
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<td>ARS 257</td>
<td>Technology in the Arts</td>
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<td>COM 289</td>
<td>Science Communication and Public Engagement</td>
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<td>Communication and Globalization</td>
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<td>The World Since 1750</td>
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<td>Asian Civilizations to 1800</td>
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<td>Modern Asia: 1800 to Present</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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<td>British History to 1688</td>
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<td>History of British Cultures and Societies From 1868</td>
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### Literature I

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<td>Classical Mythology</td>
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<tr>
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<td>Masterpieces of Classical Lit</td>
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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>Literature of the Western World I</td>
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<td>Major British Writers</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>English Literature I</td>
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<td>Studies in British Poetry</td>
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<td>HON 202</td>
<td>Inquiry, Discovery, and Literature</td>
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### Acad Writing Research

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### Transfer Sequence

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<td>Ancient Mediterranean World</td>
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<td>Latin America to 1826</td>
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<td>Literature, Art, and Society</td>
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**Anthropology**

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**Semester Sequence**

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**Total Hours**: 120

**Major Residency Requirement**: At least 18 of the 30 credits in the major (departmental requirements) must be completed following admission to the program. Maximum 15 hours of external transfer credit may be applied towards the major (departmental requirements).
Science, Technology and Society (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.iirp.ncsu.edu/pgas/).

The Science, Technology, and Society (STS) curriculum seeks to explore the myriad of ways in which science and technology shape our society. The only program of its kind in North Carolina, the core courses of STS aim to understand the connections between science, technology, economics and commerce, domestic policy and international relations, the environment, health and medicine, and other crucial areas inform basic questions of equity, justice, and sustainability. With these connections in mind, STS students examine how science and technology emerge, how they engage with society, how they change through social processes, and how society changes under their influence.

Plan Requirements

Science, Technology and Society (BS): 120 Total Units

### Code | Title | Hours
--- | --- | ---
Basic Science | Basic Sciences (p. 1121) | 12
 | Science Elective (p. 1122) | 4

### Mathematics
Calculus (p. 1122) | 3
Math Elective | 3

One additional math or statistics courses chosen from College approved list. 3 credits.

### Advanced Sciences/Technology Requirement

--- | --- | ---
Advanced Sciences/Technology Requirement | 15

### Departmental Requirements

--- | --- | ---
Statistics Elective (p. 1122) | 3
STS 214 Introduction to Science, Technology, and Society | 3
STS 403 Seminar in Science, Technology, and Society | 3

Breadth (p. ) | 12
Specialty | 15

Students should consult their academic advisors to determine how to complete this requirement.

### Humanities and Social Sciences

--- | --- | ---
Acad Writing Research (p. 1123) | 4
Philosophy | 3
Any PHI course on the approved GEP-Humanities list. | 3
Arts and Letters (p. 1123) | 3
History (p. 1124) | 3
Literature (p. ) | 3
Writing and Communication (p. 1129) | 3
Social Science (3 Different) (p. 1126) | 9

### GEP Courses

--- | --- | ---
GEP Health and Exercise Studies (p. 1422) | 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) | 3
GEP Interdisciplinary Perspectives (p. 1426) | 2
GEP U.S. Diversity (p. 1431) (verify requirement) | 4
GEP Global Knowledge (p. 1419) (verify requirement) | 4

Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) | 12

### Basic Sciences

Code | Title | Hours
--- | --- | ---
BIO 105 | Biology in the Modern World | 3
BIO 106 | Biology in the Modern World Laboratory | 1
BIO 140 | Survey of Animal Diversity | 3
BIO 141 | Animal Diversity Laboratory | 1
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4

### Chemistry (Max: 4 Units )

--- | --- | ---
CH 101 | Chemistry - A Molecular Science | 3
CH 102 | General Chemistry Laboratory | 1
CH 201 | Chemistry - A Quantitative Science | 3
CH 202 | Quantitative Chemistry Laboratory | 1

### Earth Sciences (Max: 4 Units )

--- | --- | ---
MEA 100 | Earth System Science: Exploring the Connections | 4
MEA 101 | Geology I: Physical | 3
MEA 110 | Geology I Laboratory | 1
MEA 130 | Introduction to Weather and Climate | 3
MEA 135 | Introduction to Weather and Climate Laboratory | 1
MEA 150 | Environmental Issues in Water Resources | 4
MEA 200 | Introduction to Oceanography | 3
MEA 202 | Geology II: Historical | 3
MEA 210 | Oceanography Lab | 1
MEA 211 | Geology II Laboratory | 1

### Physics (Max: 4 Units )

--- | --- | ---
PY 123 | Stellar and Galactic Astronomy | 3
PY 124 | Solar System Astronomy | 3
PY 125 | Astronomy Laboratory | 1
PY 131 | Conceptual Physics | 4
PY 201 | University Physics I | 4
PY 202 | University Physics II | 4
PY 203 | University Physics III | 4
PY 205 | Physics for Engineers and Scientists I | 3
PY 206 | Physics for Engineers and Scientists I Laboratory | 1
PY 208 | Physics for Engineers and Scientists II | 3
PY 209 | Physics for Engineers and Scientists II Laboratory | 1
PY 211 | College Physics I | 4
PY 212 | College Physics II | 4

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
### Science Electives

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ST 372  Introduction to Statistical Inference and Regression  3
ST 380  Probability and Statistics for the Physical Sciences  3

**Breadth**

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**Philosophy of Science and Ethics**

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**Assessment and Policy**

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**Other STS Courses**

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**Transfer Sequence**

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### Literature

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### Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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</table>
A Science, Technology, and Society minor is a 15 hour, multidisciplinary minor providing students an opportunity to appreciate and understand better the roles that science and technology play in the larger sociocultural context. A goal of the minor is to help students develop the ability to order and integrate the diverse aspects of their educations. Two essential components of this ability are sensitivity to the moral dimensions of scientific and technological inquiry, as affecting how people may live or want to live, and an appreciation of the practical implications of scientific and technical theory. In addition, the Science, Technology, and Society minor enables students to increase the breadth of their science and technology. No courses for the minor may be taken for S/U credit.

Admissions

Students interested in the Science, Technology and Society minor should contact the minor advisor by their junior year or earlier, if possible.

Certification

A University Minor Declaration Form should be submitted to Registration and Records for inclusion of the minor on the student’s official record. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

Contact Person

Dr. Matthew Booker
Director, STS
1911 Building 106A, Box 7107
919.513.1431
mmbooker@ncsu.edu

SIS Code: 16STM

Plan Requirements

- Completion of 15 hours of relevant courses, including:
  - at least one course from each of the category groupings,
  - one additional course from any of the categories, and
  - STS 214 Introduction to Science, Technology, and Society
- Students must take at least one scientific or technical course beyond the introductory level.
- Students must take mathematics through a first calculus or statistics course.
- In order to receive an introduction to the field and to promote communication among themselves, STS minors are required to take STS 214 Introduction to Science, Technology, and Society in their junior year or as soon as possible after declaring their intention to pursue the STS minor.
- A maximum of one (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

Science, Technology, and Society (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Women's and Gender Studies Program

Faculty

Program Coordinator

Karey Harwood, Associate Professor, Philosophy and Religious Studies

Core Faculty

Amanda R. Edwards, Teaching Associate Professor
Deann D. Judge, Lecturer
Carol Ann Lewald, Teaching Assistant Professor, International Studies
Leila S. May, Associate Professor, English
Julie E. Mayberry, Lecturer
Deena M. Murphy, Lecturer

Caroline Myrick, Lecturer
Elizabeth A. Nelson, Teaching Assistant Professor, Communication
Elaine Orr, Professor, English
Michael L. Schwalbe, Professor, Sociology
Sharon M. Setzer, Professor, English
Ashley Paige Simons-Rudolph, Lecturer
Margaret E. Stiffler, Lecturer
Mary Wyer, Associate Professor, Psychology

Plans

- Interdisciplinary Studies (BA): Women's and Gender Studies Concentration (p. 1131)
- Women's and Gender Studies (Minor) (p. 1141)

Interdisciplinary Studies (BA): Women's and Gender Studies Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Women's and Gender Studies curriculum is designed to lead students to analyze and reinterpret existing data and common assumptions about gender and gender identity from a multidisciplinary perspective. This approach foregrounds the complex relationships between gender, class, ethnic and racial structures; acquaints students with the often unacknowledged contributions made by women in the humanities and sciences, and grounds students in feminist theories and methodological perspectives. The aim of this program is to recognize the substantial contributions of feminist theories to social and public policy analysis.

Plan Requirements

Interdisciplinary Studies (BA) Women's and Gender Studies Concentration: 120 Total Units

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<td>Theoretical Issues in Women's and Gender Studies ¹</td>
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<td>WGS 310</td>
<td>Women's and Gender Studies Internship ¹</td>
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<td>WGS 210</td>
<td>Women and Gender in Science and Technology ¹</td>
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<td>PS 314</td>
<td>Science, Technology and Public Policy</td>
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<td>Humans and the Environment</td>
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<td>Science and Civilization</td>
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Disciplinary Groupings (p. 1132) ¹

- Concentration Area Advanced (p. 1132) ¹: 6
- Concentration Area Elective (p. 1133) ¹: 3

Humanities and Social Sciences

- ENG 101 Academic Writing and Research ¹: 4
- History I (p. 1133): 3
- History II (p. 1133): 3
- Literature I (p. 1133): 3
Disciplinary Groupings

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<td>Gender Law and Policies</td>
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<td>Cross-Cultural Perspectives on Women</td>
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<td>WGS 493</td>
<td>Special Topics in Women's and Gender Studies</td>
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<td>Cross-Cultural Perspectives on Women</td>
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<td>HI 448</td>
<td>American Women in the Twentieth Century</td>
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<td>HI 477</td>
<td>Women in the Middle East</td>
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<tr>
<td>HI 523</td>
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<td>American Women in the Twentieth Century</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Concentration Area Advanced

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<td>Studies in Gender and Genre</td>
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<td>The Sexes and Society in Early-Modern Europe</td>
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<td>Women in European Enlightenment</td>
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<td>HI 447</td>
<td>Women in America: From Contact to the Civil War</td>
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<td>Women in the Middle East</td>
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<td>The Sexes and Society in Early-Modern Europe</td>
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### Concentration Area Electives

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<td>The Middle Ages</td>
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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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<td>History of British Cultures and Societies From 1688</td>
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<td>American History I</td>
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<tr>
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<td>American History II</td>
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<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>Inquiry, Discovery, and Literature</td>
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## Literature II

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**Literature II List A**

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<td>Classical Mythology</td>
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**Sociology**

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<td>SOC 492</td>
<td>External Learning Experience</td>
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<td>SOC 493</td>
<td>Special Problems in Sociology</td>
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<td>SOC 495</td>
<td>Special Topics in Sociology</td>
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<td>SOC 498</td>
<td>Independent Study in Sociology</td>
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<td>SOC 508</td>
<td>Social Organization</td>
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<td>SOC 509</td>
<td>Population Problems</td>
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<td>SOC 514</td>
<td>Developing Societies</td>
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<td>The Community</td>
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<td>SOC 591</td>
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### Multidisciplinary

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<td>Introduction to Language and Linguistics</td>
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<tr>
<td>STS 402</td>
<td>Peace and War in the Nuclear Age</td>
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### Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

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<td>Introduction to Women's and Gender Studies</td>
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<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<tr>
<td>Arts &amp; Letters</td>
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<td>Arts &amp; Letters</td>
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**Plan Requirements**

Students must complete fifteen (15) credit hours with a grade of C or better, including three (3) required courses and two (2) elective courses.

*Please note:* Students may only double count one course towards both their major and the WGS minor.

### Code | Title | Hours
--- | --- | ---
WGS 200 | Introduction to Women's and Gender Studies | 9
WGS 300 | Introduction to Feminist Theories | |
WGS 492 | Theoretical Issues in Women's and Gender Studies | |

### Elective Courses

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<tr>
<th>Code</th>
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<tr>
<td>ANT/WGS 444</td>
<td>Cross-Cultural Perspectives on Women</td>
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<td>COM/WGS 362</td>
<td>Communication and Gender</td>
</tr>
<tr>
<td>ENG/WGS 305</td>
<td>Women and Literature</td>
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<tr>
<td>ENG/WGS 308</td>
<td>Contemporary Issues in Ecofeminism</td>
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<tr>
<td>ENG/WGS 327</td>
<td>Language and Gender</td>
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<tr>
<td>HI 423</td>
<td>Women in European Enlightenment</td>
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<tr>
<td>HI/WGS 447</td>
<td>Women in America: From Contact to the Civil War</td>
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<tr>
<td>HI/WGS 448</td>
<td>American Women in the Twentieth Century</td>
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<td>STS/WGS 210</td>
<td>Women and Gender in Science and Technology</td>
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<td>WGS 220</td>
<td>Men and Masculinity</td>
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<tr>
<td>WGS 310</td>
<td>Women's and Gender Studies Internship</td>
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<td>WGS 330</td>
<td>Women and Health</td>
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<td>WGS 350</td>
<td>Emerging Issues in Women's and Gender Studies</td>
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<tr>
<td>MUS/WGS 360</td>
<td>Women In Music</td>
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<td>WGS/AFS 380</td>
<td>Black Feminist Theory</td>
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<td>PS/WGS 418</td>
<td>Gender Law and Policies</td>
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<td>PSY/WGS 406</td>
<td>Psychology of Gender</td>
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<tr>
<td>SOC/WGS 204</td>
<td>Sociology of Family</td>
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<td>Gender and Society</td>
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<td>SOC/WGS 407</td>
<td>Sociology of Sexualities</td>
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<tr>
<td>WGS 473/ REL 573</td>
<td>Religion, Gender, and Reproductive Technologies</td>
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<tr>
<td>WGS 493</td>
<td>Special Topics in Women's and Gender Studies</td>
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Total Hours: 120-121

1. C- or better

---

**Women’s and Gender Studies (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! The Women's and Gender Studies Minor offers all students in the university the possibility of rigorous interdisciplinary study of women's and gender issues. Course offerings across the campus give students the opportunity to understand the complex relationships between gender, class, ethnic, and race structures; to understand feminist theory and methodological perspectives and their substantial contributions to social and public policy analysis; to develop the ability to reach out to community and non-profit organizations concerned with social equality; and to develop international understandings and perspectives.

### Admissions and Certification of Minor

To complete a WGS minor is a simple process but it’s a good idea to get the paperwork in progress. Download the “Declare a Minor” form available here (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) in PDF format. The form must be signed by the Director of WGS and by the CHASS Dean’s Office. It is then forwarded to the student’s home department.

### Contact Person

Dr. Karey Harwood  
449 Withers Hall  
919.515.6383  
karey_harwood@ncsu.edu

**SIS Code:** 16WGM
School of Public and International Affairs

For more information about this department, including contact information, visit the department (http://spia.chass.ncsu.edu/).

The Department of Political Science, part of the School for Public and International Affairs, offers basic and advanced courses in all major fields of the discipline: American government and politics (local, state, and national), public law and criminal justice, public administration, comparative politics, international relations and global issues, political theory, and methodology of political science. The department affords opportunities for the study of government and administration to students in other curricula and schools.

Graduate courses in public administration and international studies are available to advanced undergraduates. See the listing of graduate degree programs and consult the Graduate Catalog.

The department provides academic credit for internships with political parties and campaigns, lobbyists, non-profits, and all levels of government, including the North Carolina General Assembly Legislative Internship Program. Majors in political science with distinguished academic achievements are annually invited to join the Zeta Epsilon Chapter of Pi Sigma Alpha, the national political science honor society.

Honors Program

The honors program includes nine credit hours of specialized coursework designed to challenge academically talented majors and allow them to realize their greatest potential as political science students. Required for admission to the program: 3.25 GPA both overall and in the major, completion of 9 hours of PS coursework, and completion of PS 371 Research Methodology of Political Science. Majors admitted to the program complete a substantial research project in consultation with a faculty honors adviser (6 credit hours). Also required: either one 500 level PS course or an honors option 400 level political science course (3 credit hours). Successful completion of the program is noted on the student’s transcript, and at commencement.

Faculty

Director
I. Morris

Chair of Political Science
M. Struett

Undergraduate Academic Coordinator
S. Carey

Professors
S. Greene
A. J. Taylor

Associate Professor
W. Boettcher
C. Griffin
H. Hobbs
L. Kochtcheeva
T. Reid
J. Zink

Assistant Professors
J. Liao
R. Reardon

Teaching Assistant Professor
D. Figgins
D. Mitin
A. Solari

Professors Emeriti
E.R. Rubin
J. O. Williams

Associate professors emeriti
J. H. Gilbert
S. Kessler
R. Moog

Plans

• Law and Justice (Minor) (p. 1142)
• Leadership in the Public Sector (BA): Distance Education (p. 1143)
• Leadership in the Public Sector (Certificate) (p. 1152)
• Political Science (BA) (p. 1153)
• Political Science (BA): American Politics Concentration (p. 1161)
• Political Science (BA): International Politics Concentration (p. 1170)
• Political Science (BA): Law and Justice Concentration (p. 1180)
• Political Science (BA): Public Policy Concentration (p. 1190)
• Political Science (BS) (p. 1199)
• Political Science (Minor) (p. 1212)

Law and Justice (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Law and Justice Minor is designed for students who have a special interest in the areas of public law, criminal justice and political theory. It
provides a broad understanding of the interplay between law and politics, of the administrative dimensions of law enforcement and criminal justice processes and of the legal and theoretical dimensions of political life. This minor is especially suitable for students interested in careers in law, government, criminal justice agencies and judicial administration as well as for students interested in graduate and professional education in law, political science of criminal justice. No courses for the minor may be taken for S/U credit.

The Law and Justice Minor is designed so that students will:

- Develop an understanding of the role of law and the legal system in the larger political, economic and social contexts in which they function.
- Learn to analyze writings in the field and to communicate effectively ideas concerning law and justice issues both orally and in writing.
- Think analytically about ethical issues and societal responsibilities attached to actors within the justice system.
- Understand the interplay of law and politics in addressing important issues in national as well as international communities
- Study the role of law and legal institutions from a political system perspective.
- Develop a thorough familiarity with the workings of the entire justice system, both in theory and in practice.

Admissions and Certification of Minor

The minor will be administered by an advisory committee consisting of four members of the Department of Political Science and Public Administration. The members are Shannon Carey, Sanford Kessler, Robert Moog and Traci Reid. Kessler, Moog and Reid are all faculty members who teach the department’s political theory, public law and criminal justice courses. Susan Lawhead will serve as the Academic advisor for the minor. Students may contact her at: 228 Caldwell Hall, 919.515.5025, slrawhea@ncsu.edu (slrawhea@ncsu.edu)

Contact Person

Susan Lawhead
Academic Advisor
Political Science
919.515.5025
slrawhea@ncsu.edu
Caldwell 228

SIS Code: 16LJM

Plan Requirements

To complete the Law and Justice Minor, a student must complete 15 hours of course work with grades of C- or better and with a cumulative average of 2.0 in that course work. Seminar courses are marked each semester in the Schedule of Courses by a head note.

A maximum of ONE (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

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<td>The Justice System in the American Political Process</td>
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Leadership in the Public Sector (BA): Distance Education

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Plan Requirements

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<td>Introduction to Criminal Law in the United States</td>
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<td>PS 308</td>
<td>Supreme Court and Public Policy</td>
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<td>PS 309</td>
<td>Equality and Justice in United States Law</td>
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<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
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<td>PS 335</td>
<td>International Law</td>
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<td>PS 361</td>
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<td>PS 362</td>
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<td>PS 506</td>
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Total Hours 15
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

**Free Electives**

Free Electives (12 Hr S/U Lmt) 30

**Total Hours** 120

### 200 Level Elective Courses

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<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>LPS 201</td>
<td>The Humanitarian Response to Conflict</td>
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<tr>
<td>LPS 202</td>
<td>Essentials of Fundraising for Leaders in Public and Non-Profit Institutions</td>
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<td>LPS 205</td>
<td>International Leadership for the Public Sector</td>
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<td>PER 201</td>
<td>Intermediate Persian I</td>
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<td>PER 202</td>
<td>Intermediate Persian II</td>
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<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<td>PHI 250</td>
<td>Thinking Logically</td>
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<td>PS 201</td>
<td>American Politics and Government</td>
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<td>PS 202</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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### 300 Level Electives Courses

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<td>Spy vs. Spy: Cold War Intelligence History</td>
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<td>Diversity and Leadership in the Public Sector</td>
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<td>Public Policy Analysis and Evaluation</td>
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<td>Human Resource Management in Public Sector</td>
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<td>PS 301</td>
<td>The Presidency and Congress</td>
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<td>Race in U.S. Politics</td>
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<td>The Justice System in the American Political Process</td>
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<td>Public Policy</td>
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<td>PS 314</td>
<td>Science, Technology and Public Policy</td>
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<td>Industrial and Organizational Psychology</td>
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<td>SLC 300</td>
<td>Leading with an Ethical Perspective</td>
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<td>SLS 302</td>
<td>Contemporary Science, Technology and Human Values</td>
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<td>STS 322</td>
<td>Technological Catastrophes</td>
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### Acad Writing Research

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<tr>
<td>FLE 101</td>
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### Transfer Sequence

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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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### History I

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<td>Introduction to History of South and East Africa</td>
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<tr>
<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
<td>3</td>
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<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
<td>3</td>
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<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
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<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
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<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
<td>3</td>
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<tr>
<td>HI 217</td>
<td>Caribbean History</td>
<td>3</td>
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<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
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<tr>
<td>HI 233</td>
<td>The World Since 1750</td>
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<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
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<td>SOC 204</td>
<td>Sociology of Family</td>
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<tr>
<td>SOC 205</td>
<td>Jobs and Work</td>
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<tr>
<td>SOC 206</td>
<td>Social Deviance</td>
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<tr>
<td>SOC 207</td>
<td>Language and Society</td>
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<tr>
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<td>SOC 212</td>
<td>Race in America</td>
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<td>SOC 241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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<td>SOC 295</td>
<td>Special Topics in Sociology</td>
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<td>Social Research Methods</td>
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<td>Human Behavior</td>
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<td>SOC 305</td>
<td>Racial and Ethnic Relations</td>
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<td>Theories of Social Interaction</td>
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<td>Urban Sociology</td>
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<td>SOC 404</td>
<td>Families and Work</td>
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<td>SOC 405</td>
<td>Racism in the U.S.</td>
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<tr>
<td>SOC 407</td>
<td>Sociology of Sexualities</td>
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<td>SOC 410</td>
<td>Sociology of Organizations</td>
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<td>SOC 413</td>
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<td>SOC 414</td>
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<td>SOC 418</td>
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<td>Juvenile Delinquency</td>
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<td>SOC 428</td>
<td>Formal Institutions of Social Control</td>
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<td>SOC 429</td>
<td>Quantitative Institutions of Social Control</td>
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<td>Community and Crime</td>
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<td>SOC 440</td>
<td>Social Change</td>
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<td>SOC 445</td>
<td>Inequality, Ideology, and Social Justice</td>
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<td>SOC 450</td>
<td>Environmental Sociology</td>
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<td>SOC 457</td>
<td>Corporate Power in America</td>
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<td>SOC 465</td>
<td>Social Aspects of Mental Health</td>
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<td>SOC 492</td>
<td>External Learning Experience</td>
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<td>Special Problems in Sociology</td>
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<td>SOC 498</td>
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<td>SOC 508</td>
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<td>SOC 509</td>
<td>Population Problems</td>
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<td>SOC 533</td>
<td>The Community</td>
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<td>WGS 304</td>
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**Multidisciplinary**

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<td>Introduction to Language and Linguistics</td>
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<td>GEO 220</td>
<td>Cultural Geography</td>
<td>3</td>
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<tr>
<td>SOC 220</td>
<td>Cultural Geography</td>
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<tr>
<td>STS 402</td>
<td>Peace and War in the Nuclear Age</td>
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</table>

**Semester Sequence**

This is a sample.

**Critical Path Courses** – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<thead>
<tr>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (CP)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<tr>
<td>Arts &amp; Letters Elective</td>
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<td>3</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>Free Electives</td>
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| Hours | 16 |

**Spring Semester**

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<tr>
<td>History I</td>
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<td>3</td>
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<tr>
<td>Natural Science w/Lab</td>
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<td>4</td>
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<tr>
<td>Literature I</td>
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<tr>
<td>Philosophy</td>
<td></td>
<td>3</td>
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</tbody>
</table>

| Hours | 16 |
### Second Year

#### Fall Semester
- **GEP Natural Sciences (p. 1429)**: 3
- **Mathematics**: 3
- **GEP Social Sciences (p. 1430)**: 3
- **Free Electives**: 3
- **GEP Health and Exercise Studies (p. 1422)**: 1

<table>
<thead>
<tr>
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#### Spring Semester
- **GEP Social Sciences (p. 1430)**: 3
- **Literature II**: 3
- **Free Electives**: 3
- **History II**: 3
- **GEP Additional Breadth (p. 1417)** (Mathematical Sciences/Natural Sciences/Engineering): 3
- **GEP Health and Exercise Studies (p. 1422)**: 1

<table>
<thead>
<tr>
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### Third Year

#### Fall Semester
- **LPS 200 Introduction to Public Leadership**: 3
- **200 level major elective course**: 9
- **GEP Interdisciplinary Perspectives (p. 1426)**: 3
- **Free Electives**: 3

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<tbody>
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#### Spring Semester
- **LPS 315 Public Leadership**: 3
- **300 level major elective course**: 6
- **GEP Interdisciplinary Perspectives (p. 1426)**: 2-3
- **Free Electives**: 3

<table>
<thead>
<tr>
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### Fourth Year

#### Fall Semester
- **LPS 320 Research Methodology for the Public Sector**: 3
- **400 level major elective course**: 3
- **Foreign Language 201**: 3
- **Free Electives**: 6

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<th>Hours</th>
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<tbody>
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#### Spring Semester
- **LPS 425 Leadership in the Public & Nonprofit Sectors Capstone**: 3
- **Free Electives**: 9

<table>
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<th>Hours</th>
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<tr>
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<table>
<thead>
<tr>
<th>Total Hours</th>
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<tbody>
<tr>
<td>120-121</td>
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</tbody>
</table>

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1. C- or better

LPS is an online degree completion program for non-traditional students, and cannot accept traditional students who are currently enrolled in a regular degree program. Incoming students may transfer a maximum of 72 credit hours of college course work. Transfer credit should include a sufficient number of courses to satisfy the general education component of the major. In addition, transfer students must have taken and passed a college level Math course and a college level English course comparable to our ENGL 101 (4 hrs.).

**Grade Point Average (GPA) Requirements:** Students admitted into the B.A. in Leadership in the Public Sector program will be expected to maintain a minimum overall GPA of 2.0. Courses used to complete the Major Field of Study must be completed with a “C-” or better. A 2.0 GPA in the major is required.

### Career Opportunities

A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

### Leadership in the Public Sector (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Leadership in the Public Sector Undergraduate Certificate is designed for those students who want to develop the knowledge and skills to be effective leaders in the public sector. Students in this program will survey leadership theories, research, and applied practices in order to learn and apply necessary skills, methods, and techniques of effective leadership in public and non-profit organizations. This certificate program is offered entirely online and available only for non-traditional or non-degree seeking students.

### Admissions Requirements

Students pursuing university certificate programs are considered non-degree studies (NDS) students for the purpose of university registration. Certificate program students may **NOT** be enrolled in a traditional degree program on campus at NCSU. This program will operate much like the Administrative Officers Management Program (AOMP), which is also housed in SPIA. This program has been providing management and leadership education for law enforcement professionals since 1989 and offers participants the opportunity to earn fifteen college credits as a non-degree student.
If students are able to complete the correct courses as NDS then they may still receive the certificate.

There is no time limit on completion of the certificate; however, if students wish to take a “break” from the certificate program, they must notify the LPS academic advisor. This will allow us to keep track of the number of enrolled certificate students.

Students who complete the certificate may apply for admittance to the Bachelor’s Degree program. Their certificate course work will be considered in the application, but there is no guarantee of admission. It is a separate application process. If a certificate student does complete the Bachelor’s Degree in Leadership in the Public Sector then their certificate will be removed from their transcript, as students may not have a certificate or a minor degree in the same major degree.

When the student is approved for graduation with the Bachelor’s, LPS administration will notify Registration and Records that the certificate should be removed from the transcript.

Leadership in the Public Sector BA students who are unable to or do not wish to complete the BA, but have fulfilled the requirements for the certificate, may receive the certificate.

Certification
To be certified as having the certificate in Leadership in the Public Sector, students must have a minimum 2.66 grade point average across all courses used towards the Certificate. The LPS Academic Advisor will certify the certificate prior to completion

Administration of the Certificate Program
The certificate program coordinator will be the LPS academic advisor, which is currently:

LaShica Waters
Caldwell 210
Phone: 919-513-4330
Email: ldwaters@ncsu.edu

The LPS program administrator will determine whether courses, which have been transferred from other institutions, qualify for the certificate. No more than one course transferred from other institutions may count toward the certificate.

Academic Structure
Term Effective: 8/2014
Plan Code: 16LPSCTU
CIP Code: 24.0199
Description: Undergraduate Certificate in Leadership in the Public Sector Offered via Distance Education

Plan Requirements

- Completion of 15 hours of coursework including 9 hours of required courses and 6 hours of elective courses. Students must take on 200 level elective and one 300 or 400 level elective.
- A grade of C (2.00) or better is required for each course taken in the certificate program as well as a 2.66 overall cumulative GPA in all certificate courses. If a student drops below this GPA, the student may not continue in the program.

### Elective Courses
Select six credits of the following:

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<td>LPS 201</td>
<td>The Humanitarian Response to Conflict</td>
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<td>LPS 205</td>
<td>International Leadership for the Public Sector</td>
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<td>LPS 400</td>
<td>Advanced Military Leadership Theory</td>
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<td>PA 311</td>
<td>Public Policy Analysis and Evaluation</td>
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<td>PA 332</td>
<td>Human Resource Management in Public Sector</td>
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<td>PS 301</td>
<td>The Presidency and Congress</td>
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<td>PS 305</td>
<td>The Justice System in the American Political Process</td>
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<td>Public Policy</td>
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<tr>
<td>PS 312</td>
<td>Introduction to Public Administration</td>
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Total Hours 15

### Political Science (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Major requirements are: 19 hours of core courses that cover major political science sub fields (i.e., American government, international relations, theory, public law and policy, and research methods) as well as courses that develop computer competencies and an orientation to the discipline; 15 hours of political science electives, 12 of which must be taken at the 300 level or above, and one of which must be a 400 level senior seminar, which includes a substantial research requirement. Grades of C- or better are required for courses applied towards the major. At graduation, a minimum GPA of 2.0 is required for all political science courses taken. For a seminar-by-seminar guide to the course requirements for the Bachelor of Arts curriculum, including all of the concentrations described below, see the departmental website (http://spia.ncsu.edu/ps/undergraduate.html).

Students who wish to focus their studies in a specific sub field may elect one of the following concentrations under the Bachelor of Arts program:

### American Politics

This concentration develops skills that benefit students interested in graduate and professional school, administrative careers, and business careers that involve government relations and policy. Major requirements are: 21 hours of core courses; 9 hours of courses specifically related to the study of political processes, institutions, political culture, and political events within the American system.

### International Politics

This concentration develops skills that benefit students interested in graduate or professional school, careers in government service, international organizations, issue advocacy, and businesses with international interests. Major requirements are: 15 hours of core courses; 12 hours of concentration electives in regional and world politics; 3 hours of concentration electives in any political science sub-field.
**Law and Justice**

This concentration develops skills that benefit students interested in graduate or professional school (particularly law school), law enforcement, judicial administration, and careers with agencies involved in the administration of justice. Major requirements are: 18 hours of core courses; 12 hours of emphasis electives in either the justice system or law and theory.

**Public Policy**

This concentration prepares students for careers with public institutions where they will work with the processes, formulation, implementation, and evaluation of public policy at international, national, state, and local levels. Major requirements are: 15 hours of core courses; 15 hours of concentration electives.

### Plan Requirements

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<td>American Politics and Government</td>
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<td>PS 231</td>
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<td>PS 236</td>
<td>Issues in Global Politics</td>
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<td>PS 241</td>
<td>Introduction to Comparative Politics</td>
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<td>PS 361</td>
<td>Introduction to Political Theory</td>
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<td><strong>Law &amp; Justice / Public Policy (p. 1154)</strong></td>
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<td>PS Seminar (p. 1154)</td>
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<td>Supreme Court and Public Policy</td>
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<td>Equality and Justice in United States Law</td>
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### PS Seminar

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Arts and Letters

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### Critical Path Courses

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

### Semester Sequence

This is a sample.

### GEP Math Sci MA or ST

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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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problems logically and systematically, working with others in vertically
and horizontally organized arrangements, expressing a position and
defending it with corroborating evidence, and writing clear and correct
prose. They also develop citizenship and leadership competencies that
include the personal obligation to participate in public life. Consequently,
political science majors are well-positioned for careers in teaching, the
legal profession, criminal justice agencies, state and local government,
urban planning, the federal bureaucracy, journalism or in any of the
organizations that seek to monitor political processes or to influence the
content of public policy. Private firms also seek managers and public
affairs specialists who have a knowledge of the functioning of the political
system and of politics in general.

Political Science (BA): American Politics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Major requirements are: 19 hours of core courses that cover major
political science sub fields (i.e., American government, international
relations, theory, public law and policy, and research methods) as well
as courses that develop computer competencies and an orientation to
the discipline; 15 hours of political science electives, 12 of which must
be taken at the 300 level or above, and one of which must be a 400
level senior seminar, which includes a substantial research requirement.
Grades of C- or better are required for courses applied towards the
major. At graduation, a minimum GPA of 2.0 is required for all political
science courses taken. For a semester-by-semester guide to the course
requirements for the Bachelor of Arts curriculum, including all of the
concentrations described below, see the departmental website (http://
sia.ncsu.edu/ps/undergraduate.html).

Students who wish to focus their studies in a specific sub field may elect
one of the following concentrations under the Bachelor of Arts program:

American Politics

This concentration develops skills that benefit students interested in
graduate and professional school, administrative careers, and business
careers that involve government relations and policy. Major requirements
are: 21 hours of core courses; 9 hours of courses specifically related to
the study of political processes, institutions, political culture, and political
events within the American system.

Plan Requirements

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<thead>
<tr>
<th>Code</th>
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<td>Gender Law and Policies</td>
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<td>WGS 418</td>
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Departmental Requirements

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<td>Research Methodology of Political Science 1</td>
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<td>PS 301</td>
<td>The Presidency and Congress 1</td>
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PS 302  Campaigns and Elections in the US Political System  3
PS 320  U.S. Environmental Law and Politics  3
Select one of the following:  3
PS 331  U.S. Foreign Policy  3
PS 231  Introduction to International Relations  3
PS 312  The Justice System in the American Political Process  3
or PS 310  Public Policy  3
PS Elective 300+ (p. 1162)  6

Humanities & Soc Sci
Acad Writing Research (p. 1162)  4
History I (p. 1162)  3
History II (p. 1163)  3
Literature I (p. 1163)  3
Literature II (p. 1163)  3
Philosophy  3
Any PHI course on the approved GEP-Humanities list.
Arts and Letters (p. 1164)  3
Foreign Language 200 Level (p. 1166)  3
Social Sciences (3 Different) (p. 1166)  9
EC 205  Fundamentals of Economics  3
Mathematics
GEP Math Sci MA or ST (p. 1169)  3
ST 311  Introduction to Statistics  3
GEP Courses
GEP Natural Sciences (p. 1429)  7
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)  3
GEP Interdisciplinary Perspectives (p. 1426) (verify requirement)  5
GEP Global Knowledge (p. 1419) (verify requirement)  3
Foreign Language Proficiency (p. 1417) (verify requirement)  3
Free Electives
Free Electives (12 Hr S/U Lmt)  27

Total Hours  120

1  C- or better
2  Students should consult their academic advisors to determine which courses fill this requirement.

American Politics Conc

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<td>Race in U.S. Politics</td>
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<td>PS 308</td>
<td>Supreme Court and Public Policy</td>
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<td>PS 310</td>
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<td>Introduction to Public Administration</td>
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<td>PS 314</td>
<td>Science, Technology and Public Policy</td>
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<td>U.S. Environmental Law and Politics</td>
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<td>U.S. Foreign Policy</td>
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PS Elective 300+

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<td>The Justice System in the American Political Process</td>
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<td>Gender and Politics in the United States</td>
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<td>PS 307</td>
<td>Introduction to Criminal Law in the United States</td>
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<td>PS 308</td>
<td>Supreme Court and Public Policy</td>
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<td>Equality and Justice in United States Law</td>
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<td>Introduction to Political Theory</td>
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<td>American Political Thought</td>
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<td>PS 391</td>
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Acad Writing Research

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Transfer Sequence

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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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History I

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<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
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<td>HI 207</td>
<td>Ancient Mediterranean World</td>
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History II

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<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
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<td>Modern Europe 1815-Present</td>
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Literature I

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<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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<td>ENG 220</td>
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<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
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<td>Major British Writers</td>
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<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
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<td>Introduction to Shakespeare</td>
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<td>Literature, Art, and Society</td>
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<td>Literature and Science</td>
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ENG 392  Major World Author  3  
ENG 393  Studies in Literary Genre  3  
ENG 394  Studies in World Literature  3  
ENG 399  Contemporary Literature  3  
ENG 406  Modernism  3  
ENG 407  Postmodernism  3  
ENG 410  Studies in Gender and Genre  3  
ENG 420  Major American Author  3  
ENG 439  Studies in English Renaissance Literature  3  
ENG 448  African-American Literature  3  
ENG 451  Chaucer  3  
ENG 453  The Romantic Period  3  
ENG 460  Major British Author  3  
ENG 462  18th-Century English Literature  3  
ENG 463  The Victorian Period  3  
ENG 464  British Literature and the Founding of Empire  3  
ENG 465  British Literature and the Dissolution of Empire  3  
ENG 466  Transatlantic Literatures  3  
ENG 468  Studies in Nineteenth-Century American Literature  3  
ENG 470  American Literature, Twentieth Century and Beyond  3  
ENG 476  Southern Literature  3  
ENG 486  Shakespeare, The Earlier Plays  3  
ENG 487  Shakespeare, The Later Plays  3  
ENG 551  Chaucer  3  
FL 219  Studies in Great Works of Non-Western Literature  3  
FL 220  Studies in Great Works of Western Literature  3  
FL 221  Literature of the Western World I  3  
FL 222  Literature of the Western World II  3  
FL 223  Contemporary World Literature I  3  
FL 224  Contemporary World Literature II  3  
FL 246  Literature of the Holocaust  3  
FL 275  Literature and War  3  
FL 392  Major World Author  3  
FL 393  Studies in Literary Genre  3  
FL 394  Studies in World Literature  3  
FL 406  Modernism  3  
FL 407  Postmodernism  3  
FLN 301  Twentieth Century Hindi & Urdu Fiction  3  
FLN 302  Modern Hindi & Urdu Poetry  3  
FLN 401  Hindi Literature and South Asian Cultural Contexts  3  
WGS 305  Women and Literature  3  
WGS 410  Studies in Gender and Genre  3  

**Literature II List B**

ENG 219  Studies in Great Works of Non-Western Literature  3  
ENG 220  Studies in Great Works of Western Literature  3  
ENG 221  Literature of the Western World I  3  
ENG 223  Contemporary World Literature I  3  
ENG 224  Contemporary World Literature II  3  
ENG 246  Literature of the Holocaust  3  
ENG 392  Major World Author  3  
ENG 393  Studies in Literary Genre  3  
ENG 394  Studies in World Literature  3  
ENG 406  Modernism  3  
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FL 392  Major World Author  3  
FL 393  Studies in Literary Genre  3  
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FL 406  Modernism  3  
FL 407  Postmodernism  3  
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FLF 302  Survey of French Literature from Romanticism to the Contemporary Period  3  
FLG 302  Seminar in French Studies  3  
FLG 320  Introduction to German Literature  3  
FLG 323  Twentieth Century German Literature  3  
FLG 325  German Lyric Poetry  3  
FLG 325  German Lyric Poetry  3  
FLJ 342  Classical Japanese Literature in Translation  3  
FLJ 344  Early Modern Japanese Literature in Translation  3  
FLJ 345  Modern Japanese Literature in Translation  3  
FLN 301  Twentieth Century Hindi & Urdu Fiction  3  
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FLN 401  Hindi Literature and South Asian Cultural Contexts  3  
FLR 303  Russian Literature in Translation: The Nineteenth Century  3  
FLR 304  Russian Literature in Translation: The Twentieth Century  3  
FLS 340  Introduction to Hispanic Literatures and Cultures  3  
FLS 341  Literature and Culture of Spain I  3  
FLS 342  Literature and Culture of Spain II  3  
FLS 343  Literature and Culture of Spain III  3  
FLS 351  Literature and Culture of Latin America I  3  
FLS 352  Literature and Culture of Latin America II  3  
FLS 353  Literature and Culture of Latin America III  3  
FLS 492  Seminar in Hispanic Studies  3  
HON 202  Inquiry, Discovery, and Literature  3  
HON 293  Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge  3  

**Arts and Letters**

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MA 231  Calculus for Life and Management Sciences B  3  
MA 241  Calculus II  4  
MA 335  Symbolic Logic  3  
MSGE 295  Mathematical Sciences Special Topics  3  
ST 101  Statistics by Example  3  
ST 311  Introduction to Statistics  3  
ST 312  Introduction to Statistics II  3  

Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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PS 362  American Political Thought  3  
Philosophy  3  
GEP Interdisciplinary Perspectives (p. 1426)  3  
GEP Natural Science  3  

Spring Semester

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Spring Semester

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Career Opportunities

A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

Political Science (BA): International Politics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Major requirements are: 19 hours of core courses that cover major political science sub fields (i.e., American government, international relations, theory, public law and policy, and research methods) as well as courses that develop computer competencies and an orientation to the discipline; 15 hours of political science electives, 12 of which must
be taken at the 300 level or above, and one of which must be a 400 level senior seminar, which includes a substantial research requirement. Grades of C- or better are required for courses applied towards the major. At graduation, a minimum GPA of 2.0 is required for all political science courses taken. For a semester-by-semester guide to the course requirements for the Bachelor of Arts curriculum, including all of the concentrations described below, see the departmental website (http://spia.ncsu.edu/ps/undergraduate.html).

Students who wish to focus their studies in a specific sub field may elect one of the following concentrations under the Bachelor of Arts program:

**International Politics**

This concentration develops skills that benefit students interested in graduate or professional school, careers in government service, international organizations, issue advocacy, and businesses with international interests. Major requirements are: 15 hours of core courses; 12 hours of concentration electives in regional and world politics; 3 hours of concentration electives in any political science sub-field.

### Plan Requirements

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<td>PS 231 Introduction to International Relations</td>
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**GEP Interdisciplinary Perspectives (p. 1426)** 5
**GEP U.S. Diversity (p. 1431) (verify requirement)**
**GEP Global Knowledge (p. 1419) (verify requirement)**
**Foreign Language Proficiency (p. 1417) (verify requirement)**

### Free Electives

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1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

### International Politics Conc

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<td>PS 341 European Politics</td>
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<td>PS 342 Politics of China and Japan</td>
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<td>PS 345 Governments and Politics in the Middle East</td>
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<td>PS 443 Seminar in Latin American &amp; Caribbean Politics</td>
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<td>PS 445 Comparative Systems of Law and Justice</td>
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<td>PS 543 Seminar in Latin American &amp; Caribbean Politics</td>
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<td>World Politics (Max: 6 Units)</td>
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<td>PS 335 International Law</td>
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<td>PS 336 Global Environmental Politics</td>
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### Concentration Seminar

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<td>PS 433 Global Problems and Policies</td>
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<td>PS 437 U.S. National Security Policy</td>
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<td>PS 445 Comparative Systems of Law and Justice</td>
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### PS Elective 300+

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<td>PS 302 Campaigns and Elections in the US Political System</td>
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<td>PS 303 Race in U.S. Politics</td>
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<td>PS 305 The Justice System in the American Political Process</td>
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<td>PS 308</td>
<td>Supreme Court and Public Policy</td>
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<td>PS 309</td>
<td>Equality and Justice in United States Law</td>
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<td>PS 310</td>
<td>Public Policy</td>
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<td>PS 312</td>
<td>Introduction to Public Administration</td>
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<td>PS 313</td>
<td>Criminal Justice Policy</td>
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<td>Science, Technology and Public Policy</td>
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<td>U.S. Environmental Law and Politics</td>
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<td>Global Environmental Politics</td>
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### Acad Writing Research

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### Transfer Sequence

| ENG 202   | Disciplinary Perspectives in Writing              | 3     |
| ENG 1GEP  | 100 Level English Composition                     | 3     |

### Literature I

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<td>Masterpieces of Classical Literature</td>
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<td>Studies in Great Works of Non-Western Literature</td>
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<td>Studies in Great Works of Western Literature</td>
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<td>ENG 221</td>
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<td>ENG 222</td>
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<td>Major British Writers</td>
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<td>Beyond Britain: Literature from Colonies of the</td>
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<td>British Empire</td>
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<td>Studies in British Poetry</td>
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| AFS 276   | Introduction to History of West Africa             | 3     |
| HI 207    | Ancient Mediterranean World                        | 3     |
| HI 214    | History and Archaeology of Ancient Latin America  | 3     |
| HI 215    | Latin America to 1826                              | 3     |
| HI 216    | Latin America Since 1826                           | 3     |
| HI 217    | Caribbean History                                  | 3     |
| HI 232    | The World from 1200 to 1750                        | 3     |
| HI 233    | The World Since 1750                               | 3     |
| HI 263    | Asian Civilizations to 1800                       | 3     |
| HI 264    | Modern Asia: 1800 to Present                      | 3     |
| HI 270    | Modern Middle East                                 | 3     |</p>
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### Social Science

#### Anthropology

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EC 348  Introduction to International Economics  3
EC 351  Econometrics I  3
EC 404  Money, Financial Markets, and the Economy  3
EC 410  Public Finance  3
EC 413  Industrial Organization  3
EC 431  Labor Economics  3
EC 437  Health Economics  3
EC 449  International Finance  3
EC 451  Econometrics II  3
EC 468  Game Theory  3
EC 474  Economics of Financial Institutions and Markets  3
EC 480  Introduction to Economic Research  3
EC 490  Research Seminar in Economics  3
EC 495  Special Topics in Economics  1-6
EC 498  Independent Study in Economics  1-6

Political Science
AFS 409  Black Political Participation in America  3
LPS 315  Public Leadership  3
PS 101  Internet Research  1
PS 102  Data Analysis  1
PS 103  Designing Political Web Pages  1
PS 201  American Politics and Government  3
PS 202  State and Local Government  3
PS 203  Introduction to Nonprofits  3
PS 204  Problems of American Democracy  3
PS 213  Introduction to International Relations  3
PS 236  Issues in Global Politics  3
PS 241  Introduction to Comparative Politics  3
PS 298  Special Topics in Political Science  1-6
PS 301  The Presidency and Congress  3
PS 302  Campaigns and Elections in the US Political System  3
PS 303  Race in U.S. Politics  3
PS 305  The Justice System in the American Political Process  3
PS 306  Gender and Politics in the United States  3
PS 307  Introduction to Criminal Law in the United States  3
PS 308  Supreme Court and Public Policy  3
PS 309  Equality and Justice in United States Law  3
PS 310  Public Policy  3
PS 312  Introduction to Public Administration  3
PS 313  Criminal Justice Policy  3
PS 314  Science, Technology and Public Policy  3
PS 320  U.S. Environmental Law and Politics  3
PS 331  U.S. Foreign Policy  3
PS 335  International Law  3
PS 336  Global Environmental Politics  3
PS 339  Politics of the World Economy  3
PS 341  European Politics  3
PS 342  Politics of China and Japan  3
PS 343  Government and Politics in South Asia  3
PS 345  Governments and Politics in the Middle East  3
PS 353  Issues in Latin American and Caribbean Politics  3
PS 361  Introduction to Political Theory  3
PS 362  American Political Thought  3
PS 371  Research Methodology of Political Science  3
PS 391  Internship in Political Science  1-6
PS 398  Special Topics in Political Science  3
PS 401  American Political Parties  3
PS 409  Black Political Participation in America  3
PS 411  Public Opinion and the Media in American Politics  3
PS 415  Administration of Justice  3
PS 418  Gender Law and Policies  3
PS 431  The United Nations and Global Order  3
PS 432  Violence, Terrorism, and Public Policy  3
PS 433  Global Problems and Policies  3
PS 437  U.S. National Security Policy  3
PS 443  Seminar in Latin American & Caribbean Politics  3
PS 445  Comparative Systems of Law and Justice  3
PS 452  Seminar in Political Theory  3
PS 463  Public Choice and Political Institutions  3
PS 464  The Classical Liberal Tradition  3
PS 471  Public Opinion Research Methodology  3
PS 490  Readings and Research in Political Science  1-6
PS 492  Honors Readings and Thesis in Political Science  1-6
PS 498  Special Topics in Political Science  1-6
PS 502  The Legislative Process  3
PS 506  United States Constitutional Law  3
PS 507  Civil Liberties In the United States  3
PS 530  Seminar In International Relations  3
PS 531  International Law  3
PS 532  Seminar in Global Governance  3
PS 533  Global Problems and Policy  3
PS 534  The Politics of Human Rights Policies  3
PS 536  Global Environmental Law and Policy  3
PS 539  International Political Economy  3
PS 540  Seminar In Comparative Politics  3
PS 541  Political Islam  3
PS 542  European Politics  3
PS 543  Seminar in Latin American & Caribbean Politics  3
PS 544  Contemporary African Politics  3
PS 545  Comparative Systems of Law and Justice  3
PS 546  The Politics of East Asia  3
PS 547  Russian Politics  3
PS 560  Nuclear Nonproliferation Policy & Process  3
PS 561  Nuclear Strategy and Nonproliferation  3
PS 571  Research Methods and Analysis  3
PS 585  Constitutional and Legal Principles for Police Supervisors  3
PS 590  Special Topics  1-6
PS 598  Special Topics In Political Science  1-6
SOC 413  Criminal Justice Field Work  4
SOC 432  Violence, Terrorism, and Public Policy  3
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### Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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**Career Opportunities**

A degree in political science is excellent preparation for a number of careers and graduate schools. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism, or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

**Political Science (BA): Law and Justice Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

Major requirements are: 19 hours of core courses that cover major political science sub fields (i.e., American government, international relations, theory, public law and policy, and research methods) as well as courses that develop computer competencies and an orientation to the discipline; 15 hours of political science electives, 12 of which must be taken at the 300 level or above, and one of which must be a 400 level senior seminar, which includes a substantial research requirement. Grades of C- or better are required for courses applied towards the major. At graduation, a minimum GPA of 2.0 is required for all political science courses taken. For a semester-by-semester guide to the course requirements for the Bachelor of Arts curriculum, including all of the concentrations described below, see the departmental website (http://spia.ncsu.edu/ps/undergraduate.html).

Students who wish to focus their studies in a specific sub field may elect one of the following concentrations under the Bachelor of Arts program:

**Law and Justice**

This concentration develops skills that benefit students interested in graduate or professional school (particularly law school), law enforcement, judicial administration, and careers with agencies involved in the administration of justice. Major requirements are: 18 hours of core courses; 12 hours of emphasis electives in either the justice system or law and theory.

**Plan Requirements**

**Political Science (BA): Law and Justice Concentration: 120 Total Units**

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<td>PS 236 Issues in Global Politics</td>
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<td>Equality and Justice in United States Law</td>
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**Concentration Seminar**

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**PS 300lvl+ Electives**

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FLR 304  Russian Literature in Translation: The Twentieth Century  3
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FLS 341  Literature and Culture of Spain I  3
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FLS 351  Literature and Culture of Latin America I  3
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HON 202  Inquiry, Discovery, and Literature  3
HON 293  Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge  3

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### Social Science

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**Sociology**

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NC State University

SOC 509  Population Problems  3
SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics In Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

Multidisciplinary
ENG 210  Introduction to Language and Linguistics  3
GEO 220  Cultural Geography  3
SOC 220  Cultural Geography  3
STS 402  Peace and War in the Nuclear Age  3

SOC 514  Developing Societies  3
SOC 533  The Community  3
SOC 591  Special Topics In Sociology  1-6
WGS 204  Sociology of Family  3
WGS 304  Gender and Society  3
WGS 407  Sociology of Sexualities  3

GEP Math Sci MA or ST

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Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

Course  Title  Hours
First Year  
Fall Semester
ENG 101  Academic Writing and Research  4
PS 201  American Politics and Government  3
Mathematics  3
History I  3
GEP Social Sciences (p. 1430)  3

Spring Semester
Foreign Language 201  3
International Requirement  3

Second Year  
Fall Semester
PS 241  Introduction to Comparative Politics  3
ST 311  Introduction to Statistics  3
Literature I  3
GEP Natural Science with Lab  4
GEP Health and Exercise Studies (p. 1422)  1

Spring Semester
PS 371  Research Methodology of Political Science  3
Literature II  3
GEP Additional Breadth (p. 1417) (Mathematical Sciences/ Natural Sciences/Engineering)  3
GEP Social Sciences (p. 1430)  3
Additional GEP Social Sciences (p. 1430)  3

Hours  15

Third Year  
Fall Semester
PS 305  The Justice System in the American Political Process  3
PS 300-level Electives  3
Philosophy  3
GEP Interdisciplinary Perspectives (p. 1426)  3
GEP Natural Sciences (p. 1429)  3

Hours  15

Spring Semester
PS 362  American Political Thought  3
Restricted Electives  6
GEP Interdisciplinary Perspectives (p. 1426)  2
Free Elective  3

Hours  14

Fourth Year  
Fall Semester
PS Concentration Elective  3
PS 300-level Electives  3
Free Elective  9

Hours  15

Spring Semester
PS Concentration Elective  3
PS Concentration Seminar  3
Free Elective  9

Hours  15

Total Hours  120

1  C- or better
Career Opportunities
A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

Political Science (BA): Public Policy Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Major requirements are: 19 hours of core courses that cover major political science sub fields (i.e., American government, international relations, theory, public law and policy, and research methods) as well as courses that develop computer competencies and an orientation to the discipline; 15 hours of political science electives, 12 of which must be taken at the 300 level or above, and one of which must be a 400 level senior seminar, which includes a substantial research requirement. Grades of C- or better are required for courses applied towards the major. At graduation, a minimum GPA of 2.0 is required for all political science courses taken. For a semester-by-semester guide to the course requirements for the Bachelor of Arts curriculum, including all of the concentrations described below, see the departmental website (http://spia.ncsu.edu/ps/undergraduate.html).

Students who wish to focus their studies in a specific sub field may elect one of the following concentrations under the Bachelor of Arts program:

Public Policy
This concentration prepares students for careers with public institutions where they will work with the processes, formulation, implementation, and evaluation of public policy at international, national, state, and local levels. Major requirements are: 15 hours of core courses; 15 hours of concentration electives.

Plan Requirements
Political Science (BA): Public Policy Concentration: 120 Total Units

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<td>PS 301</td>
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Any PHI course on the approved GEP-Humanities list.

Arts and Letters (p. 1193) 3
Foreign Language 200 Level (p. 1194) 3
Social Sciences (3 Different) (p. 1194) 9
EC 205 Fundamentals of Economics 3

Mathematics
GEP Math Sci MA or ST (p. 1198) 3
ST 311 Introduction to Statistics 3

GEP Courses
GEP Natural Sciences (p. 1429) 7
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2 27
Total Hours 120

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Public Policy Concentration

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### Concentration Seminar

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HA 298  Special Topics in Art History  3
HA 395  History of Art: Study Abroad  3
HA 401  19th Century European Art from Revolution to Post-Impressionism  3
HA 404  Italian Renaissance Art and Material Culture  3
HA 498  Independent Study in History of Art  1-6
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HESM 324  Concert Dance History  3
HESM 326  Current Trends in Dance  3
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HI 402/502  Early Christianity to the Time of Eusebius  3
HI 408/508  Islam in the Modern World  3
HI 407/507  Islamic History to 1798  3
HON 390  Music and the Celtic World  3
IDS 496  Topics in Film and Interdisciplinary Studies  3
LAR 444  History of Landscape Architecture  3
MUS 105  Introduction to Music in Western Society  3
MUS 180  Introduction to Musical Experiences  3
MUS 181  Exploring Music Theory  3
MUS 200  Understanding Music: Global Perspectives  3
MUS 201  Introduction to Music Literature I  3
MUS 202  Introduction to Music Literature II  3
MUS 206  America's Music  3
MUS 310  Music of the 17th and 18th Centuries  3
MUS 315  Music of the 19th Century  3
MUS 320  Music of the 20th Century  3
MUS 330  Survey of Musical Theater  3
MUS 350  Music of Asia  3
MUS/WGS 360  Women In Music  3
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REL 210  Religious Traditions of the World  3
REL 220  Religion in the Contemporary World  3
REL 230  Asian Religions  3
REL 298  Special Topics in Religious Studies  3
REL/SOC 309  Religion and Society  3
REL 311  Introduction to the Old Testament  3
REL 312  Introduction to the New Testament  3
REL 314  Introduction to Intertestamental Literature  3
REL 317  Christianity  3
REL 323  Religious Cults, Sects, and Minority Faiths in America  3
REL 327  Issues in Contemporary Religion  3
REL 331  The Hindu Tradition  3
REL 332  The Buddhist Traditions  3
REL 333  Chinese Religions  3
REL 334  Japanese Religions  3
REL 340  Islam  3
REL 350  Introduction to Judaism  3
REL 383  Religion, Globalism, and Justice  3
REL 412/512  Advanced Readings in the Christian Gospels  3
REL 413/513  The Life and Letters of the Apostle Paul  3
REL 423/523  Religion and Politics in America  3
REL 424/524  Religion and Politics in Global Perspective  3
REL 471/571/STS 471/571  Darwinism and Christianity  3
REL 472/572  Women and Religion  3
REL 473/573  Religion, Gender, and Reproductive Technologies  3
REL 482/582  Religion and Conflict  3
REL 489/589  Interpretations of Religion  3
REL 496  Seminar in Religious Studies  3
REL 498/598  Special Topics in Religious Studies  1-6
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THE 303  Stage Directing  3
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THE 340  African American Theatre  3

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### Multidisciplinary

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### GEP Math Sci MA or ST

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### Semester Sequence

#### This is a sample.

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**Career Opportunities**

A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

**Political Science (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Major requirements are 27 hours of political science coursework. At least 6 hours must be taken from each of the following groups: Group A-American politics/or public policy and administration; Group B-international affairs/comparative politics; and Group C-political theory/

---

**Plan Requirements**

**Political Science (BS): 120 Total Units**

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**Outcomes website**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).
### Free Electives
Free Electives (12 Hr S/U Lmt) 2  15

### Total Hours
120

#### Math Electives

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MA 551  Introduction to Topology  3
MA 555  Introduction to Manifold Theory  3
MA 561  Set Theory and Foundations Of Mathematics  3
MA 565  Graph Theory  3
MA 573  Mathematical Modeling of Physical and Biological Processes I  3
MA 574  Mathematical Modeling of Physical and Biological Processes II  3
MA 580  Numerical Analysis I  3
MA 583  Introduction to Parallel Computing  3
MA 584  Numerical Solution of Partial Differential Equations--Finite Difference Methods  3
MA 587  Numerical Solution of Partial Differential Equations--Finite Element Method  3
MA 591  Special Topics  1-6
MBA 528  Options and Derivatives Pricing  3
MEA 315  Mathematics Methods in Atmospheric Sciences  4
OR 504  Introduction to Mathematical Programming  3
OR 505  Linear Programming  3
OR 531  Dynamic Systems and Multivariable Control I  3
OR 565  Graph Theory  3
ST 305  Statistical Methods  4
ST 307  Introduction to Statistical Programming- SAS  1
ST 308  Introduction to Statistical Programming - R  1
ST 311  Introduction to Statistics  3
ST 312  Introduction to Statistics II  3
ST 350  Economics and Business Statistics  3
ST 370  Probability and Statistics for Engineers  3
ST 371  Introduction to Probability and Distribution Theory  3
ST 372  Introduction to Statistical Inference and Regression  3
ST 380  Probability and Statistics for the Physical Sciences  3
ST 401  Experiences in Data Analysis  4
ST 404  Epidemiology and Statistics in Global Public Health  3
ST 405  Applied Nonparametric Statistics  3
ST 412  Long-Term Actuarial Models  3
ST 413  Short-Term Actuarial Models  3
ST 421  Introduction to Mathematical Statistics I  3
ST 422  Introduction to Mathematical Statistics II  3
ST 430  Introduction to Regression Analysis  3
ST 431  Introduction to Experimental Design  3
ST 432  Introduction to Survey Sampling  3
ST 433  Applied Spatial Statistics  3
ST 434  Applied Time Series  3
ST 435  Statistical Methods for Quality and Productivity Improvement  3
ST 437  Applied Multivariate and Longitudinal Data Analysis  3
ST 440  Applied Bayesian Analysis  3
ST 442  Introduction to Data Science  3
ST 445  Introduction to Statistical Computing and Data Management  3
ST 446  Intermediate SAS Programming with Applications  3
ST 491  Statistics in Practice  3
ST 495  Special Topics in Statistics  1-6
ST 497  Professional Experience in Statistics  1-3
ST 498  Independent Study In Statistics  1-6
ST 499  Research Experience in Statistics  1-3
ST 501  Fundamentals of Statistical Inference I  3
ST 502  Fundamentals of Statistical Inference II  3
ST 503  Fundamentals of Linear Models and Regression  3
ST 505  Applied Nonparametric Statistics  3
ST 506  Sampling Animal Populations  3
ST 507  Statistics For the Behavioral Sciences I  3
ST 508  Statistics For the Behavioral Sciences II  3
ST 511  Statistical Methods For Researchers I  3
ST 512  Statistical Methods For Researchers II  3
ST 513  Statistics for Management I  3
ST 514  Statistics For Management and Social Sciences II  3
ST 515  Experimental Statistics for Engineers I  3
ST 516  Experimental Statistics For Engineers II  3
ST 517  Applied Statistical Methods I  3
ST 519  Teaching and Learning of Statistical Thinking  3
ST 520  Statistical Principles of Clinical Trials  3
ST 524  Statistics In Plant Science  3
ST 533  Applied Spatial Statistics  3
ST 534  Applied Time Series  3
ST 535  Statistical Methods for Quality and Productivity Improvement  3
ST 537  Applied Multivariate and Longitudinal Data Analysis  3
ST 540  Applied Bayesian Analysis  3
ST 542  Statistical Practice  3
ST 544  Applied Categorical Data Analysis  3
ST 546  Probability and Stochastic Processes I  3
ST 555  Statistical Programming I  3
ST 556  Statistical Programming II  3
ST 557  Using Technology to Teach Statistics  3
ST 558  Data Science for Statisticians  3
ST 561  Applied Econometrics I  3
ST 562  Data Mining with SAS Enterprise Miner  3
ST 563  Introduction to Statistical Learning  3
ST 590  Special Topics  1-6
ST 701  Statistical Theory I  3
ST 702  Statistical Theory II  3
ST 705  Linear Models and Variance Components  3

Basic Sciences

Code  Title  Hours

Biological Sciences (Max: 4 Units )
BIO 105  Biology in the Modern World  3
BIO 106  Biology in the Modern World Laboratory  1
BIO 140  Survey of Animal Diversity  3
BIO 141  Animal Diversity Laboratory  1
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<td>BIO 140</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>BIO 227</td>
<td>Understanding Structural Diversity through Biological Illustration</td>
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<td>BIT 100</td>
<td>Current Topics in Biotechnology</td>
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<td>Phage Hunters</td>
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<td>Phage Genomics</td>
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<tr>
<td>CH 100</td>
<td>Chemistry and Society</td>
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**Chemistry (Max: 4 Units)**

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**Earth Sciences (Max: 4 Units)**

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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>MEA 201</td>
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**Physics (Max: 4 Units)**

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**Science Electives**

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**Social Science**

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**Political Science**

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SOC 202 Principles of Sociology 3
SOC 203A Current Social Problems 3
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SOC 204 Sociology of Family 3
SOC 205 Jobs and Work 3
SOC 206 Social Deviance 3
SOC 207 Language and Society 3
SOC 211 Community and Health 3
SOC 212 Race in America 3
SOC 220 Cultural Geography 3
SOC 241 Sociology of Agriculture and Rural Society 3
SOC 241A Sociology of Agriculture and Rural Society 3
SOC 295 Special Topics in Sociology 1-3
SOC 300 Social Research Methods 4
SOC 302 Human Behavior 3
SOC 304 Gender and Society 3
SOC 305R Racial and Ethnic Relations 3
SOC 306 Criminology 3
SOC 309 Religion and Society 3
SOC 311 Community Relationships 3
SOC 342 International Development 3
SOC 350 Food and Society 3
SOC 351 Population and Planning 3
SOC 381 Sociology of Medicine 3
SOC 395 Special Topics in Sociology 1-3
SOC 400 Theories of Social Structure 3
SOC 401 Theories of Social Interaction 3
SOC 402 Urban Sociology 3
SOC 404 Families and Work 3
SOC 405 Racism in the U.S. 3
SOC 407 Sociology of Sexualities 3
SOC 410 Sociology of Organizations 3
SOC 413 Criminal Justice Field Work 4
SOC 414 Social Class 3
SOC 418 Sociology of Education 3
SOC 425 Juvenile Delinquency 3
SOC 427 Sociology of Law 3
SOC 428 Formal Institutions of Social Control 3
SOC 429 Quantitative Data Analysis in Sociology 3
SOC 430 Community and Crime 3
SOC 440 Social Change 3
SOC 445 Inequality, Ideology, and Social Justice 3
SOC 450 Environmental Sociology 3
SOC 457 Corporate Power in America 3
SOC 465 Social Aspects of Mental Health 3
SOC 492 External Learning Experience 1-6
SOC 493 Special Problems in Sociology 1-6
SOC 495 Special Topics in Sociology 1-3
SOC 498 Independent Study in Sociology 1-6
SOC 508 Social Organization 3
SOC 509 Population Problems 3
SOC 514 Developing Societies 3
SOC 533 The Community 3
SOC 591 Special Topics in Sociology 1-6
WGS 204 Sociology of Family 3
WGS 304 Gender and Society 3
WGS 407 Sociology of Sexualities 3

Multidisciplinary

ENG 210 Introduction to Language and Linguistics 3
GEO 220 Cultural Geography 3
SOC 220 Cultural Geography 3
STS 402 Peace and War in the Nuclear Age 3

Writing and Communication

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Semester Sequence

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<td></td>
<td><strong>Total Hours</strong></td>
</tr>
<tr>
<td></td>
<td>14</td>
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</tr>
</tbody>
</table>

**Major Residency Requirements:** A minimum of 18 credit hours of PS courses taken at NC State with a grade of C or better.

**Grade Point Average (GPA) Requirements:** A 2.0 GPA is required in all major courses with a PS prefix.

### Career Opportunities

A degree in political science is excellent preparation for a number of careers and graduate opportunities. Political science majors study critical issues surrounding such things as international security, public policy, and government practices. They develop real-world skills such as solving problems logically and systematically, working with others in vertically and horizontally organized arrangements, expressing a position and defending it with corroborating evidence, and writing clear and correct prose. They also develop citizenship and leadership competencies that include the personal obligation to participate in public life. Consequently, political science majors are well-positioned for careers in teaching, the legal profession, criminal justice agencies, state and local government, urban planning, the federal bureaucracy, journalism or in any of the organizations that seek to monitor political processes or to influence the content of public policy. Private firms also seek managers and public affairs specialists who have a knowledge of the functioning of the political system and of politics in general.

### Political Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Political Science is open to all students. It will prepare them to be well-informed and politically active citizens as well as prepare them for graduate study in political science, public administration or law. Students will learn how laws are created and enforced, the diversity of political cultures, the problems of the world community, and more. No courses for the minor may be taken for S/U credit.

### Admissions

Students may declare their intention to complete the Political Science minor by consulting with Susan Lawhead as listed below.

### Certification

Susan Lawhead will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

### Contact Person

Susan Lawhead
228 Caldwell  
919.515.5025  
srlawhea@ncsu.edu

**SIS Code: 16OSM**

**Plan Requirements**

- Completion of 15 hours of political science courses.
- A grade of “C” or better in each course.
- A maximum of ONE (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

**Required Courses**

NONE

**Elective Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Select nine hours of 300-level political science courses</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Select one 400-500 level course seminar</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select a minimum of one course selected from two of the following three pairs of sub-fields:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Pair A: American politics/policy &amp; administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pair B: International affairs/comparative politics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pair C: Political theory/social scientific methods</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours** 15

1 Must be a 400-500 level course listed with an “S” after the course number, or any 498 or 598 course with the word “seminar” in its title, or other course designated as a seminar for a given semester.
2 Courses in Pair A have a middle digit of 0 or 1; courses in Pair B a middle digit of 3 or 4; and courses in Pair C a middle digit of 6 or 7

**School of Social Work**

The Department of Social Work offers a Bachelor of Social Work (BSW) degree, which was reaccredited by the Council on Social Work Education (CSWE) in 2013. The CSWE Commission on Accreditation is the sole body authorized to accredit social work education programs in the United States.

As one of the nation’s first accredited BSW programs, the Department of Social Work has been training BSW students for more than 30 years to help them prepare for the next step in their social work careers. Our curriculum incorporates a professional foundation that includes: Social Work Practice, Human Behavior and Diversity, Community Social Services, Social Policy, Research Methodology for Social Workers. The program also prepares students for advanced graduate-level academic work. Social work elective courses offer opportunities to study in depth various social work practice areas such as child welfare, aging, health care, addiction recovery, African American families, school social work, homeless individuals, soldiers/veterans/families, legal aspects of social work and a 7-week study abroad program in Guatemala along others. Students complete three 40-hour pre-professional placements and a 420-hour field placement in a social service setting. Upon degree completion, students are eligible for state licensing or certification.

The Department also offers an undergraduate minor in social work and a Master of Social Work (MSW). The social work minor is an excellent choice for students interested in combining a primary academic area (major), such as sociology, political science, psychology, nonprofit studies, or Spanish or other language. The minor must be completed no later than the semester in which the student expects to graduate from their degree program.

The Department offers two MSW program options; an Advanced Standing MSW and a Traditional MSW. The Advanced Standing MSW option is a 12-month intensive, full-time program totaling 39 credit hours that begins in May. The Traditional MSW program is a two-year, full-time program requiring the completion of 60 credit hours and begins in August. The Department of Social Work does not admit MSW students in the spring. For more information please visit the Department of Social Work website (https://socialwork.chass.ncsu.edu/).

Our mission is to prepare students for practice that addresses the social, economic, cultural, demographic and political changes that shape our world and beyond. Through teaching, advising, practice and research, we emphasize: Professional ethics, Social justice, Diversity, and Community Engagement.

For more information about our BSW program curriculum, please visit The Department of Social Work’s BSW Curriculum Page (https://socialwork.chass.ncsu.edu/bsw/curriculum.php).

**Residency Requirements**

A minimum of 30 of the last 45 credit hours, including three practice courses, field preparation and fieldwork, must be completed at NC State’s Department of Social Work BSW Program. Transfer credit for these courses will not apply towards a student degree but may be used for free elective credit.

A grade of C- or better is required in all major courses, with the exception of SW 480 Preparation for Field Work.

**Student Organizations**

Baccalaureate Student Social Work Association (BSSWA) (https://getinvolved.ncsu.edu/organization/92/)

Collegiate Recovery Community (CRC) at NC State (https://getinvolved.ncsu.edu/organization/CRCNCSU/)

Graduate Student Social Work Association (GSSWA) (https://getinvolved.ncsu.edu/organization/gsswa/)

Men in Social Work (MiSW) (https://getinvolved.ncsu.edu/organization/429/)

Phi Alpha Honor Society - Epsilon Kappa (https://getinvolved.ncsu.edu/organization/519/)

**Faculty**

**Department Head**

Karen Bullock, Ph.D., Department Head and Professor

**Director of Graduate Program**

Kim L. Stansbury, Ph.D., Associate Professor and MSW Program Director
Professor emeritus
J. Pennell

Plans
• Social Work (Bachelor) (p. 1214)
• Social Work (Minor) (p. 1222)

Social Work (Bachelor)

The Bachelor of Social Work (BSW) degree prepares students for entry-level professional generalist practice with diverse populations. BSW students acquire knowledge, social work professional values, and the skills necessary to respond competently to the service needs of diverse individuals, families, groups, communities, and organizations. The program emphasizes human and social well-being, human rights, social and economic justice, and the empowerment of individuals, families, groups, and communities that experience oppression and discrimination.

During their final semester, all social work students complete a field internship in a community agency.

The BSW program is accredited by the Council on Social Work Education (CSWE (https://www.cswe.org/)). The program graduates social workers who follow the NASW Code of Ethics (https://www.socialworkers.org/about/ethics/code-of-ethics/code-of-ethics-english/) and apply it to a variety of situations related to diverse client populations, both in the classroom and in field settings.

For more information about our School, visit our website (https://socialwork.chass.ncsu.edu/) or our office on campus.

School of Social Work
North Carolina State University
Campus Box 7639
Raleigh, North Carolina 27695

Contact
Dr. Karen Bullock
School of Social Work, Head
1911 Building, Room 205
10 Current Drive
Raleigh, North Carolina 27695
Phone: 919-515-2492
Kbulloc2@ncsu.edu

Plan Requirements
Social Work (Bachelor): 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Humanities &amp; Social Sciences</td>
<td></td>
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</tr>
<tr>
<td>Acad Writing Research (p. 1215)</td>
<td></td>
<td>4</td>
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<tr>
<td>Soc 2** (p. 1215)</td>
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<td>3</td>
</tr>
<tr>
<td>History I (p. 1215)</td>
<td></td>
<td>3</td>
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<tr>
<td>History II (p. 1215)</td>
<td></td>
<td>3</td>
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<tr>
<td>Literature I (p. 1216)</td>
<td></td>
<td>3</td>
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<tr>
<td>Literature II (p. 1216)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Foreign Language 200 Level (p. 1217)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Philosophy</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Any PHI course on the approved GEP-Humanities list.</td>
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### Math and Natural Sciences

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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Select one of the following:

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
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<td>BIO 105 &amp; BIO 106</td>
<td>Biology in the Modern World and Biology in the Modern World Laboratory</td>
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<tr>
<td>BIO 181 &amp; BIO 183</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity and Introductory Biology: Cellular and Molecular Biology</td>
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### Departmental Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>SW 201</td>
<td>Introduction to Social Work ¹</td>
<td>4</td>
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<tr>
<td>SW 290</td>
<td>The Development of Social Welfare and Social Work in the U.S. ¹</td>
<td>3</td>
</tr>
<tr>
<td>SW 300</td>
<td>Research Methods in Social Work ¹</td>
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</tr>
<tr>
<td>SW 307</td>
<td>Social Welfare Policy: Analysis and Advocacy ¹</td>
<td>3</td>
</tr>
<tr>
<td>SW 310</td>
<td>Human Behavior Theory for Social Work Practice ¹</td>
<td>3</td>
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<tr>
<td>SW 312</td>
<td>Multicultural Social Work ¹</td>
<td>3</td>
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<tr>
<td>SW 320</td>
<td>Social Work Practice I ¹</td>
<td>4</td>
</tr>
<tr>
<td>SW 405</td>
<td>Social Work Practice II ¹</td>
<td>4</td>
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<tr>
<td>SW 408</td>
<td>Social Work Practice III ¹</td>
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<tr>
<td>SW 480</td>
<td>Preparation for Field Work</td>
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<tr>
<td>SW 490</td>
<td>Field Seminar ¹</td>
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<tr>
<td>SW 491</td>
<td>Community-Based Field Practicum ¹</td>
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### Major Electives

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>SW Electives (p. 1221) ¹</td>
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### GEP Courses

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<tr>
<th>Code</th>
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<tr>
<td>GEP Mathematical Sciences (p. 1428)</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Mathematical Sciences/Natural Sciences/Engineering)</td>
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</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
<td></td>
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</table>

Foreign Language Proficiency (p. 1417) (verify requirement)

### Free Electives

Free Electives (12 Hr S/U Lmt) ² | 17

Total Hours 120

1. C- or better
2. Students should consult their academic advisors to determine which courses fill this requirement.

### Acad Writing Research

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>FLE 101</td>
<td>Academic Writing and Research</td>
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</table>

### Transfer Sequence

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
<td>3</td>
</tr>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
<td>3</td>
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### Soc 2**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ANT 261</td>
<td>Technology in Society and Culture</td>
<td>3</td>
</tr>
<tr>
<td>GEO 220</td>
<td>Cultural Geography</td>
<td>3</td>
</tr>
<tr>
<td>SOC 202</td>
<td>Principles of Sociology</td>
<td>3</td>
</tr>
<tr>
<td>SOC 203</td>
<td>Current Social Problems</td>
<td>3</td>
</tr>
<tr>
<td>SOC 203A</td>
<td>Current Social Problems</td>
<td>3</td>
</tr>
<tr>
<td>SOC 204</td>
<td>Sociology of Family</td>
<td>3</td>
</tr>
<tr>
<td>SOC 205</td>
<td>Jobs and Work</td>
<td>3</td>
</tr>
<tr>
<td>SOC 206</td>
<td>Social Deviance</td>
<td>3</td>
</tr>
<tr>
<td>SOC 207</td>
<td>Language and Society</td>
<td>3</td>
</tr>
<tr>
<td>SOC 211</td>
<td>Community and Health</td>
<td>3</td>
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<tr>
<td>SOC 212</td>
<td>Race in America</td>
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<tr>
<td>SOC 220</td>
<td>Cultural Geography</td>
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</tr>
<tr>
<td>SOC 241</td>
<td>Sociology of Agriculture and Rural Society</td>
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<tr>
<td>SOC 241A</td>
<td>Sociology of Agriculture and Rural Society</td>
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<td>SOC 261</td>
<td>Technology in Society and Culture</td>
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<tr>
<td>SOC 295</td>
<td>Special Topics in Sociology ¹-³</td>
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<tr>
<td>SOC 381</td>
<td>Sociology of Medicine</td>
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<td>WGS 204</td>
<td>Sociology of Family</td>
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### History I

<table>
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<tr>
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<tbody>
<tr>
<td>AFS/HI 275</td>
<td>Introduction to History of South and East Africa</td>
<td>3</td>
</tr>
<tr>
<td>AFS/HI 276</td>
<td>Introduction to History of West Africa</td>
<td>3</td>
</tr>
<tr>
<td>HI 207</td>
<td>Ancient Mediterranean World</td>
<td>3</td>
</tr>
<tr>
<td>HI 214</td>
<td>History and Archaeology of Ancient Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HI 215</td>
<td>Latin America to 1826</td>
<td>3</td>
</tr>
<tr>
<td>HI 216</td>
<td>Latin America Since 1826</td>
<td>3</td>
</tr>
<tr>
<td>HI 217</td>
<td>Caribbean History</td>
<td>3</td>
</tr>
<tr>
<td>HI 232</td>
<td>The World from 1200 to 1750</td>
<td>3</td>
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<tr>
<td>HI 233</td>
<td>The World Since 1750</td>
<td>3</td>
</tr>
<tr>
<td>HI 263</td>
<td>Asian Civilizations to 1800</td>
<td>3</td>
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<tr>
<td>HI 264</td>
<td>Modern Asia: 1800 to Present</td>
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<td>HI 270</td>
<td>Modern Middle East</td>
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### History II

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<tbody>
<tr>
<td>HI 205</td>
<td>Western Civilization Since 1400</td>
<td>3</td>
</tr>
<tr>
<td>HI 208</td>
<td>The Middle Ages</td>
<td>3</td>
</tr>
<tr>
<td>HI 209</td>
<td>From Renaissance to Revolution: The Origins of Modern Europe</td>
<td>3</td>
</tr>
<tr>
<td>HI 210</td>
<td>Modern Europe 1815-Present</td>
<td>3</td>
</tr>
<tr>
<td>HI 221</td>
<td>British History to 1688</td>
<td>3</td>
</tr>
<tr>
<td>HI 222</td>
<td>History of British Cultures and Societies From 1688</td>
<td>3</td>
</tr>
<tr>
<td>HI 251</td>
<td>American History I</td>
<td>3</td>
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<tr>
<td>HI 252</td>
<td>American History II</td>
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### Literature I

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENG 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
</tr>
<tr>
<td>ENG 221</td>
<td>Literature of the Western World I</td>
<td>3</td>
</tr>
<tr>
<td>ENG 222</td>
<td>Literature of the Western World II</td>
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</tr>
<tr>
<td>ENG 251</td>
<td>Major British Writers</td>
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<tr>
<td>ENG 255</td>
<td>Beyond Britain: Literature from Colonies of the British Empire</td>
<td>3</td>
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<tr>
<td>ENG 261</td>
<td>English Literature I</td>
<td>3</td>
</tr>
<tr>
<td>ENG 262</td>
<td>English Literature II</td>
<td>3</td>
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<tr>
<td>ENG 361</td>
<td>Studies in British Poetry</td>
<td>3</td>
</tr>
<tr>
<td>FL 219</td>
<td>Studies in Great Works of Non-Western Literature</td>
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</tr>
<tr>
<td>FL 220</td>
<td>Studies in Great Works of Western Literature</td>
<td>3</td>
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<tr>
<td>FL 221</td>
<td>Literature of the Western World I</td>
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</tr>
<tr>
<td>FL 222</td>
<td>Literature of the Western World II</td>
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<tr>
<td>FLF 301</td>
<td>Survey of French Literature from the Middle Ages through the Enlightenment</td>
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<tr>
<td>FLG 320</td>
<td>Introduction to German Literature</td>
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<tr>
<td>FLG 325</td>
<td>German Lyric Poetry</td>
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<tr>
<td>FLJ 342</td>
<td>Classical Japanese Literature in Translation</td>
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<td>FLJ 344</td>
<td>Early Modern Japanese Literature in Translation</td>
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<td>FLR 303</td>
<td>Russian Literature in Translation: The Nineteenth Century</td>
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<tr>
<td>FLS 340</td>
<td>Introduction to Hispanic Literatures and Cultures</td>
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<td>FLS 341</td>
<td>Literature and Culture of Spain I</td>
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<tr>
<td>FLS 342</td>
<td>Literature and Culture of Spain II</td>
<td>3</td>
</tr>
<tr>
<td>FLS 351</td>
<td>Literature and Culture of Latin America I</td>
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<tr>
<td>HON 202</td>
<td>Inquiry, Discovery, and Literature</td>
<td>3</td>
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<tr>
<td>HON 293</td>
<td>Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge</td>
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### Literature II

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>AFS 248</td>
<td>Survey of African-American Literature</td>
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<td>AFS 349</td>
<td>African Literature in English</td>
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</tr>
<tr>
<td>AFS 448/548</td>
<td>African-American Literature</td>
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</tr>
<tr>
<td>ENG 448/558</td>
<td>English Literature</td>
<td>3</td>
</tr>
<tr>
<td>CLA 210</td>
<td>Classical Mythology</td>
<td>3</td>
</tr>
<tr>
<td>CLA 320</td>
<td>Masterpieces of Classical Lit</td>
<td>3</td>
</tr>
<tr>
<td>ENG 207</td>
<td>Studies in Poetry</td>
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SW Electives

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Semester Sequence

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| **Third Year** |                                                 |       |
| Fall Semester  |                                                 |       |
| SW 305         | Social Work Practice II                         | 4     |
| SW 408         | Social Work Practice III                        | 3     |
| SW 480         | Preparation for Field Work                      | 1     |
| Free Electives |                                                 | 4     |
| **Hours**      |                                                 | 12    |
| **Spring Semester** |                                             |       |
| SW 490         | Field Seminar                                   | 3     |
| SW 491         | Community-Based Field Practicum                 | 9     |
| **Hours**      |                                                 | 12    |

| **Fourth Year** |                                                 |       |
| Fall Semester   |                                                 |       |
| SW 405         | Social Work Practice II                         | 4     |
| SW 408         | Social Work Practice III                        | 3     |
| SW 480         | Preparation for Field Work                      | 1     |
| Free Electives |                                                 | 4     |
| **Hours**      |                                                 | 12    |

**Major Residency Requirements**: A minimum of 34 credit hours must be completed at NC State’s Department of Social Work’s BSW program, including three practice courses. (SW 320 Social Work Practice I, SW 405 Social Work Practice II, SW 408 Social Work Practice III), field preparation (SW 480), field work and field seminar (SW 490 Field Seminar and SW 491 Community-Based Field Practicum).

**Grade Point Average (GPA) Requirements**: A grade of C- or better is required in all major courses and an S in SW 480.

Career Opportunities

Social work is an exciting, challenging, and dynamic profession. No matter what the political climate or the changing nature of personal or social need, social workers will be in demand. The BSW Program provides students with the knowledgeable, values, and skills to respond competently to:

1. The aspirations and service needs of diverse client populations
2. The contexts that shape the needs of clients and service delivery systems throughout the state.

Social workers are employed in a variety of settings which include health care, mental health, services to the aging, child welfare, public welfare, addictions recovery, public schools, developmental disabilities, and many other public and private settings. In each of these areas there is...
recognition for professional preparation, and the BSW graduate will be prepared to embark upon a career in his or her chosen field. All states, including North Carolina, have licensing or certification procedures for social work practice.

Social Work (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!

The minor in Social Work is designed to familiarize students with the social service system, major social welfare programs, and elements of the profession of social work. This is an excellent minor for students interested in combining a primary academic area (major), such as sociology, political science, or psychology with social welfare and professional social work content. It is also an excellent field of study for students majoring in any area who may need or desire knowledge of social welfare and social. No courses for the minor may be taken for S/U credit.

Admissions and Certification of Minor

In both instances, students can contact any of the social work faculty members listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in Room 205C in the 1911 Building and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Suzy Lamb
1911 Building, Room 205C
919.513.7995
sslamb@ncsu.edu

SIS Code: 16SWM

Plan Requirements

- A total of 16 hours (5 courses) is required for the minor. Four required courses (13 credit hours) and one SW Elective (3 credit hours).
- A grade of ‘C’ or better must be achieved in each class counting toward the minor and an overall GPA of 2.5 must be maintained in the minor courses.
- All courses in the minor must be taken for a letter grade. Credit only is not permitted.
- A maximum of six credit hours may be transferred into the minor from another CSWE-accredited institution. The Department of Social Work will determine which courses transferred from other institutions may qualify to meet requirements for the minor.
- A maximum of ONE (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>SW 201</td>
<td>Introduction to Social Work</td>
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<tr>
<td>SW 290</td>
<td>The Development of Social Welfare and Social Work in the U.S.</td>
<td>3</td>
</tr>
<tr>
<td>SW 307</td>
<td>Social Welfare Policy: Analysis and Advocacy</td>
<td>3</td>
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<td>SW 310</td>
<td>Human Behavior Theory for Social Work Practice</td>
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<table>
<thead>
<tr>
<th>Elective Courses</th>
<th>Hours</th>
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<tr>
<td>SW 312</td>
<td>Multicultural Social Work</td>
</tr>
<tr>
<td>SW 412</td>
<td>Social Work in Schools</td>
</tr>
<tr>
<td>SW 413</td>
<td>African American Families: History, Tradition, and Community</td>
</tr>
<tr>
<td>SW 415</td>
<td>Child Welfare</td>
</tr>
<tr>
<td>SW 416</td>
<td>Addiction Recovery and Social Work Practice</td>
</tr>
<tr>
<td>SW 417</td>
<td>Direct Practice with Older Adults</td>
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<tr>
<td>SW 420</td>
<td>The Legal Aspects of Social Work</td>
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<tr>
<td>SW 495</td>
<td>Special Topics in Social Work</td>
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<tr>
<td>SW 498</td>
<td>Independent Studies in Social Work</td>
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</tbody>
</table>

Total Hours: 16

1 Denotes special topics or new courses. Different letters designate each separate course offering (i.e., 495A, 495B). Check with the professor teaching the course or Suzy Lamb as listed below for more information.

2 Individual student class topic and research designed in consultation with a faculty member. Requires departmental approval. For more information contact Suzy Lamb as listed below.

College of Natural Resources

For more information about this college, including contact information, visit the college (http://www.cnr.ncsu.edu).

NCSU Box 8001
Raleigh, NC 27695-8001

NC State University College of Natural Resources

Bringing science, technology, policy and people together to work for a healthy and sustainable tomorrow.

Vision

We desire to improve the sustainability of the world’s natural resources and improve the economic and social condition of its people through education, innovation, and the discovery and dissemination of new knowledge.

Mission

Our mission is to serve as a leader in our disciplines in North Carolina, the nation and the world. We seek to strengthen natural resource management, enhance environmental quality and conservation values, increase the sustainable yield of forestland goods and services, increase the value and competitiveness of the forest products and natural resource-based industries, expand recreation and tourism opportunities, and enhance the health and well being of our citizens through superior professional education, innovative scientific research, and dissemination of credible and timely information.

Values

We value—

- Academic excellence in all of its forms—the scholarships of discovery, teaching, information transfer and scientific integration.
• Both cutting-edge research in fundamental science and translational research to address practical problems in North Carolina, the nation and the world.
• Diversity of disciplines, people, places and ideas
• Our students, staff and faculty and are committed to nurturing all.

We admire— academic and scientific rigor and dedication
We seek— innovative and creative solutions to today’s problems.
We strive— for collegiality and appreciate friendly service.
We aspire— to leadership in all of our disciplines.
We intend— to make the world a better place for this and future generations.

Student Activities
Each department in the college has student curriculum clubs within the degree programs and/or student chapters of the appropriate national professional organizations. All of these organizations provide opportunities for professional development, for interaction with faculty and other students, and for participation in local, regional, and national student and professional activities. Student representatives from each organization and curriculum serve on the College of Natural Resources Council. The Council provides overall coordination for student activities, allocates funds for student activities, and oversees production of the Pinetum, the College of Natural Resources student yearbook.

CNR Ambassadors
The CNR Ambassador Program highlights the “student face” of the college. The group is composed of leaders from each program in the college, following a college-wide nomination and selection process. Their activities include representing the college in many ways, ranging from mentoring freshmen to working with prospective students, through shadowing experiences, phone calls and campus tours. In addition the Ambassadors represent their programs and the college to outside visitors, such as the Board of Trustees, Foundation officers, and others who would like to know about the CNR student experience at NC State.

Facilities and Laboratories
In addition to standard classrooms and teaching laboratories, the College of Natural Resources has a unique complex of indoor and field facilities that are utilized in the academic programs. CNR computer facilities provide access to disciplinary applications such as geographic information systems, remote sensing, process simulation, and management/planning software as well as to the university computer network. Included are a general computer lab, two classrooms incorporating a flexible landscape, plasma screens and laptop computers providing the breadth of teaching/learning approaches, a high-tech “collaboratory” designed especially for student team project work. Also available are several different analytical and biotechnology facilities, an extensive herbarium, and a wood sample collection. About 95,000 acres of forestland are available for field instruction and research at Chowan Swamp, Bull Neck Swamp, Goodwin Forest, Hill Forest, Hofmann Forest, Hosley Forest and Schenck Forest, Slocum Camp, the site of the annual forestry and wildlife camps at Hill Forest, contains classrooms, dining facilities, and student and staff housing. Specialized pilot plant laboratories unique to wood and paper science are contained in the Hodges Wood Products Laboratory and the Reuben B. Robertson Pulp and Paper Laboratory. Equipment in the Hodges Laboratory includes computer controlled woodworking machinery, testing for biomaterials, 3-D printer, life cycle analysis software, and numerous other items required to convert sustainable materials into viable products. The Robertson Laboratory is a 50,000 sq. ft. facility, which contains laboratories and modern pulping and papermaking equipment dedicated to teaching and research activities. Examples of equipment are secondary fiber recycling equipment, a thermo-mechanical pulping unit, a pilot-scale paper machine, process control equipment, paper testing laboratory, and pulping digesters.

Fields of Instruction and Work Experience
All curricula in the college have strong components of hands-on field and laboratory instruction and experience, and all either require or strongly recommend on-the-job work experience. All students are required to complete the equivalent of one or more of the following summer activities: camp, internship, practicum, and work experience. The Forest Management and Fisheries, Wildlife, and Conservation Biology curricula both have required summer camps. Undergraduates enrolled in Parks, Recreation and Tourism Management complete a 9-week internship immediately following the completion of the junior year. All Paper Science majors complete a 12-week internship in an industrial setting approved by the college. Sustainable Materials and Technology students are required to complete a summer internship in the industry. Students in all curricula are encouraged to participate in summer jobs and the cooperative education program to gain work experience.

Outdoor and other practical laboratories are a regular part of some courses. In other courses, field instruction may include longer trips (often on weekends) to privately owned businesses and industries, governmental agencies, state and federal forests, and wildlife refuges.

Honors and Scholars Programs
The College of Natural Resources participates in the University Honors Program, the University Scholars Program, the Women in Science and Engineering (WISE) Program, and the Eco-Village Program in which exceptional new students (freshman or transfer) are selected for special courses and activities that provide an expanded educational experience.

The College of Natural Resources also offers a disciplinary honors program, which provides the opportunity for advanced students with outstanding records to enhance the depth of study in their major field. Students with an overall GPA of 3.0 or better and a major GPA of 3.25 or better are invited to participate in the Honors Program. Students must have at least 40 hours of credit. Honors students develop more rigorous programs of study, frequently taking advanced courses in mathematics, science, or social science, or graduate courses in the chosen curriculum. With the adviser’s consent honors students may substitute preferred courses for normally required courses in order to develop strength in special interest areas. Honors students are required to undertake a program of independent study, which can involve a research problem or special project during their junior or senior year, and they must participate in the senior honors seminar.

Two honor societies in the College of Natural Resources promote and recognize academic excellence: Xi Sigma Pi (for majors within Forestry and Environmental Resources and in Forest Biomaterials) and Rho Phi Lambda (for recreation majors). Advanced undergraduate and graduate students with high academic achievement are invited to become members of these societies. High achieving forest management and natural resources students are also eligible for recognition by two agriculture honor societies, Alpha Zeta and Gamma Sigma Delta. All
students are also eligible for recognition by the campus-wide honor societies.

Scholarships
The College of Natural Resources administers a large program of academic scholarships that is separate from the University Merit Awards Program. About 170 academic scholarships (ranging from $1,000 to $10,000 per year), renewable annually, are awarded in several program areas to new, continuing, and transfer students. The scholarships are awarded based on academic excellence and leadership.

Computer Competency
Extensive use of computers and workstations is incorporated throughout all curricula of the College of Natural Resources. Students are expected to use the computer for increasingly complex class assignments and for the preparation of papers and reports. Computing resources are available for student use in the college and elsewhere on campus, but many students find it more convenient to purchase a personal computer. Questions about such purchases should be directed to the Associate Dean for Academic Affairs or the appropriate departmental curriculum coordinator.

International Activities
Students in the College of Natural Resources are exposed to the international dimensions of their programs in a variety of ways. Many faculty members regularly travel abroad and a number are active in major projects in foreign countries, including an international cooperative research project concentrating on Central American and Mexico, faculty exchange programs with Sweden and Finland, and several recent agreements for student exchange programs in Asia and South America. With the faculty’s experiences, the international aspects of many topics are covered in core courses, and several elective undergraduate and graduate courses focus specifically on the international dimensions of natural resource management. In addition, many international students enroll in the college with as many as 21 different countries represented in recent years. There are also in-the-major study abroad opportunities, which are led by CNR faculty, and which range from two-week trips to five-week summer sessions. Recent study trips have included China, Australia, Namibia, Ghana, Sweden, Costa Rica, and Chile. There is also scholarship support to help students take advantage of international job opportunities.

Faculty
Dean
Dr. Myron Floyd, Interim Dean

Assistant Dean for Academic Affairs
Dr. Melissa Pasquinelli

Associate Dean for Extension
Dr. Bob Bardon

Assistant Dean for Research
Dr. Marian McCord

Assistant Dean for College Advancement
Laura Brown de Fuenmayor

Assistant Dean for Finance and Business
Shane Jarvis

Director
Sam Cook, Executive Director of Forest Assets
Sarah Corica, Director of Marketing and Communications
Joshua Gira, Director of Information and Instructional Technology
Dr. Shaefny Grays, Interim Director of Community and Diversity
Yvonne Lee, Director of Academic and Student Affairs
Rory Loycano, Director of Research Administration
Tiffany McLean, Director of Recruitment and Student Engagement
Mohan Ramaswamy, Director of Natural Resources Library

Departments
• Department of Forest Biomaterials (p. 1225)
• Department of Forestry and Environmental Resources (p. 1239)
• Department of Parks, Recreation and Tourism Management (p. 1294)

Majors
• Environmental Sciences (BS) (p. 1240)
• Environmental Technology and Management (BS) (p. 1246)
• Fisheries, Wildlife, and Conservation Biology (BS): Conservation Biology Concentration (p. 1249)
• Fisheries, Wildlife, and Conservation Biology (BS): Fisheries Science Concentration (p. 1252)
• Fisheries, Wildlife, and Conservation Biology (BS): Wildlife Science Concentration (p. 1256)
• Forest Management (BS) (p. 1258)
• Forest Management (BS): Ecology Concentration (p. 1269)
• Forest Management (BS): Production Concentration (p. 1277)
• Natural Resources (BS): Ecosystem Assessment Concentration (p. 1285)
• Natural Resources (BS): Policy and Administration Concentration (p. 1288)
• Paper Science and Engineering (BS) (p. 1226)
• Paper Science and Engineering (BS): Dual Major (p. 1229)
• Parks, Recreation and Tourism Management (BS): Parks and Natural Resource Recreation Concentration (p. 1295)
• Parks, Recreation, and Tourism Management (BS): Program Management Concentration (p. 1298)
• Parks, Recreation, and Tourism Management (BS): Sustainable Tourism Concentration (p. 1301)
• Professional Golf Management (BS) (p. 1304)
Minors

- Environmental Education (Minor) (p. 1294)
- Environmental Sciences (Minor) (p. 1245)
- Forest Management (Minor) (p. 1284)
- Parks, Recreation, and Tourism Management (Minor) (p. 1304)
- Pulp and Paper Technology (Minor) (p. 1232)
- Renewable Energy Assessment (Minor) (p. 1293)
- Sustainable Materials and Technology (Minor) (p. 1239)
- Wetland Assessment (Minor) (p. 1293)
- Wildlife Sciences (Minor) (p. 1294)

Certificates

- Renewable Energy Assessment (Certificate) (p. 1292)

Department of Forest Biomaterials

Sustainable, renewable forest biomaterials such as wood, paper and value-added biomaterials are produced by large and small industries across North Carolina, and throughout the US. These renewable biomaterials are used for construction of sustainable housing, low carbon bioenergy, recyclable pulp and paper products, and value-added chemicals and composites. The future is bright for students with a blend of engineering, materials science, and practical business skills that are highly valued by employers.

The Department of Forest Biomaterials offers two curricula leading to Bachelor of Science degrees - Paper Science and Engineering, and Sustainable Materials and Technology. Both curricula feature small classes, extensive interactions between faculty and students, opportunities for internships, co-ops and undergraduate research, and stress the professional development of all students. Graduates are exceptionally well prepared for rewarding professional careers with large or small companies in the renewable biomaterials industries, suppliers to the industry, or with government agencies.

Faculty

Head
M. Hakovirta

Directors
M.V. Byrd, Director of Undergraduate Programs, Paper Science & Engineering
V. Chiang, Co-Director, Forest Biotechnology Group
P.N. Peralta, Director of Sustainable Materials

J. Piercy, Director of Student Recruiting, Executive Director of the Pulp & Paper Foundation

Professors
D. Argyropoulos
M. Hakovirta
M. Hubbe
H. Jameel
S.S. Kelley, Reuben B. Robertson Professor
M.G. McCord
M.A. Pasquinelli, University Faculty Scholar
O.J. Rojas
D.C. Tilotta
R.A. Venditti

Professor Emeriti
H.M. Chang
V. Chiang
E. Funkhouser
M. Kocurek
E.A. Wheeler

Adjunct Professor
S. Banerjee
M. Joyce

Associate Professor
M.V. Byrd
L.A. Lucia
L. Pal
S. Park, EJ Woody Rice Associate Professor, University Faculty Scholar
J.J. Pawlak
P.N. Peralta
I.S. Peszlen
D.E. Saloni

Assistant Professor
R. Gonzalez, University Faculty Scholar
Within a few years after graduation, alumni of the Paper Science & Engineering program at NC State University will be:

- Effective engineers and leaders in the paper, chemical process, and related industries.
- Professionals who act in a safe and ethical manner.
- Lifelong learners who pursue opportunities to continue their education.

**Summer Internship**

All Paper Science and Engineering majors are required to work one summer in a pulp or paper manufacturing facility. One hour of academic credit is granted after completion of 12 weeks of this work and presentation of an engineering report of professional quality. In addition, students are urged to work in manufacturing facilities the other two summers, as the work provides valuable practical experience. Departmental advisers assist students in locating summer jobs, which are found throughout the US and abroad.

Many Paper Science & Engineering students work at least one co-op rotation, in which they leave school for one semester and work in the industry. The resulting experience adds significantly to a student’s desirability upon graduation.

**Accredited Program**


**Regional Program**

The Paper Science and Engineering curriculum is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field.

**Scholarships**

Approximately 125 undergraduate academic scholarships worth approximately $300,000 are granted annually to new and continuing students by companies comprising the Pulp and Paper Foundation, and by alumni and supporters of the program.

**Plan Requirements**

**Paper Science and Engineering (BS): 128 Total Units**

<table>
<thead>
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<th>Course</th>
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<th>Hours</th>
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<tr>
<td><strong>First Year</strong></td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>&amp; CH 102</td>
<td>and General Chemistry Laboratory</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>4</td>
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<tr>
<td>&amp; CH 202</td>
<td>and Quantitative Chemistry Laboratory</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PY 206</td>
<td>and Physics for Engineers and Scientists I</td>
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<td>PSE 201</td>
<td>Pulping and Papermaking Technology</td>
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<td>Acad Writing Research (p. 1227)</td>
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<td>Economics Elective (p. 1227)</td>
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<td><strong>Second Year</strong></td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
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<td>&amp; CH 222</td>
<td>and Organic Chemistry I Lab</td>
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<tr>
<td>CH 223 &amp; CH 224</td>
<td>Organic Chemistry II and Organic Chemistry II Lab</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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<tr>
<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>PSE 212</td>
<td>Paper Properties ¹</td>
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<td>PSE 371</td>
<td>Pulping Process Analysis ¹</td>
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<td>Third Year</td>
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<td>MAE 201</td>
<td>Engineering Thermodynamics I</td>
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<tr>
<td>PSE 322</td>
<td>Wet End and Polymer Chemistry</td>
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<td>PSE 332</td>
<td>Wood and Pulping Chemistry</td>
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<tr>
<td>PSE 355</td>
<td>Pulp and Paper Unit Processes I ¹</td>
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<td>PSE 360</td>
<td>Pulp and Paper Unit Processes II</td>
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<tr>
<td>PSE 370</td>
<td>Pulp and Paper Products and Markets</td>
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<td>Pulp and Paper Internship</td>
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<td>Process Design and Analysis</td>
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<td>PSE 417</td>
<td>Modeling &amp; Simulation of Pulp &amp; Paper Processes</td>
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<tr>
<td>PSE 465</td>
<td>Process Engineering</td>
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<td>PSE 472</td>
<td>Paper Process Analysis</td>
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<td>PSE 475</td>
<td>Process Control in Pulp and Paper</td>
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<tr>
<td>PSE 425</td>
<td>Bioenergy &amp; Biomaterials Engineering</td>
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¹ A grade of C- or better is required.
² A grade of C or better is required.

### Acad Writing Research

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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>FLE 101</td>
<td>Academic Writing and Research</td>
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### Transfer Sequence

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<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<tr>
<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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### Economics Electives

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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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</tr>
<tr>
<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
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</tr>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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### Engineering Electives

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<tbody>
<tr>
<td>BAET 411</td>
<td>Agricultural Machinery and Power Units</td>
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<td>CE 214</td>
<td>Engineering Mechanics-Statics</td>
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<td>CHE 225</td>
<td>Introduction to Chemical Engineering Analysis</td>
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<td>ECE 331</td>
<td>Principles of Electrical Engineering</td>
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<td>MAE 206</td>
<td>Engineering Statics</td>
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<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials</td>
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<tr>
<td>TE 200</td>
<td>Introduction to Polymer Science and Engineering</td>
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### Advised Electives

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<tbody>
<tr>
<td>ACC 200</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
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**Semester Sequence**

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<td>Modeling &amp; Simulation of Pulp &amp; Paper Processes</td>
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principles can be obtained from the Chemical Engineering Concentration. Students who have completed the Chemical Engineering Concentration in Paper Science and Engineering can, in cooperation with the College of Engineering and with an additional semester of study, earn a Bachelor of Science in Chemical Engineering as a second degree.

Program Educational Objectives

Within a few years after graduation, alumni of the Paper Science & Engineering Program at NC State University will be:

- Effective engineers and leaders in the paper, chemical process, and related industries.
- Professionals who act in a safe and ethical manner.
- Lifelong learners who pursue opportunities to continue their education.

Summer Internship

All Paper Science and Engineering majors are required to work one summer in a pulp or paper manufacturing facility. One hour of academic credit is granted after completion of 12 weeks of this work and presentation of an engineering report of professional quality. In addition, students are urged to work in manufacturing facilities other two summers, as the work provides valuable practical experience. Departmental advisers assist students in locating summer jobs, which are found throughout the US and abroad.

Many Paper Science & Engineering students work at least one co-op rotation, in which they leave school for one semester and work in the industry. The resulting experience adds significantly to a student’s desirability upon graduation.

Accredited Program


Regional Program

The Paper Science and Engineering curriculum is a regional program approved by the Southern Regional Education Board as the undergraduate program to serve the Southeast in this field.

Scholarships

Approximately 125 undergraduate academic scholarships worth approximately $300,000 are granted annually to new and continuing students by companies comprising the Pulp and Paper Foundation, and by alumni and supporters of the program.

Plan Requirements

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1. A grade of C or better is required.
2. A grade of C- or better is required.

**Code**

**Title**

**Hours**

**GEP Courses**

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**Chemistry Electives**

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BCH 351</td>
<td>General Biochemistry</td>
<td>3</td>
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<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CH 315</td>
<td>Quantitative Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CH 316</td>
<td>Quantitative Analysis Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 331</td>
<td>Introductory Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CH 335</td>
<td>Principles of Green Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CH 437</td>
<td>Physical Chemistry for Engineers</td>
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<tr>
<td>FS 402</td>
<td>Chemistry of Food and Bioprocessed Materials</td>
<td>4</td>
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<tr>
<td>FS 403</td>
<td>Analytical Techniques in Food &amp; Bioprocessing Science</td>
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<tr>
<td>FS 502</td>
<td>Chemistry of Food and Bioprocessed Materials</td>
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### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
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<td>PCC 464</td>
<td>Chemistry of Polymeric Materials Laboratory</td>
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<td>PSE 335</td>
<td>Principles of Green Chemistry</td>
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### Course Title Hours

#### First Year

**Fall Semester**

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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<td>ENG 101</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Hours 15**

**Spring Semester**

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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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**Hours 18**

#### Second Year

**Fall Semester**

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<tr>
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**Hours 17**

**Spring Semester**

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<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
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<td>CHE 225</td>
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<td>PSE 371</td>
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**Hours 17**

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<td>CHE 315</td>
<td>Chemical Process Thermodynamics</td>
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<td>PSE 211</td>
<td>Pulp and Paper Internship</td>
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<td>PSE 322</td>
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**Hours 18**

**Spring Semester**

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<td>Thermodynamics of Chemical and Phase Equilibria</td>
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<td>Wood and Pulping Chemistry</td>
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<td>PSE 360</td>
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<td>Pulp and Paper Products and Markets</td>
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**Hours 15**

#### Fourth Year

**Fall Semester**

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<td>PSE 417</td>
<td>Modeling &amp; Simulation of Pulp &amp; Paper Processes</td>
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<td>PSE 425</td>
<td>Bioenergy &amp; Biomaterials Engineering</td>
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<td>PSE 475</td>
<td>Process Control in Pulp and Paper</td>
<td>3</td>
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<td>GEP Requirement (p. 1417)</td>
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<td>GEP Requirement (p. 1417)</td>
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**Hours 18**

**Spring Semester**

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<td>PSE 465</td>
<td>Process Engineering</td>
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<td>PSE 472</td>
<td>Paper Process Analysis</td>
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<td>GEP Interdisciplinary Perspectives Requirement</td>
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**Hours 14-15**

#### Fifth Year

**Fall Semester**

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<td>CHE 330</td>
<td>Chemical Engineering Lab I</td>
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<td>CHE 446</td>
<td>Design and Analysis of Chemical Reactors</td>
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<td>GEP Requirement (p. 1417)</td>
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<tr>
<td>ECE 331</td>
<td>Principles of Electrical Engineering or Structure and Properties of Engineering Materials</td>
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**Hours 13**

**Total Hours 145-146**

1. Grade of C (2.0) or higher required.
2. Minimum grade of C- required.

### Career Opportunities

Graduates of this curriculum find opportunities for challenging careers as process engineers, product development engineers, process control engineers, chemists, technical service engineers, quality control supervisors, and production supervisors. Design and construction
engineering companies employ graduates as project engineers, and pulp and paper machinery/chemical companies use their education and skills for technical service and sales positions. Opportunities for managerial and executive positions are available to graduates as they gain experience.

The broad and intensive nature of this curriculum makes graduates attractive not only to the pulp and paper industry, but also to a variety of other major chemical process and bio-energy industries. This appeal is especially true for the dual degree in Paper Science & Engineering and Chemical Engineering.

**Pulp and Paper Technology (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgaas/)

The Pulp and Paper Technology Minor is available to all undergraduate students enrolled in the University as degree candidates, except Pulp and Paper Technology majors. The minor is focused on papermaking science and technology and is intended to be especially valuable to students majoring in programs leading to careers in corporate or government positions which would interface with the paper related industries. Students interested in business, scientific or engineering specialties which may interface with or be employed by these industries will find the minor especially useful.

Six hours of required courses provide a comprehensive overview of pulping and papermaking science and technology, including pulping, bleaching, chemical recovery, recycled fibers, stock preparation, papermaking, coating, printing, converting, and paper properties. Nine elective hours may be chosen from areas including wood chemistry, wet end chemistry, unit operations, process design and analysis, project management, paper physics, process control, or to gain more in depth exposure to the basic pulping, bleaching and papermaking processes.

**Admissions and Certification of Minor**

All undergraduate students enrolled in the University as a degree candidate, other than PPT majors, are eligible for admission to the PPT minor program. Dr. Med Byrd will serve as advisor and certify completion of the minor. Paperwork for certification can be found in 2205 Pulp & Paper Labs and must be submitted to the minor advisor no later than the registration period of the student’s final semester at NC State. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

**Contact Person**

Dr. Med Byrd  
2205 Pulp & Paper Labs  
919.515.5790  
med_byrd@ncsu.edu

**SIS Code: 15PPM**

**Plan Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PSE 201</td>
<td>Pulping and Papermaking Technology</td>
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</tr>
<tr>
<td>PSE 212</td>
<td>Paper Properties</td>
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<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSE 212</td>
<td>Paper Properties</td>
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</table>

**Elective Courses**

Select three of the following:

- PSE 322 Wet End and Polymer Chemistry
- PSE 332 Wood and Pulping Chemistry
- PSE 355 Pulp and Paper Unit Processes I
- PSE 360 Pulp and Paper Unit Processes II
- PSE 371 Pulping Process Analysis
- PSE 415 Paper Industry Strategic Project Analysis
- PSE 416 Process Design and Analysis
- PSE 465 Process Engineering
- PSE 472 Paper Process Analysis
- PSE 475 Process Control in Pulp and Paper

Total Hours: 15

**Note:** Some of the above courses have prerequisites. Permission to waive those prerequisites must be obtained from the course instructor after evaluation of the student’s academic background.

**Sustainable Materials and Technology (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgaas/)

Perry N. Peralta  
Director of Undergraduate Programs  
perry_peralta@ncsu.edu

The Sustainable Materials & Technology degree prepares students for 21st century jobs helping businesses and communities reduce their ecological footprint through efficient use of renewable natural materials, such as wood, bamboo and cork, in the manufacture and use of value-added products. You'll gain a strong foundation in environmental science, economics, social sciences, and materials science which prepares you to design, manufacture and sell sustainable bio-based products. This degree is for students interested in a career in a growing field with job flexibility, high placement rates, great starting salaries, a tradition of success and an unlimited future.

**Summer Internship**

Graduates of the Sustainable Materials and Technology program enter the real world with hands-on experience gained through internships, lab experiments, and practical coursework. More than one half of students participate in paid undergraduate research and work study opportunities. In addition, students are required to complete a paid summer internship or a semester co-op with a company in the industry. There are many other summer employment opportunities that are available to you beyond the required internship.

**Plan Requirements**

**Sustainable Materials and Technology: 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENV 100</td>
<td>Student Success in Environmental First Year &amp; ENV 101</td>
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<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
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</table>
SMT 200  Introduction to Sustainable Materials and Technology  3
SMT 203  Physical Properties of Sustainable Materials  4
SMT 210  Sustainable Materials Internship  1
SMT 301  Chemistry of Sustainable Materials  3
SMT 302  Processing of Biomaterials  4
SMT 320  Industrial Chemical Pollutants  2
SMT 441  Mechanical Properties of Sustainable Materials  4
SMT 444  Sustainable Composites and Biopolymers  3
SMT 450  Sustainable Business and Innovation  2
SMT 483  Capstone in Sustainable Materials and Technology  3
PSE 476  Environmental Life Cycle Analysis  3
MIE 201  Introduction to Business Processes  3
EC 205  Fundamentals of Economics  3
ISE 311  Engineering Economic Analysis  3

Select one of the following:
PS 320  U.S. Environmental Law and Politics
PS 336  Global Environmental Politics
ARE 309  Environmental Law & Economic Policy
IDS 201  Environmental Ethics  3

Mathematics & Natural Sciences
Select one of the following Calculus courses:
MA 121  Elements of Calculus  3
MA 131  Calculus for Life and Management Sciences A
MA 141  Calculus I
ST 311  Introduction to Statistics  3
CH 101  Chemistry - A Molecular Science  3
CH 102  General Chemistry Laboratory  1
CH 220  Introductory Organic Chemistry  3
CH 222  Organic Chemistry I Lab  1
Select one of the following Physics courses:
PY 205  Physics for Engineers and Scientists I
PY 206  Physics for Engineers and Scientists I Laboratory
PY 211  College Physics I
BIO 181  Introductory Biology: Ecology, Evolution, and Biodiversity  4

Concentration Requirements
Technical Electives (p. 1233)  15
Advised Electives  2  18

General Education Program (GEP) Courses
ENG 101  Academic Writing and Research  1  4
GEP Humanities (p. 1423)  6
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP Health and Exercise Studies (p. 1422)  2
GEP U.S. Diversity (p. 1431) (Verify Requirement)
GEP Global Knowledge (p. 1419) (Verify Requirement)
Foreign Language Proficiency (p. 1417) (Verify Requirement)

Total Hours  120

1 A grade of C- or better is required.
2 Students should consult their academic advisors to determine how to complete this requirement.

Technical Electives

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<td>Introduction to Managerial Accounting</td>
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<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<td>ACC 230</td>
<td>Individual Income Taxation</td>
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<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
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<td>ACC 310</td>
<td>Intermediate Financial Accounting I</td>
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<td>ACC 311</td>
<td>Intermediate Financial Accounting II</td>
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<td>ACC 330</td>
<td>An Introduction To Income Taxation</td>
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<td>ACC 340</td>
<td>Accounting Information Systems</td>
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<td>ACC 411</td>
<td>Business Valuation</td>
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<td>ACC 420</td>
<td>Cost Accounting for Effective Management</td>
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<td>Enterprise Resource Planning Systems</td>
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<td>Auditing and Assurance Services</td>
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<td>ACC 533</td>
<td>Accounting and Tax Research</td>
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<td>ACC 550</td>
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<td>ACC 560</td>
<td>Tools for Tax Analytics</td>
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<td>ACC 562</td>
<td>Forecasting Effective Tax Rates and Scenario</td>
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<td>Database Management Applications in Tax</td>
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<td>Enterprise Resource Planning for Tax</td>
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<td>Analysis of Unstructured Data in Tax</td>
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<td>Data Security and Warehousing in Tax</td>
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**ISE 305** A Closer Look at Capitalism 3
**ISE 336** Introduction to Resource and Environmental Economics 3
**ISE 348** Introduction to International Economics 3
**EC 351** Econometrics I 3
**ISE 404** Money, Financial Markets, and the Economy 3
**ISE 410** Public Finance 3
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**ISE 431** Labor Economics 3
**ISE 437** Health Economics 3
**ISE 449** International Finance 3
**ISE 451** Econometrics II 3
**ISE 468** Game Theory 3
**ISE 474** Economics of Financial Institutions and Markets 3
**ISE 480** Introduction to Economic Research 3
**ISE 490** Research Seminar in Economics 3
**ISE 495** Special Topics in Economics 1-6
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**ECE 460** Embedded System Architectures 3
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**ECE 514** Random Processes 3
**ECE 517** Object-Oriented Design and Development 3
**ECE 547** Cloud Computing Technology 3
**ECE 560** Embedded System Architectures 3
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**ECE 573** Internet Protocols 3
**ECE 574** Computer and Network Security 3
**ECE 575** Introduction to Wireless Networking 3
**ECE 576** Networking Services: QoS, Signaling, Processes 3
**ECE 577** Switched Network Management 3
**ECE 579** Introduction to Computer Performance Modeling 3
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**GC 120** Foundations of Graphics 3
**GC 250** Architectural Graphic Communications 3
**GC 320** 3D Spatial Relations 3
**GC 330** Basic Technical Animation 3
**GC 340** Concepts of Website Development 3
**GC 350** Applied CAD/D and Geometric Controls 3
**GC 420** Visual Thinking 3
**GC 450** Advanced Graphics Usage with CAD 3
**GC 496** Special Topics in Graphic Communications 1-4
**GC 498** Independent Study in Graphic Communications 1-4
**ISE 135** Computer-Based Modeling for Engineers 3
**ISE 215** Foundations of Design & 3D Modeling for Engineers 1
**ISE 216** Product Development and Rapid Prototyping 3
**ISE 311** Engineering Economic Analysis 3
**ISE 315** Introduction to Computer-Aided Manufacturing 1
**ISE 316** Manufacturing Engineering I - Processes 3
**ISE 352** Fundamentals of Human-Machine Systems Design 3
**ISE 361** Deterministic Models in Industrial Engineering 3
**ISE 362** Stochastic Models in Industrial Engineering 3
**ISE 408** Design and Control of Production and Service Systems 3
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**ISE 416** Manufacturing Engineering II - Automation 3
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**ISE 435** Python Programming for Industrial & Systems Engineers 3
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**ISE 441** Introduction to Simulation 3
**ISE 443** Quality Design and Control 3
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**ISE 453** Modeling and Analysis of Supply Chains 3
**ISE 462** Advanced Stochastic Models in Industrial Engineering 3
**ISE 489** Special Topics in Industrial and Systems Engineering 1-3
**ISE 495** Project Work in Industrial Engineering 1-3
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**ISE 501** Introduction to Operations Research 3
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**ISE 519** Database Applications in Industrial and Systems Engineering 3
**ISE 520** Healthcare Systems Performance Improvement I 3
**ISE 521** Healthcare Systems Performance Improvement II 3
**ISE 535** Python Programming for Industrial & Systems Engineers 3
**ISE 540** Human Factors In Systems Design 3
**ISE 541** Occupational Safety Engrg 3
**ISE 543** Musculoskeletal Mechanics 3
**ISE 544** Occupational Biomechanics 3
**ISE 546** Management Decision and Control Systems 3
**ISE 552** Design and Control of Production and Service Systems 3
**ISE 553** Modeling and Analysis of Supply Chains 3
**ISE 560** Stochastic Models in Industrial Engineering 3
**ISE 562** Simulation Modeling 3
**ISE 589** Special Topics In Industrial Engineering 1-6
**ISE 714** Product Manufacturing Engineering for the Medical Device Industry 3
**M 100** Personal and Professional Identity Development 1
**MA 416** Introduction to Combinatorics 3
**MA 427** Introduction to Numerical Analysis I 3
**MA 428** Introduction to Numerical Analysis II 3
**MA 505** Linear Programming 3
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<th>Hours</th>
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<tbody>
<tr>
<td>SMT 210</td>
<td>Sustainable Materials Internship</td>
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**Third Year**

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<tbody>
<tr>
<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
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<tr>
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**Spring Semester**

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<tr>
<td>SMT 302</td>
<td>Processing of Biomaterials</td>
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<tr>
<td>SMT 320</td>
<td>Industrial Chemical Pollutants</td>
<td>2</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Science/ Visual and Performing Arts)</td>
<td>3</td>
<td></td>
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<tr>
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<tr>
<td>Technical Elective (p. )</td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>3</td>
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<tr>
<td>Advised Elective</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Technical Elective (p. )</td>
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**Spring Semester**

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<thead>
<tr>
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<th>Hours</th>
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<tbody>
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</tr>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Science/ Visual and Performing Arts)</td>
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<tr>
<td>Advised Elective</td>
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</tr>
<tr>
<td>Technical Elective (p. )</td>
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</table>
participate in paid undergraduate research and work study opportunities. Experiments, and practical coursework. More than one half of students participate in paid undergraduate research and work study opportunities. Graduates of the Sustainable Materials and Technology program enter the real world with hands-on experience gained through internships, lab experiences, and practical coursework. More than one half of students participate in paid undergraduate research and work study opportunities. Summer Internship

Graduates of the Sustainable Materials and Technology program enter the real world with hands-on experience gained through internships, lab experiences, and practical coursework. More than one half of students participate in paid undergraduate research and work study opportunities. In addition, students are required to complete a paid summer internship or a semester co-op with a company in the industry. There are many other summer employment opportunities that are available to you beyond the required internship.

Plan Requirements

Sustainable Materials and Technology: SMT Wood Products Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
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<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
<td>3</td>
</tr>
<tr>
<td>SMT 200</td>
<td>Introduction to Sustainable Materials and Technology</td>
<td>3</td>
</tr>
<tr>
<td>SMT 203</td>
<td>Physical Properties of Sustainable Materials</td>
<td>4</td>
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<tr>
<td>SMT 210</td>
<td>Sustainable Materials Internship</td>
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<tr>
<td>SMT 301</td>
<td>Chemistry of Sustainable Materials</td>
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<td>SMT 441</td>
<td>Mechanical Properties of Sustainable Materials</td>
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<td>SMT 444</td>
<td>Sustainable Composites and Biopolymers</td>
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<td>SMT 450</td>
<td>Sustainable Business and Innovation</td>
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<td>SMT 483</td>
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<tr>
<td>PSE 476</td>
<td>Environmental Life Cycle Analysis</td>
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<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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<tr>
<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
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<td>PS 336</td>
<td>Global Environmental Politics</td>
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<td>ARE 309</td>
<td>Environmental Law &amp; Economic Policy</td>
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Mathematics & Natural Sciences

Select one of the following Calculus courses: 3

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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
<td>3</td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PY 211</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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Concentration Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>SMT 202</td>
<td>Anatomy and Properties of Renewable Materials</td>
<td>3</td>
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<tr>
<td>SMT 206</td>
<td>Wood Manufacturing Site Visits</td>
<td>1</td>
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<tr>
<td>SMT 240</td>
<td>Introduction to Wood Products Industries</td>
<td>2</td>
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<tr>
<td>SMT 308</td>
<td>Wood Processing</td>
<td>4</td>
</tr>
<tr>
<td>Advised Electives</td>
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<td>15</td>
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</table>

1. A grade of C- or better is required.

2. Students should consult their academic advisors to determine how to complete this requirement.

Career Opportunities

Graduates of the Sustainable Materials and Technology curriculum have many and varied job opportunities upon graduation with most receiving more than one job offer. Graduates enter the industry as management trainees, sales trainees, process engineers, quality assurance specialist, research & development associates and many others.

Sustainable Materials and Technology (BS): SMT Wood Products Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! Perry N. Peralta
Director of Undergraduate Programs
perry_peralta@ncsu.edu

The Sustainable Materials & Technology degree prepares students for 21st century jobs helping businesses and communities reduce their ecological footprint through efficient use of renewable natural materials, such as wood, bamboo and cork, in the manufacture and use of value-added products. You'll gain a strong foundation in environmental science, economics, social sciences, and materials science which prepares you to design, manufacture and sell sustainable bio-based products. This degree is for students interested in a career in a growing field with job flexibility, high placement rates, great starting salaries, a tradition of success and an unlimited future.

Summer Internship

Graduates of the Sustainable Materials and Technology program enter the real world with hands-on experience gained through internships, lab experiments, and practical coursework. More than one half of students participate in paid undergraduate research and work study opportunities.
Advised IP Elective 2  2
Technical Electives 2  15

**General Education Program (GEP) Courses**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research 1</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>GEP Additional Breadth</td>
<td>(p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise</td>
<td>Studies (p. 1422)</td>
<td>2</td>
</tr>
<tr>
<td>GEP U.S. Diversity</td>
<td>(p. 1431) (Verify Requirement)</td>
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</tr>
<tr>
<td>GEP Global Knowledge</td>
<td>(p. 1419) (Verify Requirement)</td>
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<tr>
<td>Foreign Language Proficiency</td>
<td>(p. 1417) (Verify Requirement)</td>
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**Total Hours**  120

1 A grade of C- or better is required.
2 Students should consult their academic advisors to determine how to complete this requirement.

### Semester Sequence

This is a sample.

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td>Student Success in Environmental First Year and Exploring the Environment</td>
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<tr>
<td>&amp; ENV 101</td>
<td></td>
<td></td>
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<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
<td>3</td>
</tr>
<tr>
<td>SMT 200</td>
<td>Introduction to Sustainable Materials and Technology</td>
<td>3</td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus (CP)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>SMT 240</td>
<td>Introduction to Wood Products Industries</td>
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</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science (CP)</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory (CP)</td>
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<tr>
<td>PY 205</td>
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<tr>
<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
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**Second Year**

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<td>SMT 202</td>
<td>Anatomy and Properties of Renewable Materials (CP)</td>
<td>3</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry (CP)</td>
<td>3</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab (CP)</td>
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</tr>
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<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<tr>
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**Third Year**

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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>GEP Health and Exercise</td>
<td>Studies (p. 1422)</td>
<td>1</td>
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<tr>
<td>Advised Elective 2</td>
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<tbody>
<tr>
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<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
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<td>(p. 1417) (Humanities/Social Science/Visual and Performing Arts)</td>
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<tr>
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**Fourth Year**

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<td>Mechanical Properties of Sustainable Materials</td>
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<td>SMT 444</td>
<td>Sustainable Composites and Biopolymers</td>
<td>3</td>
</tr>
<tr>
<td>SMT 450</td>
<td>Sustainable Business and Innovation</td>
<td>2</td>
</tr>
<tr>
<td>PSE 476</td>
<td>Environmental Life Cycle Analysis</td>
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</tr>
<tr>
<td>Technical Elective 3</td>
<td></td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>SMT 483</td>
<td>Capstone in Sustainable Materials and Technology</td>
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<td>Environmental Law Elective</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>Technical Elective 3</td>
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<tr>
<td>Advised IP Elective 2</td>
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</table>

**Total Hours**  120-121

1 A grade of C- or better is required.
2 Courses should expand student’s sustainability portfolio and must be approved by a faculty advisor.
Student is encouraged to select courses that will fulfill an academic minor. Courses should enhance student's career objectives and must be approved by a faculty advisor.

Career Opportunities

Graduates of the Sustainable Materials and Technology curriculum have many and varied job opportunities upon graduation with most receiving more than one job offer. Graduates enter the industry as management trainees, sales trainees, process engineers, quality assurance specialist, research & development associates and many others.

Sustainable Materials and Technology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Forest Biomaterials (FB) offers a minor in Sustainable Materials and Technology (SMT) to all undergraduates enrolled in the University as degree candidates except those in FB. The minor will provide students with a basic understanding of sustainability as applied to materials (e.g., wood, agricultural products, etc.) and the manufacturing processes that are used to convert them into a multitude of different products.

Admission and Certification of Minor

In both instances, students should contact the minor advisor, Dr. Perry Peralta. Paperwork for certification can be found in 1022 Biltmore Hall and should be completed no later than the registration period for the student's final semester at NC State.

Contact Person

Dr. Perry Peralta
1022 Biltmore Hall
919.515.5731
perry_peralta@ncsu.edu

SIS Code: 15SMTM

Plan Requirements

- A minimum of 15 hours is required for completion of the minor, and the minor should be completed no later than the semester in which the student expects to graduate from his/her degree program.
- 3 courses are required as indicated below, other courses are elective.
- An overall GPA of 2.0 in the minor coursework must be achieved.

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>Required Courses</td>
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<tr>
<td>SMT 201</td>
<td>Sustainable Materials for Green Housing</td>
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<td>SMT 310</td>
<td>Introduction to Industrial Ecology</td>
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<td>PSE 476</td>
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<tr>
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<td>Elective Courses</td>
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<td>SMT 232</td>
<td>Recycling to Create a Sustainable Environment</td>
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<td>ET 203</td>
<td>Pollution Prevention</td>
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<td>ET 303</td>
<td>Laboratory Safety Systems and Management</td>
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<td>FOR 248</td>
<td>Forest History, Technology and Society</td>
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<tr>
<td>PSE 425</td>
<td>Bioenergy &amp; Biomaterials Engineering</td>
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</table>

Department of Forestry and Environmental Resources

Undergraduate programs in forestry and environmental resources incorporate many topics needed to make decisions about how society will interact with natural resources. Resources span aquatic, atmospheric, and terrestrial ecosystems upon which human lives depend. Faculty and students in the Department of Forestry and Environmental Resources study all of these resources and their interactions. As they plan for and assess impacts to natural resources, they integrate STEM and social science areas of study in multiple ways.

Five programs allow undergraduate students to focus study on the kinds of problems they want to solve:

- Environmental Technology and Management
- Environmental Science
- Fisheries, Wildlife and Conservation Biology
- Forest Management (Production and Ecology concentrations)
- Natural Resources (Ecosystem Assessment and Policy/Administration concentrations)

Department Highlights:

- Hands-on and field-based coursework throughout programs of study
- Strong emphasis on professional development, internships and experiential learning
- Generous scholarship support for students with proven academic credentials
- Broad range of research opportunities within and outside the academy
- Personal advising attention focused on students’ career opportunities

For more information examine our website or contact one of the following:

Dr. Gary B. Blank
gblank@ncsu.edu
Director of Undergraduate Programs
5229 Jordan Hall Addition

Ms. Kimber Lunsford
ktlunso@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall

Department of Forestry and Environmental Resources
Box 8008
North Carolina State University, Raleigh, North Carolina 27695-8008

Faculty

Plans

- Environmental Sciences (BS) (p. 1240)
- Environmental Sciences (Minor) (p. 1245)
Environmental Sciences (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

This area of study uses interdisciplinary approaches that link natural science and social science disciplines, and a knowledge of environmental systems and earth processes. Such interdisciplinary approaches are essential for understanding changes in a rapidly changing world, and for understanding our past, present, and future. Environmental scientists will help ensure human prospects by improving both socio-economic development and environmental quality through innovation in new technologies and policies.

Public interest about environmental issues is increasing. Protecting and improving the environment involves knowledge and systematic problem-solving skills that are essential for environmental sciences. North Carolina State University’s environmental sciences degree program provides sound, individualized academic programs for students who can develop a wide range of careers. For information on entrance requirements, contact the program coordinator:

Erin Champion
Department of Forestry and Environmental Resources, NCSU
Box 8008
Raleigh, NC 27695-8008
Phone: (919) 513-2520
E-mail: eachampi@ncsu.edu (terrie_litzenberger@ncsu.edu)

Plan Requirements

Environmental Sciences: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<td></td>
<td>Communication Skills (p. 1241)</td>
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<td></td>
<td>Mathematical Science and Physics</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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</table>

or MA 141

| MA 231 | Calculus for Life and Management Sciences B| 3     |
| or MA 241 | Calculus II |                           |       |
| Select one of the following: |                                           |       |
| PY 205 & PY 206 | Physics for Engineers and Scientists I | 4     |
|                  | and Physics for Engineers and Scientists I Laboratory |       |
| PY 211 | College Physics I                          |       |

Select one of the following: |                                           |       |
| PY 208 & PY 209 | Physics for Engineers and Scientists II | 4     |
|                  | and Physics for Engineers and Scientists II Laboratory |       |
| PY 212 | College Physics II                         |       |

Natural Sciences

| CH 101 | Chemistry - A Molecular Science          | 3     |
| CH 102 | General Chemistry Laboratory             | 1     |
| ES 100 | Introduction to Environmental Sciences ¹ | 3     |
| ES 111 | Applications of Environmental Sciences ¹ | 1     |
| ES 200 | Climate Change and Sustainability ¹      | 3     |
| ES 300 | Energy and Environment ¹                 | 3     |
| ES 400 | Analysis of Environmental Issues ¹       | 3     |
| ST 311 | Introduction to Statistics               | 3     |
| ST 312 | Introduction to Statistics II            | 3     |
| Economics Electives (p. 1244) |                                           | 3     |
| PS 320 | U.S. Environmental Law and Politics      | 3     |
| or PS 336 | Global Environmental Politics           |       |
| External Learning Experience (p. 1244) |                                           | 3     |

Focal Area

| ES Focal Area (See Advisor) ² |                                           | 15    |

Electives

| Advised Electives (See Advisor) ² |                                           | 9     |

General Education Program (GEP) Courses

| GEP Humanities (p. 1423) |                                           | 6     |
| GEP Health and Exercise Studies (p. 1422) |                                           | 2     |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) | | 3     |
| GEP U.S. Diversity (p. 1431) (Verify Requirements) | |       |
| GEP Global Knowledge (p. 1419) (Verify Requirements) | |       |
| Foreign Language Proficiency (p. 1417) GEP Global Knowledge (p. 1419) (Verify Requirements) | |       |

Free Electives

|                |                                           |       |

¹ Required for the major.
² Listed electives are general guidelines and are subject to change.

For more information, please visit the Environmental Sciences program website.
Free Electives (12 Hr S/U Lmt)  
Total Hours  

1 A grade of C- or better is required.
2 Students should consult their academic advisors to determine how to complete this requirement.
3 Students should consult their academic advisors to determine which courses fill this requirement.

Communication Skills Electives

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- ENG 266 American Literature II 3
- ENG 267 LGBTQI Literature in the U.S. 3
- ENG 275 Literature and War 3
- ENG 281 Introduction to Creative Nonfiction 3
- ENG 282 Introduction to Film 3
- ENG 287 Explorations in Creative Writing 3
- ENG 288 Fiction Writing 3
- ENG 289 Poetry Writing 3
- ENG 292 Writing About Film 3
- ENG 298 Special Projects in English 1-3
- ENG 305 Women and Literature 3
- ENG 308 Contemporary Issues in Ecofeminism 3
- ENG 314 Technical Document Design and Editing 3
- ENG 315 Phonetics 3
- ENG 316 Introduction to News and Article Writing 3
- ENG 317 Designing Networked Communications 3
- ENG 321 Survey of Rhetorical Theory 3
- ENG 323 Writing in the Rhetorical Tradition 3
- ENG 324 Modern English Syntax 3
- ENG 325 Spoken and Written Traditions of American English Dialects 3
- ENG 326 History of the English Language 3
- ENG 327 Language and Gender 3
- ENG 328 Language and Writing 3
- ENG 329 Language and Globalization 3
- ENG 330 Screenwriting 3
- ENG 331 Communication for Engineering and Technology 3
- ENG 332 Communication for Business and Management 3
- ENG 333 Communication for Science and Research 3
- ENG 335 Language Development 3
- ENG 338 Speech Science 3
- ENG 339 Literature and Technology 3
- ENG 340 Literature, Art, and Society 3
- ENG 341 Literature and Science 3
- ENG 342 Literature of Space and Place 3
- ENG 349 African Literature in English 3
- ENG 350 Professional Internships 3
- ENG 359 Topics in Film Studies 3
- ENG 361 Studies in British Poetry 3
- ENG 362 Studies in the British Novel 3
- ENG 364 History of Film to 1940 3
- ENG 369 The American Novel of the 19th Century 3
- ENG 370 American Fiction, Twentieth Century and Beyond 3
- ENG 372 American Poetry, Twentieth Century and Beyond 3
- ENG 374 History of Film From 1940 3
- ENG 375 African American Cinema 3
- ENG 376 Science Fiction 3
- ENG 377 Fantasy 3
- ENG 378 Women & Film 3
- ENG 380 Modern Drama 3
- ENG 381 Creative Nonfiction Writing Workshop 3

NC State University
1241
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ENG 338 Speech Science 3
ENG 364 History of Film to 1940 3
ENG 374 History of Film From 1940 3
ENG 395 Studies in Rhetoric and Digital Media 3
ENG 411 Rhetorical Criticism 3

ENG 420 Advanced Topics in Public Relations 3
ENG 453 First Year Seminar 3
ENG 454 Professional Development in Environmental Science 3
ENG 455 Engagement: Integrating Theory and Practice 3
ENG 456 Communicating in the Global Village 3
ENG 463 Second Year Seminar 3
ENG 464 Internship 3

ENG 502 Introduction to Communication Science 3
ENG 503 Communication Research and Methodology 3
ENG 506 Verbal Data Analysis 3
ENG 512 Communication Science Research Methods 3
ENG 514 History Of Rhetoric 3
ENG 516 Rhetorical Criticism: Theory and Practice 3
ENG 554 Contemporary Rhetorical Theory 3
ENG 558 Visual Rhetoric: Theory and Criticism 3
GES 508 Emerging Technologies and Society 3
HSS 392 International and Crosscultural Communication 3
PA 539 Fund Development 3
TH 103 Introduction to the Theater 3
THE 203 Theory and Practice of Acting 3
THE 223 Stagecraft 3
THE 293 Theater Practicum 1-6
THE 303 Stage Directing 3
THE 334 Advanced Acting 3
THE 340 African American Theatre 3
WGS 362 Communication and Gender 3

Economics Electives

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<tr>
<td>ES 499</td>
<td>Thesis in Environmental Science</td>
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Semester Sequence

This is a sample.

Course  Title                                    Hours
---  --------------------------------------------------  ----

Fall Semester

ENG 101 Academic Writing and Research  1  4
ENV 100 Student Success in Environmental First Year  1  1
ENV 101 Exploring the Environment  2  2
BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity  4  4
MA 131 Calculus for Life and Management Sciences A  3  3

GEP Health and Exercise Studies (p. 1422)  1  1

Spring Semester

CH 101 Chemistry - A Molecular Science  3  3
CH 102 General Chemistry Laboratory  1  1
ES 111 Applications of Environmental Sciences  1  1
MA 231 Calculus for Life and Management Sciences B 3
ES 100 Introduction to Environmental Sciences 1 3
GEP Humanities (p. 1423) 3

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**Second Year**

**Fall Semester**

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<td>College Physics I</td>
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<tr>
<td>CH 220 &amp; CH 222</td>
<td>Introductory Organic Chemistry and Organic Chemistry I Lab</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

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<td>Climate Change and Sustainability 1</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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**Third Year**

**Fall Semester**

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<td>ES 300</td>
<td>Energy and Environment 1</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>Advised Elective I 3</td>
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<td>Communications Requirement</td>
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<td>Focal Area I 2</td>
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<tr>
<td>SSC 200 &amp; SSC 201</td>
<td>Soil Science and Soil Science Laboratory</td>
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**Fourth Year**

**Fall Semester**

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<td>U.S. Environmental Law and Politics</td>
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<td>External Learning Experience</td>
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<td>Focal Area III 2</td>
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<td>GEP Humanities (p. 1423)</td>
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**Spring Semester**

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<td>Analysis of Environmental Issues 1</td>
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<td>Focal Area V 2</td>
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</table>

1. Must be completed with a grade of C- or higher.
2. See adviser to determine a relevant focal area and related course selections.
3. Advised Electives (9 credit hours) are to be selected in consultation with your adviser and need to focus on Environmental Science. At least 6 hours must be at the 400-level or above.

**Career Opportunities**

The Environmental Sciences program provides opportunities for students to rigorously explore complex, interdisciplinary environmental issues by combining courses from a number of NC State colleges to create a thorough interdisciplinary grounding. All degree options encourage students to pursue original research and gain field experience tackling real-world challenges — leaving them well prepared to take advantage of career opportunities once they graduate. Some graduates find jobs in the environmental industry, including careers as environmental consultants, working in large corporations, or starting their own businesses. Others find careers working in federal, state, and local agencies with environmental mandates. Still others continue their educations in professional and graduate schools.

**Environmental Sciences (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Environmental Sciences minor allows students to connect the topics from their major to the compelling, contemporary issues that connect humans to the environment. The minor includes courses in all academic units to provide links between disciplines and to provide a foundation for analysis of environmental issues.

**Admissions**

Any student with an interest in Environmental Science minor should see the contact person listed below to discuss their interest in the minor, course requirements and complete the Declaration of Minor form to be submitted to the Office of Registration and Records. Students must have a minimum overall grade point average of 2.0 to be admitted to the minor.

**Certification**

The Environmental Science Committee will review the student's record and certify that the student has completed the requirements for the minor. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student's final semester at NC State.

**Contact Person**

Erin A. Champion
Program Coordinator
3136B Jordan Hall
919.513.2520
eachampi@ncsu.edu

Effective Date: 7/2010
Plan Requirements

To complete the ES minor, students must complete 15 credit hours by taking three of the ES Core courses earning 9 Cr with a C- or better grade in each course. Students must then complete two additional elective courses with a C- or better from the approved list. A student may not major and minor in Environmental Science.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td></td>
<td><strong>Required Courses</strong></td>
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<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
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<tr>
<td>ES 113</td>
<td>Earth from Space</td>
<td>3</td>
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<tr>
<td>ES 200</td>
<td>Climate Change and Sustainability</td>
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<td>ES 300</td>
<td>Energy and Environment</td>
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<tr>
<td></td>
<td><strong>Elective Courses</strong></td>
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<tr>
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<td>Select two courses from one or any of the following groups:</td>
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<tr>
<td></td>
<td>Group I – Biological Science</td>
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<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
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<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
<td>1</td>
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<tr>
<td>PB 360</td>
<td>Ecology</td>
<td>1</td>
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<tr>
<td>FOR 252</td>
<td>Introduction to Forest Science</td>
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<tr>
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<td>Group II – Physical Science</td>
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<tr>
<td>MEA 101</td>
<td>Geology I: Physical</td>
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<tr>
<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>CE 373</td>
<td>Fundamentals of Environmental Engineering</td>
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<td>Group III – Social Science</td>
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<td>IDS 201</td>
<td>Environmental Ethics</td>
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<td>Humans and the Environment</td>
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<tr>
<td>STS 322</td>
<td>Technological Catastrophes</td>
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<td>PS 320</td>
<td>U.S. Environmental Law and Politics</td>
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<td>PS 336</td>
<td>Global Environmental Politics</td>
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<td>LAR 221</td>
<td>Introduction to Environment and Behavior for Designers</td>
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<td>Group IV – Advanced Courses</td>
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<tr>
<td>MEA 300</td>
<td>Environmental Geology</td>
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<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<tr>
<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
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<td>HI 440</td>
<td>American Environmental History</td>
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<td>SOC 450</td>
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1 This course has a prerequisite.
2 Course substitutions may be made with minor advisor approval.
### Required Courses

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<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
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<tr>
<td>or GIS 280</td>
<td>Introduction to GIS</td>
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<tr>
<td>ET 310</td>
<td>Environmental Monitoring and Analysis</td>
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<td>ET 320</td>
<td>Fundamentals of Air Pollution</td>
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<td>ET 330</td>
<td>Environmental Technology Practicum</td>
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<td>ET 455</td>
<td>Adaptive Management and Governance</td>
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<tr>
<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>or NR 484</td>
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### Environmental Technology Laboratory Electives

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<td>Environmental Technology Laboratory II</td>
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<td>ET 203</td>
<td>Pollution Prevention</td>
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<td>ET 301</td>
<td>Environmental Technology Laboratory III</td>
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<td>ET 303</td>
<td>Laboratory Safety Systems and Management</td>
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### Capstone Electives

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<td>ET 460</td>
<td>Practice of Environmental Technology</td>
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<td>NR 406</td>
<td>Conservation of Biological Diversity</td>
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### Policy Electives

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<td>FOR 472</td>
<td>Forest Soils</td>
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<tr>
<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<td>NR 560</td>
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### Economics Electives

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<td>Principles of Microeconomics</td>
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### IP Electives

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<td>FW 221</td>
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<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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### Advised Electives

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<td>AEC 441</td>
<td>Biology of Fishes</td>
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<td>Biology of Fishes Laboratory</td>
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<td>AEC 519</td>
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<td>BUS 350</td>
<td>Economics and Business Statistics</td>
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<td>COM 436</td>
<td>Environmental Communication</td>
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<td>ES 113</td>
<td>Earth from Space</td>
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<td>Water and the Environment</td>
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<td>ES 200</td>
<td>Climate Change and Sustainability</td>
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1 A grade of C- or better required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
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<td>Analysis of Environmental Issues</td>
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<td>ET 120</td>
<td>Introduction to Renewable Energy Technologies</td>
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<td>ET 220</td>
<td>Solar Photovoltaics Assessment</td>
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<td>ET 255</td>
<td>Hydro, Wind, and Bioenergy Assessment</td>
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<td>ET 262</td>
<td>Renewable Energy Adoption: Barriers and Incentives</td>
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<tr>
<td>FOR 150</td>
<td>Critical Thinking and Data Analysis</td>
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<td>FOR 248</td>
<td>Forest History, Technology and Society</td>
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<td>FOR 260</td>
<td>Forest Ecology</td>
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<td>FOR 304</td>
<td>Theory of Silviculture</td>
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<td>North Carolina Forests</td>
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<td>FOR 339</td>
<td>Dendrology</td>
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<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
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<td>FOR 414</td>
<td>World Forestry</td>
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<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>MB 411</td>
<td>Medical Microbiology</td>
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<td>Medical Microbiology Laboratory</td>
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<td>MB 451</td>
<td>Microbial Diversity</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>TOX 201</td>
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**Semester Sequence**

This is a sample.

**Critical Path Courses** — Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

**Course**

**First Year**

**Fall Semester**

- **ENV 100 & ENV 101**: Student Success in Environmental First Year and Exploring the Environment
- **ENG 101**: Academic Writing and Research
- **MA 131** or **MA 141**: Calculus for Life and Management Sciences A (CP) or Calculus I
- **BIO 181**: Introductory Biology: Ecology, Evolution, and Biodiversity (CP)
- **GEP Health and Exercise Studies (p. 1422)**

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<thead>
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**Spring Semester**

- **CH 101** & **CH 102**: Chemistry - A Molecular Science and General Chemistry Laboratory (CP)
- **ET 105**: Introduction to Environmental Regulations (CP)
- **GEP Interdisciplinary Perspectives (p. 1426)**
- **Economics Requirement**
- **GEP Humanities (p. 1423)**
- **GEP Health and Exercise Studies (p. 1422)**

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**Second Year**

**Fall Semester**

- **Environmental Technology Lab Elective**
- **Ecology Elective (CP)**
### Career Opportunities

Career opportunities include technical positions with: firms that offer environmental services; manufacturing companies that are required to maintain sophisticated environmental monitoring networks; consulting and audit firms that perform independent environmental audits; and state and federal regulatory agencies. A number of graduates have also pursued graduate degrees. Several professional certifications can be achieved through the major. Students may receive Hazardous Waste Operations and Emergency Response training and are eligible to sit for two professional certification exams: the exam for certification as an Associate Environmental Professional, and the exam Certified Hazardous Materials Manager.

### Fisheries, Wildlife, and Conservation Biology (BS): Conservation Biology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Fisheries, Wildlife and Conservation Biology (FWCB) major prepares students to manage and conserve populations of fish and wildlife in their natural habitats. This STEM (Science, Technology, Engineering and Mathematics) major gives students the skills they need to observe, research, monitor and assess the impact of environmental change, human behavior and public policy on wild populations of animals. Using a combination of lab work, technology and field study, students develop conservation strategies that ensure the long-term health of fish and wildlife populations.

After sophomore year, students spend six weeks in summer field courses. During “summer camp” experience, students learn hands-on fish and wildlife management techniques in locations across the state. From plant and animal identification and bird mist netting to camera-trapping and radio telemetry, students gain experiences that prepare them for careers after graduation. FWCB students have the option to substitute the summer field course with approved internships or study abroad courses.
The Conservation Biology concentration allows flexibility for students to pursue elements of conservation that align with their specific career goals. The degree requirements include 9 credits of technical electives that complement the major such as courses in environmental policy, entomology, science communication, or environmental education.

For more information examine our website or contact one of the following:

Dr. Lara Pacifici
lara_pacifici@ncsu.edu
FWCB Undergraduate Coordinator Turner House

Ms. Kimber Lunsford
ktlunso@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall
Department of Forestry and Environmental Resources
Box 8008
North Carolina State University,
Raleigh, North Carolina 27695-8008

Plan Requirements

Fisheries, Wildlife, and Conservation Biology (BS): Conservation Biology Concentration: 120 Total Units

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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Second Year

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<td>Fisheries Techniques and Management</td>
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<td>Mountain Wildlife Ecology and Management</td>
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Third Year

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<td>FW 333</td>
<td>Conservation Biology in Practice</td>
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<td>FW 353</td>
<td>Wildlife Management</td>
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<td>Vertebrate Natural History</td>
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<td>GEP Additional Breadth (p. 1417)</td>
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<td>GEP U.S. Diversity (p. 1431)</td>
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<td>GEP Global Knowledge (p. 1419)</td>
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1 A grade of C- or better is required.
### Acad Writing Research

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### Transfer Sequence

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### Plant Electives

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<td>Calculus for Life and Management Sciences B</td>
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### Physical Science Electives

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<td>Organic Chemistry II</td>
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<td>Earth System Science: Exploring the Connections</td>
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<td>Introduction to Weather and Climate</td>
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<td>Marine Biology</td>
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### Policy Electives

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<td>Renewable Natural Resource Management and Policy</td>
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<td>U.S. Environmental Law and Politics</td>
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### Conservation Biology Electives

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<td>International Wildlife Management and Conservation</td>
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<td>Conservation of Biological Diversity</td>
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### Fisheries & Wildlife Electives

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<td>Principles of Wildlife Science</td>
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<td>Mammalogy</td>
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<td>Introduction to Animal Behavior</td>
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<td>Herpetology</td>
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### Technical Electives

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### Semester Sequence

This is a sample.

**Critical Path Courses** – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

### First Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENV 100 &amp; ENV 101</td>
<td>Student Success in Environmental First Year and Exploring the Environment</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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</table>
### Fisheries, Wildlife, and Conservation Biology (BS): Fisheries Science Concentration

<table>
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<th>Course Title</th>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

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<td>COM 110 or COM 112</td>
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**Hours**

15

**Second Year**

**Fall Semester**

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<tr>
<td>FW 221</td>
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<tr>
<td>FOR 172</td>
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**Hours**

15

**Spring Semester**

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**Hours**

13

**Summer**

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<td>FW 313</td>
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<td>FW 314</td>
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**Hours**

12

**Third Year**

**Fall Semester**

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<td>FW 333</td>
<td>3</td>
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<td>ST 311</td>
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<td>FW 353</td>
<td>3</td>
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**Hours**

15

**Spring Semester**

<table>
<thead>
<tr>
<th>Course Code &amp; Title</th>
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<tbody>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td>3</td>
</tr>
<tr>
<td>CH 221 &amp; CH 222</td>
<td>4</td>
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</table>

1. A grade of C- or better is required.
2. Can be met by summer camp (courses listed in adjacent block), a combination of internship and/or study abroad, or other courses that provide hands-on conservation biology experience.

### Career Opportunities

Graduates are prepared for graduate school and entry-level professional positions in state and federal government agencies, non-profit organizations and private industry. Upon graduation, students are qualified to seek certification from The Wildlife Society or the American Fisheries Society.

### Fisheries, Wildlife, and Conservation Biology (BS): Fisheries Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Fisheries, Wildlife and Conservation Biology (FWCB) major prepares students to manage and conserve populations of fish and wildlife in their natural habitats. This STEM (Science, Technology, Engineering and Mathematics) major gives students the skills they need to observe, research, monitor and assess the impact of environmental change, human behavior and public policy on wild populations of animals. Using a combination of lab work, technology and field study, students develop conservation strategies that ensure the long-term health of fish and wildlife populations.

After sophomore year, students spend six weeks in summer field courses. During “summer camp” experience, students learn hands-on
fish and wildlife management techniques in locations across the state. From plant and animal identification and bird mist netting to camera-trapping and radio telemetry, students gain experiences that prepare them for careers after graduation. FWCB students have the option to substitute the summer field course with approved internships or study abroad courses.

The Fisheries concentration meets the qualifications for certification by the American Fisheries Society. The fisheries concentration includes required courses in chemistry, aquatic ecology, and biology of fish that are not required in the other FWCB concentrations.

For more information examine our website or contact one of the following:

Dr. Lara Pacifici
lara_pacifici@ncsu.edu
FWCB Undergraduate Coordinator
Turner House

Ms. Kimber Lunsford
ktlunsfo@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall

Department of Forestry and Environmental Resources
Box 8008
North Carolina State University,
Raleigh, North Carolina 27695-8008

Plan Requirements

Fisheries, Wildlife, and Conservation Biology (BS): Fisheries Science Concentration: 120 Total Units

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<thead>
<tr>
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<tr>
<td>ENV 100</td>
<td>Student Success in Environmental First Year</td>
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<td>ENV 101</td>
<td>Exploring the Environment</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<tr>
<td>Acad Writing Research (p. 1254)</td>
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First Year

<table>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>FW 311</td>
<td>Piedmont Wildlife Ecology and Management</td>
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<td>FW 312</td>
<td>Fisheries Techniques and Management</td>
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<td>FW 313</td>
<td>Mountain Wildlife Ecology and Management</td>
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<td>FW 314</td>
<td>Coastal Ecology and Management</td>
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Summer

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<td>FW 373</td>
<td>Vertebrate Natural History</td>
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<td>FW 411</td>
<td>Human Dimensions of Wildlife and Fisheries</td>
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Third Year

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<tbody>
<tr>
<td>AEC 420</td>
<td>Introduction to Fisheries Science</td>
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<td>GN 301 or GN 311</td>
<td>Genetics in Human Affairs or Principles of Genetics</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td>GIS 280</td>
<td>Introduction to GIS</td>
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<tr>
<td>ENT 201</td>
<td>Insects and People</td>
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Fourth Year

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<td>FW 415</td>
<td>Professional Development in Fisheries, Wildlife, and Conservation Biology</td>
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<tr>
<td>AEC 441</td>
<td>Biology of Fishes</td>
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<td>Policy Elective (p. 1254)</td>
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<td>Aquatic Elective (p. 1254)</td>
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<td>Physical Science Elective (p. 1254)</td>
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<tr>
<td>Biology Elective (p. 1254)</td>
<td>3</td>
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<tr>
<td>Technical Elective (p. 1254)</td>
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Total Hours: 109

1 A grade of C- or better is required.

Code | Title | Hours
--- | --- | ---
CH 220 | Introductory Organic Chemistry | 4
CH 221 | Organic Chemistry I | 4
### GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- 3

### GEP U.S. Diversity (p. 1431) (Verify Requirements)
- 3

### GEP Global Knowledge (p. 1419) (Verify Requirements)
- 3

### Foreign Language Proficiency (p. 1417) (Verify Requirements)
- 3

### Total Hours
- 11

#### Acad Writing Research

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<tr>
<td>FLE 101</td>
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#### Transfer Sequence

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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
<td>3</td>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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#### Communication Electives

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<tbody>
<tr>
<td>COM 201</td>
<td>Introduction to Persuasion Theory</td>
<td>3</td>
</tr>
<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>COM 226</td>
<td>Introduction to Public Relations</td>
<td>3</td>
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<tr>
<td>COM 301</td>
<td>Presentational Speaking</td>
<td>3</td>
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<tr>
<td>ENG 214</td>
<td>Introduction to Editing</td>
<td>3</td>
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<tr>
<td>ENG 216</td>
<td>Technologies for Texts</td>
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<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
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#### Quantitative Electives

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<td>CSC 200</td>
<td>Introduction to Computers and Their Uses</td>
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<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<td>MA 241</td>
<td>Calculus II</td>
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<td>Introduction to Statistics II</td>
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#### Policy Electives

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<td>Environmental Law &amp; Economic Policy</td>
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<td>Forest Soils</td>
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<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<td>U.S. Environmental Law and Politics</td>
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<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
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<td>AEC 419</td>
<td>Freshwater Ecology</td>
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<td>AEC 519</td>
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<tr>
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<td>Introduction to Oceanography</td>
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<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
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#### Physical Science Electives

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<td>Chemistry - A Quantitative Science</td>
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<td>Earth System Science: Exploring the Connections</td>
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<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
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<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<tr>
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<tr>
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<td>Marine Biology</td>
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<td>Geochemistry of Natural Waters</td>
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<td>Animal Anatomy and Physiology</td>
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<td>ZO 402</td>
<td>Invertebrate Biology</td>
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<td>ZO 410</td>
<td>Introduction to Animal Behavior</td>
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<td>AEC 586</td>
<td>Aquaculture</td>
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<td>Aquaculture Laboratory</td>
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<td>FOR 252</td>
<td>Introduction to Forest Science</td>
<td>3</td>
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<td>FOR 304</td>
<td>Theory of Silviculture</td>
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<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>Wildlife Habitat Management</td>
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<td>Principles of Wildlife Science</td>
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<td>FW 515</td>
<td>Fish Physiology</td>
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<td>FW 586</td>
<td>Aquaculture</td>
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<td>Introduction to Oceanography</td>
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<td>MEA 220</td>
<td>Marine Biology</td>
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<td>Introduction to Coastal Environments</td>
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<td>MEA 251</td>
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<td>NR 520</td>
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<tr>
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#### Semester Sequence

This is a sample.
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<tr>
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<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>CH 220 &amp; CH 222</td>
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<td>FW 314</td>
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1 A grade of C- or better is required.
2 FW 492 External Learning Experience

**Career Opportunities**

Graduates are prepared for graduate school and entry-level professional positions in state and federal government agencies, non-profit organizations and private industry. Upon graduation, students are qualified to seek certification from The Wildlife Society or the American Fisheries Society.
Fisheries, Wildlife, and Conservation Biology (BS): Wildlife Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Fisheries, Wildlife and Conservation Biology (FWCB) major prepares students to manage and conserve populations of fish and wildlife in their natural habitats. This STEM (Science, Technology, Engineering and Mathematics) major gives students the skills they need to observe, research, monitor and assess the impact of environmental change, human behavior and public policy on wild populations of animals. Using a combination of lab work, technology and field study, students develop conservation strategies that ensure the long-term health of fish and wildlife populations.

After sophomore year, students spend six weeks in summer field courses. During “summer camp” experience, students learn hands-on fish and wildlife management techniques in locations across the state. From plant and animal identification and bird mist netting to camera-trapping and radio telemetry, students gain experiences that prepare them for careers after graduation. FWCB students have the option to substitute the summer field course with approved internships or study abroad courses.

The wildlife concentration provides students with specific coursework necessary to apply for the Associate Wildlife Biologist (AWB) certification from the Wildlife Society upon graduation. The AWB coursework includes extra courses in plant biology, communication, and wildlife habitat management that are not required in the other FWCB concentrations.

For more information examine our website or contact one of the following:

Dr. Lara Pacifici
lara_pacifici@ncsu.edu
FWCB Undergraduate Coordinator
Turner House

Ms. Kimber Lunsford
ktlunsfo@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall

Department of Forestry and Environmental Resources
Box 8008
North Carolina State University,
Raleigh, North Carolina 27695-8008

Plan Requirements

Fisheries, Wildlife, and Conservation Biology (BS): Wildlife Science Concentration: 120 Total Units

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<td>Conservation of Natural Resources</td>
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<td>PY 131</td>
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<td>Human Dimensions of Wildlife and Fisheries</td>
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<td>Genetics in Human Affairs or Principles of Genetics</td>
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<td>Principles of Wildlife Science</td>
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### Physical Science Elective
- **Code:** CH 201
- **Title:** Chemistry - A Quantitative Science
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- **Code:** CH 202
- **Title:** Quantitative Chemistry Laboratory
- **Hours:** 1
- **Code:** CH 223
- **Title:** Organic Chemistry II
- **Hours:** 3
- **Code:** MEA 100
- **Title:** Earth System Science: Exploring the Connections
- **Hours:** 4
- **Code:** MEA 130
- **Title:** Introduction to Weather and Climate
- **Hours:** 3
- **Code:** MEA 200
- **Title:** Introduction to Oceanography
- **Hours:** 3
- **Code:** MEA 210
- **Title:** Oceanography Lab
- **Hours:** 1
- **Code:** MEA 220
- **Title:** Marine Biology
- **Hours:** 3
- **Code:** MEA 250
- **Title:** Introduction to Coastal Environments
- **Hours:** 3
- **Code:** MEA 323
- **Title:** Geochemistry of Natural Waters
- **Hours:** 3
- **Code:** PY 212
- **Title:** College Physics II
- **Hours:** 4

### Wildlife Electives
- **Code:** AEC 501
- **Title:** Ornithology
- **Hours:** 3
- **Code:** ENT 201
- **Title:** Insects and People
- **Hours:** 3
- **Code:** ENT 402
- **Title:** Forest Soils
- **Hours:** 3
- **Code:** ENT 425
- **Title:** General Entomology
- **Hours:** 3
- **Code:** FOR 402
- **Title:** Forest Entomology
- **Hours:** 3
- **Code:** FW 333
- **Title:** Conservation Biology in Practice
- **Hours:** 3
- **Code:** FW 403
- **Title:** Urban Wildlife Management
- **Hours:** 3
- **Code:** FW 405
- **Title:** Tropical Wildlife Ecology
- **Hours:** 3
- **Code:** FW 444
- **Title:** Mammalogy
- **Hours:** 3
- **Code:** FW 460
- **Title:** International Wildlife Management and Conservation
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- **Code:** FW 465
- **Title:** African Ecology and Conservation
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- **Code:** FW 544
- **Title:** Mammalogy
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- **Title:** International Wildlife Management and Conservation
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- **Code:** SSS 200
- **Title:** Soil Science
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- **Code:** ZO 250
- **Title:** Animal Anatomy and Physiology
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- **Code:** ZO 410
- **Title:** Introduction to Animal Behavior
- **Hours:** 3
- **Code:** ZO 542
- **Title:** Herpetology
- **Hours:** 3

### Semester Sequence
This is a sample.

**Critical Path Courses** – Identify using the code (CP) which courses are considered critical path courses which represent specific major
requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>Summer Camp courses may be substituted by a combination of two approved FWCB internship(^1) or FWCB study abroad experiences.</td>
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\(^1\) A grade of C- or better is required.
\(^2\) FW 492 External Learning Experience

### Third Year

**Fall Semester**

- FOR 339: Dendrology | 4
- FW 353: Wildlife Management (CP) | 3
- GN 301 or GN 311: Genetics in Human Affairs or Principles of Genetics | 3-4
- ST 311: Introduction to Statistics | 3

**Hours** | 13-14

**Spring Semester**

- GEP Humanities (p. 1423) | 3

Select one of the following:

- CH 220 & CH 221: Introductory Organic Chemistry and Organic Chemistry I Lab | 4
- CH 221 & CH 222: Organic Chemistry I and Organic Chemistry I Lab | 4
- FW 373: Vertebrate Natural History (CP) | 3
- FW 411: Human Dimensions of Wildlife and Fisheries (CP) | 3
- ENG 333: Communication for Science and Research | 3

**Hours** | 16

### Fourth Year

**Fall Semester**

- ENT 201: Insects and People (GEP Interdisciplinary Perspectives (p. 1426)) | 3
- GIS 280: Introduction to GIS | 3
- Policy Elective | 3
- FW 404: Wildlife Habitat Management (CP) | 3
- FW 415: Professional Development in Fisheries, Wildlife, and Conservation Biology | 1

**Hours** | 13

**Spring Semester**

- FW 453: Principles of Wildlife Science (CP) | 4
- Wildlife Elective | 3
- AEC 420: Introduction to Fisheries Science | 3
- Physical Science Elective | 3

**Hours** | 13

**Total Hours** | 120-121

### Career Opportunities

Graduates are prepared for graduate school and entry-level professional positions in state and federal government agencies, non-profit organizations and private industry. Upon graduation, students are qualified to seek certification from The Wildlife Society or the American Fisheries Society.

### Forest Management (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The curriculum in Forest Management is a professional program accredited by the Society of American Foresters that has long been
ranked as one of the best in the country. The Forest Management curriculum satisfies the education requirements to become registered (licensed) forester by the North Carolina State Board of Registration for Foresters. With a rigorous math and science base, the curriculum produces graduates with a broad education in natural sciences, humanities and social sciences, communications skills, technology and the practical knowledge and skills needed for sound management of the multiple resources of natural and managed forest ecosystems. Preparatory courses in the freshman and sophomore years are followed by the nine-week forestry summer camp where the woods knowledge and field skills that are essential for all foresters are acquired. Core courses of the junior and senior years focus on forest ecosystem processes, applied economics, operational practices in forest stand management, measurement and analysis of forest stand components, policy issues in natural resource management and the management decision-making tools and skills needed to develop and implement forest management plans. Production and Ecology options have been created to further develop and implement forest management plans.

Plan Requirements

Forest Management (BS): 128 Total Units

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1 A grade of C- or better required.
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MEA 473  Principles of Chemical Oceanography  3
MEA 573  Principles of Chemical Oceanography  3
NR 219  Natural Resource Markets  3
NR 293  Independent Study in Natural Resources  1-6
NR 294  Independent Study in Natural Resources  1-6
NR 295  Special Topics in Natural Resources  1-3
NR 300  Natural Resource Measurements  4
NR 301  Practicum for Professional Development I  1
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NR 350  International Sustainable Resource Use  4
NR 360  Internship Experience  3
NR 400  Natural Resource Management  4
NR 406  Conservation of Biological Diversity  3
NR 420  Watershed and Wetlands Hydrology  4
NR 421  Wetland Assessment, Delineation and Regulation  3
NR 484  Environmental Impact Assessment  4
NR 491  Special Topics in Forestry and Related Natural Resources  1-4
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NR 494  Independent Study in Natural Resources, Teaching, Experience in Nutrition Science  1-3
NR 500  Natural Resource Management  4
NR 520  Watershed and Wetlands Hydrology  4
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PB 208  Agricultural Biotechnology: Issues and Implications  3
PB 213  Plants and Civilization  3
PB 215  Medicinal Plants  3
PB 219  Plants in Folklore, Myth, and religion  3
PB 220  Local Flora  3
PB 250  Plant Biology  4
PB 277  Space Biology  3
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PB 321  Introduction to Whole Plant Physiology  3
PB 325  Culinary Botany  3
PB 345  Economic Botany  3
PB 346  Economic Botany Lab  1
PB 360  Ecology  4
PB 400  Plant Diversity and Evolution  4
PB 403  Systematic Botany  4
PB 413  Plant Anatomy  2
PB 421  Plant Physiology  3
PB 445  Paleobotany  4
PB 464  Rare Plants of North Carolina  3
PB 480  Introduction to Plant Biotechnology  3
PB 481  Plant Tissue Culture and Transformation  2
PB 492  External Learning Experience  1-6
PB 493  SP Problems in BO  1-6
PB 495  Special Topics in Botany  1-6
PB 503  Systematic Botany  4
PB 513  Plant Anatomy  2
PB 545  Paleobotany  4
PB 564  Rare Plants of North Carolina  3
PB 580  Introduction to Plant Biotechnology  3
PP 222  Kingdom of Fungi  3
PP 232  Big Data in Your Pocket: Call it a Smartphone  3
PP 241  The Worm’s Tale: Parasites In Our Midst  3
PP 315  Principles of Plant Pathology  4
PP 318  Forest Pathology  3
PP 470  Advanced Turfgrass Pest Management  2
PP 492  External Learning Experience  1-6
PP 493  Special Problems in Plant Pathology  1-6
PP 495  Special Topics in Plant Pathology  1-3
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PSY 240  Introduction to Behavioral Research I  3
PSY 241  Introduction to Behavioral Research I Lab  1
PSY 242  Introduction to Behavioral Research II  3
PSY 243  Introduction to Behavioral Research II Lab  2
SMT 200  Introduction to Sustainable Materials and Technology  3
SMT 201  Sustainable Materials for Green Housing  2
SMT 203  Physical Properties of Sustainable Materials  4
SMT 206  Wood Manufacturing Site Visits  1
SMT 210  Sustainable Materials Internship  1
SMT 232  Recycling to Create a Sustainable Environment  2
SMT 240  Introduction to Wood Products Industries  2
SMT 293  Independent Study in Sustainable Materials & Technology  1-6
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SMT 295  Special Topics in Sustainable Materials and Technology  1-3
SMT 301  Chemistry of Sustainable Materials  3
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SMT 310  Introduction to Industrial Ecology  3
SMT 320  Industrial Chemical Pollutants  2
SMT 330  Project Management for Sustainability  3
SMT 346  Sustainable Materials Business Marketing  3
SMT 441  Mechanical Properties of Sustainable Materials  4
SMT 444  Sustainable Composites and Biopolymers  3
SMT 450  Sustainable Business and Innovation  2
SMT 483  Capstone in Sustainable Materials and Technology  3
SMT 493  Independent Study in Sustainable Materials & Technology  1-6
SMT 494  Independent Study in Sustainable Materials & Technology  1-6
SMT 499  Independent Study in Sustainable Materials & Technology  1-6
SSC 332  Environmental Soil Microbiology  3
SSC 341  Soil Fertility and Nutrient Management  3
SSC 342  Soil and Plant Nutrient Analysis  1
SSC 410  Soil Judging for Land Evaluation  1
SSC 421  Role of Soils in Environmental Management  3
SSC 427  Biological Approaches to Sustainable Soil Systems  3
SSC 428  Service-Learning in Urban Agriculture Systems  1
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<td>Introduction to Probability and Distribution Theory</td>
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<td>Major World Author</td>
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### Semester Sequence

This is a sample.

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<td>CH 101</td>
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<td>and General Chemistry Laboratory</td>
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<td>FOR 150</td>
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<td>Technical Elective</td>
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<td><strong>Spring Semester</strong></td>
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<td>Introduction to Agricultural &amp; Resource Economics or Fundamentals of Economics</td>
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<td>FOR 250</td>
<td>Professional Development II: Communications in Natural Resources</td>
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<td>FOR 260</td>
<td>Forest Ecology</td>
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<td>FOR 204</td>
<td>Silviculture</td>
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<td>FOR 261</td>
<td>Forest Communities</td>
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<td>FOR 264</td>
<td>Forest Wildlife</td>
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<td>FOR 265</td>
<td>Fire Management</td>
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<td>FOR 273</td>
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<td>FOR 303</td>
<td>Silvics and Forest Tree Physiology</td>
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<tr>
<td>FOR 319</td>
<td>Forest Economics</td>
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<td>FOR 334</td>
<td>Operations Research Applications in Natural Resources</td>
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<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment or Fundamentals of Geospatial Information Science and Technology</td>
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<td>FOR 374</td>
<td>Forest Measurement, Modeling, and Inventory</td>
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<td>ENG 332</td>
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<td>Communication for Science and Research</td>
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<td>FOR 350</td>
<td>Professional Development III: Ethical Dilemmas in Natural Resource Management</td>
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<td>Forest Health and Protection</td>
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Advised Electives 6

Hours 17

Fourth Year

Fall Semester

FW 404 Wildlife Habitat Management 1 3
FOR 405 Forest Management 1 4
NR 460 Renewable Natural Resource Management and Policy 1 3
GEP Elective 3
GEP Health and Exercise Studies (p. 1422) 1

Total Hours 23

Spring Semester

FOR 406 Forest Inventory, Analysis and Planning 1 4
Technical Electives 5
GEP Electives 6

Total Hours 15

Total Hours 127

1 A grade of C- or better is required.

Career Opportunities

Graduates in Forest Management are in high demand by state and federal land management agencies, forest products companies growing wood as a raw material, investment firms and insurance companies with land ownership portfolios, state forestry and agriculture extension services, the Peace Corps, environmental and wetland consulting firms, wood procurement companies, nursery and landscape management firms, and environmental organizations. After several years of experience, many graduates start their own businesses in forestry and land management consulting. Some graduates continue their education in graduate school to specialize in a wide variety of forestry and related programs.

Forest Management (BS): Ecology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The forest management, ecology concentration, trains professionals who will work as researchers, resource managers, and practitioners in varied agencies and non-governmental firms or organizations. Not focused on commodity production, this program provides more depth in scientific examination of forest communities. Subjects upon which forest management depends include botany, chemistry, ecology, economics, entomology, forest measurements, hydrology, mapping, mathematics, plant physiology, soil science, and statistics.

Both concentrations in the forest management program include a nine-week summer practicum between the second and third years of coursework. The purpose of the practicum is to study forest measurement and management skills in the field during concentrated hands-on experiences. Seven weeks of this residential practicum occurs at George Watts Hill Forest north of Durham, North Carolina.

The Society of American Foresters accredits the North Carolina State forest management program.

For more information examine our website or contact one of the following:

Dr. Gary B. Blank
gblank@ncsu.edu
Director of Undergraduate Programs
5229 Jordan Hall Addition

Ms. Kimber Lunsford
ktlunsfo@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall

Department of Forestry and Environmental Resources
Box 8008
North Carolina State University,
Raleigh, North Carolina 27695-8008

Plan Requirements

Forest Management (BS): Ecology Concentration: 128 Total Unit

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<td>PB 200 or BIO 181</td>
<td>Plant Life or Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<tr>
<td>FOR 150</td>
<td>Critical Thinking and Data Analysis 1</td>
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Total Hours 23

Second Year

Chemistry or Physics Elective (p. 1270) | 4 |
FOR 172 | Forest System Mapping and Mensuration I 1 | 2 |
FOR 339 | Dendrology 1 | 4 |
ST 312 | Introduction to Statistics II | 3 |
Economics Elective (p. 1270) | 3 |
FOR 260 | Forest Ecology 1 | 4 |
FOR 250 | Professional Development II: Communications in Natural Resources 1 | 1 |
Soil Science & Lab (p. ) | 4 |
MA 121 or MA 131 | Elements of Calculus or Calculus for Life and Management Sciences A | 3 |
Technical Electives (p. 1270) | 3 |

Total Hours 31

Summer

FOR 204 | Silviculture 1 | 2 |
FOR 261 | Forest Communities | 2 |
FOR 264 | Forest Wildlife 1 | 1 |
FOR 265 | Fire Management 1 | 1 |
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<td>PB 220</td>
<td>Local Flora</td>
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<td>FOR 350</td>
<td>Professional Development III: Ethical Dilemmas in Natural Resource Management</td>
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1 A grade of C- or better is required.

### GEP Courses

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### Chemical and Physical Electives

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### Economics Electives

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### Soil and Science Labs

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### Technical Electives

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FOR 339 Dendrology 4
FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management 1
FOR 353 GIS and Remote Sensing for Environmental Analysis and Assessment 3
FOR 374 Forest Measurement, Modeling, and Inventory 3
FOR 402 Forest Entomology 3
FOR 405 Forest Management 4
FOR 406 Forest Inventory, Analysis and Planning 4
FOR 408 Hardwood Management 3
FOR 411 Forest Tree Genetics and Biology 3
FOR 414 World Forestry 3
FOR 415 World Forestry Study Tour 1
FOR 420 Watershed and Wetlands Hydrology 4
FOR 422 Consulting Forestry 3
FOR 430 Forest Health and Protection 3
FOR 434 Forest Operations and Analysis 3
FOR 472 Forest Soils 4
FOR 491 Special Topics in Forestry and Related Natural Resources 1-4
FOR 493 Independent Study in Forest Management 1-6
FOR 494 Independent Study in Forest Management 1-6
FOR 505 Forest Management 4
FOR 508 Hardwood Management 3
FOR 520 Watershed and Wetlands Hydrology 4
FOR 522 Consulting Forestry 3
FOR 534 Forest Operations and Analysis 3
FW 221 Conservation of Natural Resources 3
FW 293 Independent Study in Fisheries, Wildlife, and Conservation Biology 1-6
FW 294 Independent Study in Fisheries, Wildlife, and Conservation Biology 1-6
FW 311 Piedmont Wildlife Ecology and Management 3
FW 312 Fisheries Techniques and Management 1
FW 313 Mountain Wildlife Ecology and Management 1
FW 314 Coastal Ecology and Management 1
FW 333 Conservation Biology in Practice 3
FW 353 Wildlife Management 3
FW 373 Vertebrate Natural History 3
FW 403 Urban Wildlife Management 3
FW 404 Wildlife Habitat Management 3
FW 405 Tropical Wildlife Ecology 3
FW 411 Human Dimensions of Wildlife and Fisheries 3
FW 415 Professional Development in Fisheries, Wildlife, and Conservation Biology 1
FW 444 Mammalogy 3
FW 445 Human Dimensions of Conservation Biology in the Bahamas 3
FW 453 Principles of Wildlife Science 4
FW 460 International Wildlife Management and Conservation 3
FW 465 African Ecology and Conservation 4
FW 492 External Learning Experience 1-6
FW 493 Independent Study in Fisheries, Wildlife, and Conservation Biology 1-6
FW 494 Independent Study in Fisheries, Wildlife, and Conservation Biology 1-6
FW 495 Special Topics in Fisheries and Wildlife Science 1-3
FW 511 Human Dimensions of Wildlife and Fisheries 3
FW 544 Mammalogy 3
FW 560 International Wildlife Management and Conservation 3
FW 565 African Ecology and Conservation 4
IDS 303 Humans and the Environment 3
NR 219 Natural Resource Markets 3
NR 293 Independent Study in Natural Resources 1-6
NR 294 Independent Study in Natural Resources 1-6
NR 295 Special Topics in Natural Resources 1-3
NR 300 Natural Resource Measurements 4
NR 301 Practicum for Professional Development I 1
NR 303 Humans and the Environment 3
NR 350 International Sustainable Resource Use 4
NR 360 Internship Experience 3
NR 400 Natural Resource Management 4
NR 406 Conservation of Biological Diversity 3
NR 420 Watershed and Wetlands Hydrology 4
NR 421 Wetland Assessment, Delineation and Regulation 3
NR 460 Renewable Natural Resource Management and Policy 3
NR 484 Environmental Impact Assessment 4
NR 491 Special Topics in Forestry and Related Natural Resources 1-4
NR 493 Independent Study in Natural Resources 1-6
NR 494 Independent Study in Natural Resources, Teaching Experience in Nutrition Science 1-3
NR 500 Natural Resource Management 4
NR 520 Watershed and Wetlands Hydrology 4
NR 521 Wetland Assessment, Delineation and Regulation 3
NR 560 Renewable Natural Resource Management and Policy 3
PP 318 Forest Pathology 3
SMT 202 Anatomy and Properties of Renewable Materials 3
Technical Electives-Other
ACC 200 Introduction to Managerial Accounting 3
ACC 210 Concepts of Financial Reporting 3
ACC 220 Introduction to Managerial Accounting 3
ACC 230 Individual Income Taxation 3
ACC 280 Survey of Financial and Managerial Accounting 3
ACC 295 Special Topics in Accounting 1-6
ACC 310 Intermediate Financial Accounting I 3
ACC 311 Intermediate Financial Accounting II 3
ACC 330 An Introduction To Income Taxation 3
ACC 340 Accounting Information Systems 3
ACC 411 Business Valuation 3
ACC 420 Cost Accounting for Effective Management 3
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<td>Practice of Environmental Technology</td>
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<td>Special Topics in Geospatial Information Science</td>
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<td>Home Horticulture</td>
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<td>The World of Horticulture: Principles and Practices</td>
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<td>Home Plant Identification</td>
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<td>Home Plant Propagation</td>
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<td>Home Landscape Maintenance</td>
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<td>Home Food Production</td>
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<td>Landscape Graphic Communication</td>
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<td>Ornamental Plant Identification I</td>
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<td>Residential Landscaping</td>
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<td>Nursery Management</td>
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<td>Digital Media Graphic for Landscape Designers</td>
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<td>Small Fruit Production</td>
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<td>Sustainable Agriculture Entrepreneurship Study Abroad</td>
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<td>Research Experience in Horticultural Science</td>
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<td>HS 532</td>
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<td>LOG 335</td>
<td>Symbolic Logic</td>
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<td>Elements of Matrix Computations</td>
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MA 225  Foundations of Advanced Mathematics  3
MA 231  Calculus for Life and Management Sciences B  3
MA 241  Calculus II  4
MA 242  Calculus III  4
MA 302  Numerical Applications to Differential Equations  1
MA 303  Linear Analysis  3
MA 305  Introductory Linear Algebra and Matrices  3
MA 315  Mathematics Methods in Atmospheric Sciences  4
MA 325  Introduction to Applied Mathematics  3
MA 331  Differential Equations for the Life Sciences  3
MA 335  Symbolic Logic  3
MA 341  Applied Differential Equations I  3
MA 351  Introduction to Discrete Mathematical Models  3
MA 401  Applied Differential Equations II  3
MA 402  Mathematics of Scientific Computing  3
MA 403  Introduction to Modern Algebra  3
MA 405  Introduction to Linear Algebra  3
MA 407  Introduction to Modern Algebra for Majors  3
MA 408  Foundations of Euclidean Geometry  3
MA 410  Theory of Numbers  3
MA 412  Long-Term Actuarial Models  3
MA 413  Short-Term Actuarial Models  3
MA 416  Introduction to Combinatorics  3
MA 421  Introduction to Probability  3
MA 425  Mathematical Analysis I  3
MA 426  Mathematical Analysis II  3
MA 427  Introduction to Numerical Analysis I  3
MA 428  Introduction to Numerical Analysis II  3
MA 430  Mathematical Models in the Physical Sciences  3
MA 432  Mathematical Models in Life and Social Sciences  3
MA 437  Applications of Algebra  3
MA 440  Game Theory  3
MA 444  Problem Solving Strategies for Competitions  1
MA 450  Methods of Applied Mathematics I  3
MA 451  Methods of Applied Mathematics II  3
MA 491  Reading in Honors Mathematics  1-6
MA 493  Special Topics in Mathematics  1-6
MA 494  Major Paper in Math  1
MA 499  Independent Research in Mathematics  1-6
MEA 315  Mathematics Methods in Atmospheric Sciences  4
MEA 320  Fundamentals of Air Pollution  3
PB 200  Plant Life  4
PB 205  Our Green World  3
PB 208  Agricultural Biotechnology: Issues and Implications  3
PB 213  Plants and Civilization  3
PB 215  Medicinal Plants  3
PB 219  Plants in Folklore, Myth, and religion  3
PB 220  Local Flora  3
PB 250  Plant Biology  4
PB 277  Space Biology  3
PB 295  Special Topics in Botany  1-4
PB 321  Introduction to Whole Plant Physiology  3
PB 325  Culinary Botany  3
PB 345  Economic Botany  3
PB 346  Economic Botany Lab  1
PB 360  Ecology  4
PB 400  Plant Diversity and Evolution  4
PB 403  Systematic Botany  4
PB 413  Plant Anatomy  2
PB 421  Plant Physiology  3
PB 445  Paleobotany  4
PB 464  Rare Plants of North Carolina  3
PB 480  Introduction to Plant Biotechnology  3
PB 481  Plant Tissue Culture and Transformation  2
PB 488  Systems Biology Modeling of Plant Regulation  3
PB 492  External Learning Experience  1-6
PB 493  SP Problems in BO  1-6
PB 495  Special Topics in Botany  1-6
PB 503  Systematic Botany  4
PB 513  Plant Anatomy  2
PB 545  Paleobotany  4
PB 564  Rare Plants of North Carolina  3
PB 580  Introduction to Plant Biotechnology  3
PB 588  Systems Biology Modeling of Plant Regulation  3
PP 222  Kingdom of Fungi  3
PP 232  Big Data in Your Pocket: Call it a Smartphone  3
PP 241  The Worm’s Tale: Parasites In Our Midst  3
PP 315  Principles of Plant Pathology  4
PP 318  Forest Pathology  3
PP 470  Advanced Turfgrass Pest Management  2
PP 492  External Learning Experience  1-6
PP 493  Special Problems in Plant Pathology  1-6
PP 495  Special Topics in Plant Pathology  1-3
PSY 240  Introduction to Behavioral Research I  3
PSY 241  Introduction to Behavioral Research I Lab  1
PSY 242  Introduction to Behavioral Research II  3
PSY 243  Introduction to Behavioral Research II Lab  2
SMT 200  Introduction to Sustainable Materials and Technology  3
SMT 201  Sustainable Materials for Green Housing  2
SMT 202  Anatomy and Properties of Renewable Materials  3
SMT 203  Physical Properties of Sustainable Materials  4
SMT 206  Wood Manufacturing Site Visits  1
SMT 210  Sustainable Materials Internship  1
SMT 232  Recycling to Create a Sustainable Environment  2
SMT 240  Introduction to Wood Products Industries  2
SMT 293  Independent Study in Sustainable Materials & Technology  1-6
SMT 294  Independent Study in Sustainable Materials & Technology  1-6
SMT 295  Special Topics in Sustainable Materials and Technology  1-3
SMT 301  Chemistry of Sustainable Materials  3
SMT 302  Processing of Biomaterials  4
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<td>Applied Time Series</td>
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<td>Statistical Methods for Quality and Productivity Improvement</td>
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<td>Applied Multivariate and Longitudinal Data Analysis</td>
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<td>Applied Bayesian Analysis</td>
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<td>Introduction to Statistical Computing and Data Management</td>
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<td>ST 446</td>
<td>Intermediate SAS Programming with Applications</td>
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<td>ST 491</td>
<td>Statistics in Practice</td>
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<td>Special Topics in Statistics</td>
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<td>Professional Experience in Statistics</td>
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**Advanced Communication Electives**

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<td>Science Communication and Public Engagement</td>
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<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>ENG 333</td>
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**Spatial Technology Electives**

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<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
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<td>GIS 280</td>
<td>Introduction to GIS</td>
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<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<td>SSC 540</td>
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**Capstone Electives**

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<td>Analysis of Environmental Issues</td>
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<td>FOR 406</td>
<td>Forest Inventory, Analysis and Planning</td>
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<tr>
<td>NR 400</td>
<td>Natural Resource Management</td>
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### Semester Sequence

This is a sample.

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<td>ENV 101</td>
<td>Exploring the Environment</td>
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<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<td>ENV 100</td>
<td>Student Success in Environmental First Year</td>
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<td>PB 200 or BIO 181</td>
<td>Plant Life or Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td><strong>Spring Semester</strong></td>
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<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>FOR 150</td>
<td>Critical Thinking and Data Analysis</td>
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<td>Introduction to Statistics</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Forest System Mapping and Mensuration I</td>
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<td>FOR 339</td>
<td>Dendrology</td>
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<td>ST 312</td>
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<td>Economics Elective</td>
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<td>FOR 250</td>
<td>Professional Development II: Communications in Natural Resources</td>
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<td>FOR 260</td>
<td>Forest Ecology</td>
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<td>SSC 200 &amp; SSC 201</td>
<td>Soil Science and Soil Science Laboratory</td>
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<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
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**Third Year**

**Fall Semester**

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<td>Practicum for Professional Development I</td>
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<td>FOR 374</td>
<td>Forest Measurement, Modeling, and Inventory</td>
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<td>Theory of Silviculture</td>
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<td>Professional Development III: Ethical Dilemmas in Natural Resource Management</td>
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1. A grade of C- or better required.

### Career Opportunities

Graduates in Forest Management are in high demand by state and federal land management agencies, forest products companies growing wood as a raw material, investment firms and insurance companies with land ownership portfolios, state forestry and agriculture extension services, the Peace Corps, environmental and wetland consulting firms, wood procurement companies, nursery and landscape management firms, and environmental organizations. After several years of experience, many graduates start their own businesses in forestry and land management consulting. Some graduates continue their education in graduate school to specialize in a wide variety of forestry and related programs.
Forest Management (BS): Production Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The forest management, production concentration, trains professionals who will work for forest owners (industrial and individuals) to produce wood fiber and timber, wildlife habitat, and related services forested ecosystems provide. The program of study concentrates attention on the technical planning and economics of forest investments, harvesting, regeneration and operations. Subjects upon which forest management depends include botany, chemistry, ecology, entomology, forest measurements, hydrology, mapping, mathematics, plant physiology, soil science, and statistics.

The forest management program includes a nine-week summer practicum between the second and third years of coursework. The purpose of the practicum is to study forest measurement and management skills in the field during concentrated hands-on experiences. Seven weeks of this residential practicum occur at George Watts Hill Forest, north of Durham, North Carolina.

The Society of American Foresters accredits the North Carolina State forest management program.

For more information examine our website or contact one of the following:

Dr. Gary B. Blank
gblank@ncsu.edu
Director of Undergraduate Programs
5229 Jordan Hall Addition

Ms. Kimber Lunsford
ktlunso@ncsu.edu
Assistant Director of Undergraduate Programs
3236 Jordan Hall

Department of Forestry and Environmental Resources
Box 8008
North Carolina State University,
Raleigh, North Carolina 27695-8008

Plan Requirements

Forest Management (BS): Production Concentration: 127 Total Units

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¹ A grade of C- or better is required.
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### Transfer Sequence

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<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>Organic Chemistry I</td>
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<td>PY 131</td>
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<td>Forest History, Technology and Society</td>
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<td>Rare Plants of North Carolina</td>
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<td>PB 481</td>
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<td>PP 232</td>
<td>Big Data in Your Pocket: Call It a Smartphone</td>
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<td>The Worm's Tale: Parasites In Our Midst</td>
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<td>PP 315</td>
<td>Principles of Plant Pathology</td>
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<td>SMT 201</td>
<td>Sustainable Materials for Green Housing</td>
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<td>SMT 202</td>
<td>Anatomy and Properties of Renewable Materials</td>
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<td>Sustainable Composites and Biopolymers</td>
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<td>Environmental Soil Microbiology</td>
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<td>SSC 341</td>
<td>Soil Fertility and Nutrient Management</td>
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<td>Soil Judging for Land Evaluation</td>
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<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
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<td>SSC 427</td>
<td>Biological Approaches to Sustainable Soil Systems</td>
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<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science</td>
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<td>Soil and Environmental Biogeochemistry</td>
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<td>SSC 452</td>
<td>Soil Classification</td>
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<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
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### SSC 461
Soil Physical Properties and Plant Growth 3

### SSC 462
Soil-Crop Management Systems 3

### SSC 470
Wetland Soils 3

### SSC 473
Introduction to Hydrologic and Water Quality Modeling 3

### SSC 540
Geographic Information Systems (GIS) in Soil Science and Agriculture 3

### ST 305
Statistical Methods 4

### ST 307
Introduction to Statistical Programming - SAS 1

### ST 308
Introduction to Statistical Programming - R 1

### ST 311
Introduction to Statistics 3

### ST 312
Introduction to Statistics II 3

### ST 350
Economics and Business Statistics 3

### ST 370
Probability and Statistics for Engineers 3

### ST 371
Introduction to Probability and Distribution Theory 3

### ST 372
Introduction to Statistical Inference and Regression 3

### ST 380
Probability and Statistics for the Physical Sciences 3

### ST 401
Experiences in Data Analysis 4

### ST 404
Epidemiology and Statistics in Global Public Health 3

### ST 405
Applied Nonparametric Statistics 3

### ST 412
Long-Term Actuarial Models 3

### ST 413
Short-Term Actuarial Models 3

### ST 421
Introduction to Mathematical Statistics I 3

### ST 422
Introduction to Mathematical Statistics II 3

### ST 430
Introduction to Regression Analysis 3

### ST 431
Introduction to Experimental Design 3

### ST 432
Introduction to Survey Sampling 3

### ST 433
Applied Spatial Statistics 3

### ST 434
Applied Time Series 3

### ST 435
Statistical Methods for Quality and Productivity Improvement 3

### ST 437
Applied Multivariate and Longitudinal Data Analysis 3

### ST 440
Applied Bayesian Analysis 3

### ST 442
Introduction to Data Science 3

### ST 445
Introduction to Statistical Computing and Data Management 3

### ST 446
Intermediate SAS Programming with Applications 3

### ST 491
Statistics in Practice 3

### ST 495
Special Topics in Statistics 1-6

### ST 497
Professional Experience in Statistics 1-3

### ST 498
Independent Study in Statistics 1-6

### ST 499
Research Experience in Statistics 1-3

### ST 505
Applied Nonparametric Statistics 3

### ST 533
Applied Spatial Statistics 3

### ST 534
Applied Time Series 3

### ST 535
Statistical Methods for Quality and Productivity Improvement 3

### ST 537
Applied Multivariate and Longitudinal Data Analysis 3

### ST 540
Applied Bayesian Analysis 3

### Advanced Communication Electives

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<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>ENG 333</td>
<td>Communication for Science and Research</td>
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### Spatial Technology Electives

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<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
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<td>GIS 280</td>
<td>Introduction to GIS</td>
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<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<tr>
<td>SSC 540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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### Semester Sequence

This is a sample.

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<td><strong>Fall Semester</strong></td>
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<td>ENV 101</td>
<td>Exploring the Environment</td>
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<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<td>ENV 100</td>
<td>Student Success in Environmental First Year</td>
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<td>PB 200</td>
<td>Plant Life or Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>SMT 202</td>
<td>Anatomy and Properties of Renewable Materials</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>FOR 150</td>
<td>Critical Thinking and Data Analysis</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus or Calculus for Life and Management Sciences A</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td><strong>Second Year</strong></td>
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<td>FOR 172</td>
<td>Forest System Mapping and Mensuration</td>
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Forest Management (Minor)

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<td>Introduction to Statistics</td>
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<td>Forest Ecology</td>
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<td>Soil Science Elective with lab</td>
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<td>FOR 204</td>
<td>Silviculture</td>
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<td>FOR 261</td>
<td>Forest Communities</td>
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<td>FOR 264</td>
<td>Forest Wildlife</td>
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<td>FOR 265</td>
<td>Fire Management</td>
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<td>FOR 303</td>
<td>Silvics and Forest Tree Physiology</td>
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<td>FOR 430</td>
<td>Forest Health and Protection</td>
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<td>FOR 319</td>
<td>Forest Economics</td>
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<td>FOR 374</td>
<td>Forest Measurement, Modeling, and Inventory</td>
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<td>Advanced Communication Elective</td>
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<td>Spatial Technology Elective</td>
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<td>FOR 304</td>
<td>Theory of Silviculture</td>
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<td>FOR 350</td>
<td>Professional Development III: Ethical Dilemmas in Natural Resource Management</td>
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<td>Wildlife Habitat Management</td>
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<td>Renewable Natural Resource Management and Policy</td>
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<td><strong>Total Hours</strong></td>
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1 A grade of C- or better is required.

Career Opportunities

Graduates in Forest Management are in high demand by state and federal land management agencies, forest product companies growing wood as a raw material, investment firms and insurance companies with land ownership portfolios, state forestry and agriculture extension services, the Peace Corps, environmental and wetland consulting firms, wood procurement companies, nursery and landscape management firms, and environmental organizations. After several years of experience, many graduates start their own businesses in forestry and land management consulting. Some graduates continue their education in graduate school to specialize in a wide variety of forestry and related programs.

Forest Management (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of Forestry and Environmental Resources offers a 15 credit hour minor in Forest Management that is available to all baccalaureate degree students at North Carolina State University except majors in Forest Management. The goals of the minor are to provide elementary knowledge of forest management, appreciation for the value of forest resources, and understanding of the need for sustainable management. The minor is particularly valuable to students majoring in related disciplines.

Admissions and Certification of Minor

Students wishing to complete the minor in Forest Management should contact the person listed below. This contact person is responsible for admission to the minor and all other administrative procedures. For certification, students should see the contact person listed below no later than the registration period for the student’s final semester at NC State.

Contact Person

Dr. Gary Blank
Jordan Hall Addition 5229
919.513.7617
gblank@ncsu.edu

SIS Code: 15FGM

Plan Requirements

- Requires completion of 15 credit hours, selected from each of two categories in one of the following options.
- A grade of ‘C-’ or better is required in all courses in the minor.

Option A

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<td>Forest System Mapping and Mensuration I</td>
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<td>FOR 339</td>
<td>Dendrology</td>
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Elective Courses
Select two courses from two of the following groups:

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<td>FOR 414 World Forestry</td>
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<td>FOR 303 Silvics and Forest Tree Physiology</td>
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<tr>
<td>FOR 430 Forest Health and Protection</td>
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Total Hours: 15

Option B

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>FOR 172</td>
<td>Forest System Mapping and Mensuration I</td>
<td>2</td>
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<tr>
<td>FOR 339</td>
<td>Dendrology</td>
<td>4</td>
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</tbody>
</table>

Attend Forestry Summer Camp and take the following five courses:

| FOR 204 | Silviculture                            | 2     |
| FOR 261 | Forest Communities                      | 2     |
| FOR 264 | Forest Wildlife                          | 1     |
| FOR 265 | Fire Management                          | 1     |
| FOR 273 | Forest System Mapping and Mensuration II | 3     |

Total Hours: 15

1. FOR 303 may not be double-counted.

Natural Resources (BS): Ecosystem Assessment Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Two natural resources curricula are offered by the Department of Forestry and Environmental Resources. The curricula are also accredited by the Society of American Foresters and produce natural resources professionals with a broad interdisciplinary background coupled with specifically focused skills needed to manage natural resources. The Natural Resources curricula include a series of common courses to highlight the integrated nature of work by interdisciplinary teams.

The curriculum in Natural Resources Ecosystem Assessment produces graduates who have knowledge and skills to inventory and describe ecosystems characteristics and to evaluate the impacts of management decisions. Ecosystem assessment or environmental impact assessment is an important part of development planning that calls for individuals who understand ecosystem structure and processes; who can identify, measure, inventory, and describe ecosystems; and who can apply standard evaluation and classification systems such as wildlife habitat evaluation procedures and the federal wetland delineation criteria. The curriculum entails a strong science base, as well as advanced courses in sampling and measurements, vegetation, soils, hydrology, and wildlife and fisheries are added. The 400-level courses also address techniques and issues of natural resource management.

The curriculum in Natural Resources Policy and Administration produces graduates who have knowledge and skills to manage natural resources programs in a variety of settings and organizations with an emphasis on public agencies. The advanced courses of the curriculum provide background in economics, policy, government, public administration, and natural resources management. An economics track begins with introductory microeconomics and culminates with environmental economics and public finance. Courses in government and public administration provide knowledge of how public institutions work. Courses in forestry, wildlife and fisheries, and outdoor recreation provide techniques of managing natural ecosystems for various uses. A common thread of how public policy on natural resources is influenced and developed runs through many of the courses already noted and culminates in two senior courses that focus on policy. For information on entrance requirements, contact the program coordinator:

Dr. George Hess
Department of Forestry and Environmental Resources, NCSU
Box 8008
Raleigh, NC 27695-8002
Phone: (919) 515-7437
Fax: (919) 515-8149
E-mail: george_hess@ncsu.edu

Plan Requirements

Natural Resources (BS): Ecosystem Assessment Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<td>ENV 100</td>
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<td>Exploring the Environment</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<tr>
<td>Math Electives (p. 1286)</td>
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<tr>
<td>FOR 150</td>
<td>Critical Thinking and Data Analysis</td>
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<tr>
<td>Acad Writing Research (p. 1286)</td>
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Select one of the following:

| ARE 201 | Introduction to Agricultural & Resource Economics | 3     |
| ARE 201A | Introduction to Agricultural & Resource Economics | 3     |
| EC 201 | Principles of Microeconomics                    | 2     |
| EC 205 | Fundamentals of Economics                        | 2     |

| Physics Elective (p. 1286) |                          | 4     |

Second Year

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<tr>
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<td>Public Speaking</td>
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<td>or COM 112</td>
<td>or Interpersonal Communication</td>
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TOEFL or IELTS is required for international students.
FOR 252  Introduction to Forest Science  3
FOR 339  Dendrology  4
SSC 200  Soil Science  4
& SSC 201  and Soil Science Laboratory
PS 201  American Politics and Government  3
or PS 202  or State and Local Government

Third Year
ENG 333  Communication for Science and Research  3
Select one of the following:  4
AEC 360  Ecology
FOR 260  Forest Ecology
PB 360  Ecology
NR 300  Natural Resource Measurements  4
NR 301  Practicum for Professional Development I  1
Spatial Technology Elective (p. 1286)  3
ST 311  Introduction to Statistics  3
ARE 336  Introduction to Resource and Environmental Economics  3

Summer
NR 360  Internship Experience  3

Fourth Year
NR 400  Natural Resource Management  4
NR 460  Renewable Natural Resource Management and Policy  3
NR 484  Environmental Impact Assessment  4
Select one of the following:  3
FW 333  Conservation Biology in Practice
FW 353  Wildlife Management
FW 404  Wildlife Habitat Management

Total Hours  85

1 A grade of C- or better is required.

Acad Writing Research

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<td>FLE 101</td>
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Transfer Sequence

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<tr>
<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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Math Electives

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<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>3</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<td>MA 241</td>
<td>Calculus II</td>
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Physics Electives

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<tr>
<td>PY 131</td>
<td>Conceptual Physics</td>
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<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>3</td>
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<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
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Spatial Technology Electives

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<th>Title</th>
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<tbody>
<tr>
<td>FOR 353</td>
<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
<td>3</td>
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<tr>
<td>GIS 510</td>
<td>Fundamentals of Geospatial Information Science and Technology</td>
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<td>SSC 440</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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<tr>
<td>SSC 540</td>
<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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Management Science Electives

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<tr>
<td>ACC 200</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
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<tr>
<td>FOR 248</td>
<td>Forest History, Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
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<tr>
<td>FW 333</td>
<td>Conservation Biology in Practice</td>
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<tr>
<td>GIS 295</td>
<td>Special Topics in Geospatial Information Science</td>
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<td>LAR 430</td>
<td>Site Planning</td>
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<tr>
<td>NR 350</td>
<td>International Sustainable Resource Use</td>
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<tr>
<td>PRT 350</td>
<td>Outdoor Recreation Management</td>
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<tr>
<td>PRT 451</td>
<td>Principles of Recreation Planning and Facility Development</td>
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</table>

Economics Category
ARE 301 Intermediate Microeconomics 3
ARE 304 Agribusiness Management 3
EC 301 Intermediate Microeconomics 3
EC 348 Introduction to International Economics 3
EC 410 Public Finance 3
FOR 319 Forest Economics 3

Policy Category
ARE 309 Environmental Law & Economic Policy 3
FOR 414 World Forestry 3
FW 411 Human Dimensions of Wildlife and Fisheries 3
FW 511 Human Dimensions of Wildlife and Fisheries 3
MIE 305 Legal and Regulatory Environment 3
NR 406 Conservation of Biological Diversity 3
PS 201 American Politics and Government 3
PS 202 State and Local Government 3
PS 312 Introduction to Public Administration 3
PS 320 U.S. Environmental Law and Politics 3
PS 336 Global Environmental Politics 3
PS 401 American Political Parties 3

Resource Science Electives

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>CS 414</td>
<td>Weed Science</td>
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<tr>
<td>FOR 204</td>
<td>Silviculture</td>
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<tr>
<td>FOR 261</td>
<td>Forest Communities</td>
<td>2</td>
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<tr>
<td>FOR 265</td>
<td>Fire Management</td>
<td>1</td>
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<tr>
<td>FOR 273</td>
<td>Forest System Mapping and Mensuration II</td>
<td>3</td>
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<tr>
<td>FOR 303</td>
<td>Silvics and Forest Tree Physiology</td>
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</tr>
<tr>
<td>FOR 318</td>
<td>Forest Pathology</td>
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<tr>
<td>FOR 330</td>
<td>North Carolina Forests</td>
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<tr>
<td>FOR 411</td>
<td>Forest Tree Genetics and Biology</td>
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<tr>
<td>PB 220</td>
<td>Local Flora</td>
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<tr>
<td>PB 345</td>
<td>Economic Botany</td>
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<td>PB 400</td>
<td>Plant Diversity and Evolution</td>
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<tr>
<td>PB 403</td>
<td>Systematic Botany</td>
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<td>PB 421</td>
<td>Plant Physiology</td>
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<td>PB 464</td>
<td>Rare Plants of North Carolina</td>
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<td>PB 503</td>
<td>Systematic Botany</td>
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<td>PB 564</td>
<td>Rare Plants of North Carolina</td>
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<td>Forest Pathology</td>
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<td>AEC 419</td>
<td>Freshwater Ecology</td>
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<td>AEC 420</td>
<td>Introduction to Fisheries Science</td>
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<td>AEC 423</td>
<td>Introduction to Fisheries Sciences Laboratory</td>
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<td>AEC 441</td>
<td>Biology of Fishes</td>
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<td>AEC 442</td>
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<td>AEC 460</td>
<td>Field Ecology and Methods</td>
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<td>AEC 501</td>
<td>Ornithology</td>
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<td>AEC 509</td>
<td>Biology of Aquatic Insects</td>
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<td>AEC 519</td>
<td>Freshwater Ecology</td>
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<tr>
<td>AEC 586</td>
<td>Aquaculture</td>
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ENT 402 Forest Entomology 3
ENT 425 General Entomology 3
ENT 509 Biology of Aquatic Insects 3
FOR 264 Forest Wildlife 1
FOR 402 Forest Entomology 3
FOR 430 Forest Health and Protection 3
FW 311 Piedmont Wildlife Ecology and Management 3
FW 312 Fisheries Techniques and Management 1
FW 313 Mountain Wildlife Ecology and Management 1
FW 314 Coastal Ecology and Management 1
FW 353 Wildlife Management 3
FW 373 Vertebrate Natural History 3
FW 403 Urban Wildlife Management 3
FW 404 Wildlife Habitat Management 3
FW 405 Tropical Wildlife Ecology 3
FW 444 Mammalogy 3
FW 544 Mammalogy 3
FW 586 Aquaculture 3
ME 220 Marine Biology 3
ZO 333 Captive Animal Biology 3

Earth Sciences

AEC 380 Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy 3
ES 150 Water and the Environment 3
ES 200 Climate Change and Sustainability 3
FOR 420 Watershed and Wetlands Hydrology 4
FOR 520 Watershed and Wetlands Hydrology 4
GEO 200 Principles of Geography 3
MEA 200 Introduction to Oceanography 3
MEA 210 Oceanography Lab 1
MEA 250 Introduction to Coastal Environments 3
MEA 251 Introduction to Coastal Environments Laboratory 1
MEA 300 Environmental Geology 4
NR 420 Watershed and Wetlands Hydrology 4
NR 421 Wetland Assessment, Delineation and Regulation 3
NR 520 Watershed and Wetlands Hydrology 4
NR 521 Wetland Assessment, Delineation and Regulation 3
SSC 421 Role of Soils in Environmental Management 3
SSC 442 Soil and Environmental Biogeochemistry 3
SSC 452 Soil Classification 4
SSC 455 Soils, Environmental Quality and Global Challenges 3
SSC 461 Soil Physical Properties and Plant Growth 3
SSC 470 Wetland Soils 3
SSC 570 Wetland Soils 3

Semester Sequence
This is a sample.
<table>
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<tr>
<td><strong>First Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>GEP Health and Science Studies</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Math Elective</td>
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<td>ENV 100</td>
<td>Student Success in Environmental First Year</td>
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<td>ENV 101</td>
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<tr>
<td>CH 101 &amp; CH 102</td>
<td>Chemistry - A Molecular Science and General Chemistry Laboratory</td>
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<td>FOR 150</td>
<td>Critical Thinking and Data Analysis</td>
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<td>General Education Elective</td>
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<td>ARE 201 or EC 201</td>
<td>Introduction to Agricultural &amp; Resource Economics or Principles of Microeconomics</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Dendrology</td>
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<td><strong>Spring Semester</strong></td>
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<td>SSC 200</td>
<td>Soil Science</td>
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<td>PS 201 or PS 202</td>
<td>American Politics and Government or State and Local Government</td>
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<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>ST 311</td>
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<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<td>NR 484</td>
<td>Environmental Impact Assessment</td>
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<td>Wildlife Elective</td>
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<td><strong>Spring Semester</strong></td>
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<td><strong>Total Hours</strong></td>
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</table>

1. A grade of C- or better is required.

**Career Opportunities**

Graduates of the Natural Resources Ecosystem Assessment curriculum work in environmental service firms, public agencies, non-governmental organizations, and industries. The U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the N.C. Division of Water Quality, and county and city governments employ graduates to help manage compliance with county, state, and federal environmental regulations, particularly wetlands and protected species. Non-governmental organizations and private engineering and environmental consulting firms employ graduates to prepare environmental impact statements and assessments, delineate wetlands, and conduct searches for threatened or endangered plant and animal species. The broad background in natural resources provided by this curriculum also provides a strong base for students interested in graduate school or environmental law.

The curriculum in Natural Resources Policy and Administration produces managers and administrators for public agencies and private organizations involved with management, administration, policy-making, planning, preservation, or regulation of natural resources. Examples are the USDI National Park Service, the US Environmental Protection Agency, the US Geological Survey, state and local government agencies, and not-for-profit environmental organizations. Background in government, economics, policy, and natural resource management also provides a strong base for students who wish to pursue a graduate program in natural resources economics and policy or environmental law.

**Natural Resources (BS): Policy and Administration Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

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Natural Resources curricula include a series of common courses to highlight the integrated nature of work by interdisciplinary teams.

The curriculum in Natural Resources Ecosystem Assessment produces graduates who have knowledge and skills to inventory and describe ecosystems characteristics and to evaluate the impacts of management decisions. Ecosystem assessment or environmental impact assessment is an important part of development planning that calls for individuals who understand ecosystem structure and processes; who can identify, measure, inventory, and describe ecosystems; and who can apply standard evaluation and classification systems such as wildlife habitat evaluation procedures and the federal wetland delineation criteria. The curriculum entails a strong science base, as well as advanced courses in sampling and measurements, vegetation, soils, hydrology, and wildlife and fisheries are added. The 400-level courses also address techniques and issues of natural resource management.

The curriculum in Natural Resources Policy and Administration produces graduates who have knowledge and skills to manage natural resources programs in a variety of settings and organizations with an emphasis on public agencies. The advanced courses of the curriculum provide background in economics, policy, government, public administration, and natural resources management. An economics track begins with introductory microeconomics and culminates with environmental economics and public finance. Courses in government and public administration provide knowledge of how public institutions work. Courses in forestry, wildlife and fisheries, and outdoor recreation provide techniques of managing natural ecosystems for various uses. A common thread of how public policy on natural resources is influenced and developed runs through many of the courses already noted and culminates in two senior courses that focus on policy. For information on entrance requirements, contact the program coordinator: Dr. George Hess

Department of Forestry and Environmental Resources, NCSU
Box 808
Raleigh, NC 27695-8002
Phone: (919) 515-7437
Fax: (919) 515-8149
E-mail: george_hess@ncsu.edu.

Plan Requirements

Natural Resources (BS)- Policy & Administration Concentration:
120 Total Units

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<thead>
<tr>
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<tr>
<td></td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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| EC 201 | Principles of Microeconomics              |       |
| EC 205 | Fundamentals of Economics                 |       |
|        | Hours 26                                  |       |

Second Year

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<td>Soil Science</td>
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<td>or PS 202</td>
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Third Year

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<td>NR 300</td>
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<td>ARE 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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Summer

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Fourth Year

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<td>Natural Resource Management</td>
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<td>NR 460</td>
<td>Renewable Natural Resource Management and Policy</td>
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<td>NR 484</td>
<td>Environmental Impact Assessment</td>
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A grade of C- or better is required.

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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*Code (p. 1290) 1*
**Natural Resources (BS): Policy and Administration Concentration**

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Total Hours 35

1 At least one from each

### Acad Writing Research

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### Math Electives

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<tr>
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<td>Introduction to Finite Mathematics with Applications</td>
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<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>MA 141</td>
<td>Calculus I</td>
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<td>Calculus for Life and Management Sciences B</td>
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<td>MA 241</td>
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### Physics Electives

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<td>Physics for Engineers and Scientists I</td>
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<td>Physics for Engineers and Scientists I Laboratory</td>
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### Spatial Technology Electives

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<td>GIS and Remote Sensing for Environmental Analysis and Assessment</td>
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<td>GIS 510</td>
<td>Fundamentals of Geospatial Information Science and Technology</td>
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<td>Geographic Information Systems (GIS) in Soil Science and Agriculture</td>
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### Management Science Electives

At least one course from each category:

#### Management Category

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<td>Survey of Financial and Managerial Accounting</td>
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<td>FOR 248</td>
<td>Forest History, Technology and Society</td>
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<td>FW 221</td>
<td>Conservation of Natural Resources</td>
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<tr>
<td>FW 333</td>
<td>Conservation Biology in Practice</td>
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<tr>
<td>GIS 295</td>
<td>Special Topics in Geospatial Information Science</td>
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<td>LAR 430</td>
<td>Site Planning</td>
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<td>NR 350</td>
<td>International Sustainable Resource Use</td>
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<td>PRT 350</td>
<td>Outdoor Recreation Management</td>
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<td>PRT 451</td>
<td>Principles of Recreation Planning and Facility Development</td>
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#### Economics Category

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<td>Agribusiness Management</td>
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<td>EC 301</td>
<td>Intermediate Microeconomics</td>
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<td>EC 348</td>
<td>Introduction to International Economics</td>
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<td>EC 410</td>
<td>Public Finance</td>
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#### Policy Category

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<td>World Forestry</td>
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<td>Human Dimensions of Wildlife and Fisheries</td>
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<td>Legal and Regulatory Environment</td>
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<td>PS 202</td>
<td>State and Local Government</td>
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<td>U.S. Environmental Law and Politics</td>
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#### Resource Science Electives

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<td>FOR 204</td>
<td>Silviculture</td>
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<td>FOR 261</td>
<td>Forest Communities</td>
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<td>FOR 265</td>
<td>Fire Management</td>
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<td>Forest System Mapping and Mensuration II</td>
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<td>Silvics and Forest Tree Physiology</td>
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<td>Forest Pathology</td>
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<td>Forest Tree Genetics and Biology</td>
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<td>Field Ecology and Methods</td>
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<td>Ornithology</td>
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<td>Water and the Environment</td>
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<td>Climate Change and Sustainability</td>
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<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>MEA 250</td>
<td>Introduction to Coastal Environments</td>
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<tr>
<td>MEA 251</td>
<td>Introduction to Coastal Environments Laboratory</td>
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<td>MEA 300</td>
<td>Environmental Geology</td>
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<tr>
<td>NR 420</td>
<td>Watershed and Wetlands Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>NR 421</td>
<td>Wetland Assessment, Delineation and Regulation</td>
<td>3</td>
</tr>
<tr>
<td>NR 520</td>
<td>Watershed and Wetlands Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>NR 521</td>
<td>Wetland Assessment, Delineation and Regulation</td>
<td>3</td>
</tr>
<tr>
<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
<td>3</td>
</tr>
<tr>
<td>SSC 442</td>
<td>Soil and Environmental Biogeochemistry</td>
<td>3</td>
</tr>
<tr>
<td>SSC 452</td>
<td>Soil Classification</td>
<td>4</td>
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</tbody>
</table>

### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSC 455</td>
<td>Soils, Environmental Quality and Global Challenges</td>
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</tr>
<tr>
<td>SSC 461</td>
<td>Soil Physical Properties and Plant Growth</td>
<td>3</td>
</tr>
<tr>
<td>SSC 470</td>
<td>Wetland Soils</td>
<td>3</td>
</tr>
<tr>
<td>SSC 570</td>
<td>Wetland Soils</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Course Title Hours

### First Year

**Fall Semester**

- BIO 181: Introductory Biology: Ecology, Evolution, and Biodiversity | 4
- GEP Health and Science Studies | 1
- ENG 101: Academic Writing and Research | 1
- Math Elective | 3
- ENV 100: Student Success in Environmental First Year | 1
- ENV 101: Exploring the Environment | 2

**Spring Semester**

- CH 101: Chemistry - A Molecular Science & CH 102: General Chemistry Laboratory | 4
- FOR 150: Critical Thinking and Data Analysis | 2
- General Education Elective | 3
- Math Elective | 3
- ARE 201: Introduction to Agricultural & Resource Economics or EC 201: Principles of Microeconomics | 3

### Second Year

**Fall Semester**

- Physics Elective | 4
- GEP Health and Exercise Studies (p. 1422) | 1
- FOR 339: Dendrology | 4
- General Education Elective | 3

**Spring Semester**

- FOR 252: Introduction to Forest Science | 3
- SSC 200: Soil Science | 3
- PS 201: American Politics and Government or PS 202: State and Local Government | 3
- COM 110: Public Speaking or COM 112: Interpersonal Communication | 3

### Third Year

**Fall Semester**

- Ecology Elective | 4
- NR 301: Practicum for Professional Development I | 1
- Spatial Technology Elective | 3
- ST 311: Introduction to Statistics | 3
- Technical Elective | 4

**Hours**

<table>
<thead>
<tr>
<th>Hours</th>
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<tr>
<td>15</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>12</td>
</tr>
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<td>15</td>
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</table>
Renewable Energy Assessment (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Undergraduate Certificate Renewable Energy Assessment provides students the opportunity to assess and implement renewable energy technologies. The certificate is intended to provide students with the ability to assess facilities and land for renewable energy production. The certificate is achieved by taking 12 credit hours in renewable energy assessment topics. The certificate is designed to provide students on campus and others not enrolled in a degree program at North Carolina State University opportunities to learn basic renewable energy assessment techniques and principles that are useful in emerging careers in renewable energy.

Program Coordinator
Dr. Elizabeth Nichols
Jordan Hall Addition 2225, Box 8008
919.513.4832
elizabeth_nichols@ncsu.edu

Admissions Requirement
Students must have an overall GPA of 2.5 to be accepted to the certificate program in Renewable Energy Assessment.

Plan of Study and Registration Information
Contact the Program Coordinator.

Academic Structure
Term Effective: 01/2015
Plan Code: 15REACTU, 32REACTU
CIP Code: 15.0507
Description: Undergraduate Certificate in Renewable Energy Assessment
Offered: Distance Education

Plan Requirements
A grade of ‘C’ (2.0) or better is required for certificate courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ET 120</td>
<td>Introduction to Renewable Energy Technologies and Assessments (online)</td>
<td>3</td>
</tr>
<tr>
<td>ET 262</td>
<td>Renewable Energy Adoption: Barriers and Incentives (online)</td>
<td>3</td>
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<table>
<thead>
<tr>
<th>Elective Courses</th>
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<tbody>
<tr>
<td>Select two of the following:</td>
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<tr>
<td>ET 220</td>
<td>Solar Photovoltaics Assessment (online)</td>
</tr>
<tr>
<td>ET 255</td>
<td>Hydro, Wind, and Bioenergy Assessment (online)</td>
</tr>
<tr>
<td>ES 300</td>
<td>Energy and Environment (face-to-face)</td>
</tr>
</tbody>
</table>

Total Hours 12

1 A grade of C- or better is required.

Career Opportunities
Grads of the Natural Resources Ecosystem Assessment curriculum work in environmental service firms, public agencies, non-governmental organizations, and industries. The U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the N.C. Division of Water Quality, and county and city governments employ graduates to help manage compliance with county, state, and federal environmental regulations, particularly wetlands and protected species. Non-governmental organizations and private engineering and environmental consulting firms employ graduates to prepare environmental impact statements and assessments, delineate wetlands, and conduct searches for threatened or endangered plant and animal species. The broad background in natural resources provided by this curriculum also provides a strong base for students interested in graduate school or environmental law.

The curriculum in Natural Resources Policy and Administration produces managers and administrators for public agencies and private organizations involved with management, administration, policy-making, planning, preservation, or regulation of natural resources. Examples are the USDI National Park Service, the US Environmental Protection Agency, the US Geological Survey, state and local government agencies, and not-for-profit environmental organizations. Background in government, economics, policy, and natural resource management also provides a strong base for students who wish to pursue a graduate program in natural resources economics and policy or environmental law.
Renewable Energy Assessment (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The minor in Renewable Energy Assessment provides students the opportunity to assess and implement renewable energy technologies. The minor is intended to provide students with the ability to assess facilities and land for renewable energy production. The minor is achieved by taking 15 credit hours in renewable energy assessment topics. The minor is designed to engage students from all majors and may be especially appropriate for students majoring in many of the environmental degrees on campus.

Admissions and Certification of Minor

- For completion, students must complete all required courses with a 2.5 GPA average for minor courses.

Contact the Minor Coordinator for questions. To apply for the minor, submit a “Declare a Minor” Form to: Dr. Elizabeth Nichols, egnichol@ncsu.edu, Room 2225 Jordan Addition, Department of Forestry and Environmental Resources, 919-513-4832.

Minor Coordinator

Dr. Elizabeth Guthrie Nichols, Associate Professor
Department of Forestry & Environmental Resources
Campus Box 8006
Room 2225 Jordan Addition
egnichol@ncsu.edu
919-513-4832

SIS Code: 15REAM

Plan Requirements

- Applicants must have a 2.5 GPA overall for application.
- For completion, students must complete all required courses with a 2.5 GPA average for minor courses.
- All courses must be completed with a grade of ‘C’ (2.0) or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET 120</td>
<td>Introduction to Renewable Energy Technologies and Assessments (online)</td>
<td>3</td>
</tr>
<tr>
<td>ET 220</td>
<td>Solar Photovoltaics Assessment (online)</td>
<td>3</td>
</tr>
<tr>
<td>ET 255</td>
<td>Hydro, Wind, and Bioenergy Assessment (online)</td>
<td>3</td>
</tr>
<tr>
<td>ET 262</td>
<td>Renewable Energy Adoption: Barriers and Incentives (online)</td>
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</tr>
<tr>
<td>ES 300</td>
<td>Energy and Environment (face-to-face)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Hours</td>
<td>15</td>
</tr>
</tbody>
</table>

The undergraduate minor in Wetland Assessment is an interdisciplinary, interdepartmental minor that is designed to provide NC State students with the requisite knowledge and skills needed for entry level competence in the field of wetland delineation and assessment. The soils, hydrology, and plant identification courses of the minor build the scientific background and skills needed to understand the structure and functions of wetland ecosystems and to apply assessment protocols.

Admissions

To enroll in the minor, students should contact the minor coordinator, Dr. Ryan Emanuel, 2217 Jordan Hall, 919.513.2511, ryan_emanuel@ncsu.edu. The application form for the minor will serve as a work plan and a copy will be forwarded to the student’s major advisor.

Certification

Certification of the minor should also be completed with Dr. Emanuel. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found in 2217 Jordan Hall and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Ryan Emanuel
2217 Jordan Hall
919.513.2511
ryan_emanuel@ncsu.edu

SIS Code: 15WAM

Plan Requirements

- The minor in Wetlands Assessment consists of 17 credit hours (5 courses) as specified below.
- BIO 405 Functional Histology and FOR 420 Watershed and Wetlands Hydrology/NR 420 Watershed and Wetlands Hydrology are prerequisites of NR 421 Wetland Assessment, Delineation and Regulation and therefore must be completed before enrolling in NR 421 Wetland Assessment, Delineation and Regulation. NR 421 Wetland Assessment, Delineation and Regulation is the capstone course of the minor and should be taken last.
- Successful completion of 60 credit hours and all courses that are prerequisites to courses in the minor prior to admission to the minor.

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tr>
<td></td>
<td>Required Courses</td>
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<tr>
<td>BIO 405</td>
<td>Functional Histology</td>
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<tr>
<td>FOR/NR 420</td>
<td>Watershed and Wetlands Hydrology (Fall)</td>
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<td>SSC 452</td>
<td>Soil Classification (Spring)</td>
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<tr>
<td>SSC 470</td>
<td>Wetland Soils (Fall)</td>
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</tr>
<tr>
<td>NR 421</td>
<td>Wetland Assessment, Delineation and Regulation (Spring)</td>
<td>3</td>
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</tbody>
</table>

Total Hours 17

Wetland Assessment (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)!
Wildlife Sciences (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The minor will provide basic ecological and management knowledge about, and will cultivate an appreciation for, the value of wildlife resources. The objective of the wildlife sciences minor is to provide students, who might pursue careers in related areas of natural resources management, with basic ecological and management knowledge about wildlife resources. Additionally, the minor will provide students majoring in unrelated fields an appreciation for the value wildlife resources and the need for sound management.

Admissions and Certification of Minor

Students must have a GPA of 2.5 or above to be admitted into the minor. Any student seeking a minor must consult with the minor advisor on a plan of work and must file the appropriate paperwork to declare the minor through the office of Registration and Records. Declaring minor too late may result in recognition of the minor not appearing on student’s final transcript. The wildlife minor is not available to fisheries and wildlife sciences majors.

Contact Person

Dr. Lara Pacifici
Turner House
919-515-3431
lara_pacifici@ncsu.edu

SIS Code: 15WSCIM

Plan Requirements

- Overall GPA must be above 2.5.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
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</tr>
<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
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<tr>
<td>AEC/PB 360</td>
<td>Ecology</td>
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<tr>
<td>or FOR 260</td>
<td>Forest Ecology</td>
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<td>FW 353</td>
<td>Wildlife Management</td>
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<td>Elective Courses</td>
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<td>6-7</td>
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<tr>
<td>FW 404</td>
<td>Wildlife Habitat Management</td>
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<tr>
<td>FW 411</td>
<td>Human Dimensions of Wildlife and Fisheries</td>
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<tr>
<td>FW 460</td>
<td>International Wildlife Management and Conservation</td>
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<tr>
<td>FW 444</td>
<td>Mammalogy</td>
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<tr>
<td>FW 453</td>
<td>Principles of Wildlife Science</td>
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<tr>
<td>FW 405</td>
<td>Tropical Wildlife Ecology</td>
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<tr>
<td>or FW 465</td>
<td>African Ecology and Conservation</td>
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<tr>
<td>or FW 445</td>
<td>Human Dimensions of Conservation Biology in the Bahamas</td>
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</table>

Total Hours 16-17

Department of Parks, Recreation and Tourism Management

For more information about this department, including contact information, visit the department (http://cnr.ncsu.edu/prtm/).

PRTM is committed to educating its students by providing them with the latest knowledge and tools to address society’s most pressing needs. The undergraduate programs focus on ways to promote health and enjoyment in people’s lives as well as contribute to the natural and cultural sustainability of recreation resources in communities. PRTM’s unique undergraduate programs combine relevant class time with hands-on field experiences and service learning. The department strives to enroll and graduate a highly motivated and culturally diverse student body.

The department has an established reputation for providing comprehensive, professional education programs in Professional Golf Management, Parks, Recreation and Tourism Management, and Sport Management. Each degree is designed to produce well educated graduates who have the skills, knowledge, and attitude needed to plan activities and manage parks, recreation, tourism and sport areas and facilities in a range of environments for all ages and lifestyles.

Scholarships

The Department of Parks, Recreation, and Tourism Management annually awards scholarships that are available to freshmen and advanced students. Approximately 12 academic scholarships varying between $500 and $5,000 are awarded in the spring for the following academic year and are renewable provided that superior progress is made toward a degree.

Faculty

Plans

- Environmental Education (Minor) (p. 1294)
- Parks, Recreation and Tourism Management (BS): Parks and Natural Resource Recreation Concentration (p. 1295)
- Parks, Recreation, and Tourism Management (BS): Program Management Concentration (p. 1298)
- Parks, Recreation, and Tourism Management (BS): Sustainable Tourism Concentration (p. 1301)
- Parks, Recreation, and Tourism Management (Minor) (p. 1304)
- Professional Golf Management (BS) (p. 1304)
- Sport Management (BS) (p. 1306)
- Sport Management (BS): Professional Golf Management Concentration (p. 1308)

Environmental Education (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The undergraduate minor in Environmental Education is offered to students interested in building environmental literacy among pre-K through adult audiences. Environmental literacy includes environmental awareness and knowledge, pro-environmental attitudes and sensitivity, critical thinking skills necessary to analyze complex environmental challenges, and motivation to act in environmentally responsible ways.
Undergraduates may be interested in careers including informal science education (e.g., in museums or aquaria), environmental interpretation (e.g., parks and nature centers), or formal K-12 education. The minor is designed to give an opportunity to make substantial progress toward the NC Environmental Education Certification program, a certification listed as a requirement (or working toward) for positions within many parks, informal science education facilities, and recognized and favored nationally by many museums, aquaria, and nature centers.

**ADMINISTRATION OF THE MINOR**

Kathryn Stevenson, Assistant Professor  
Department of Parks, Recreation & Tourism Management  
Biltmore 4008D, Box 8004  
919-515-2739  
kathryn_stevenson@ncsu.edu  

*SIS code: 15EEDM*

**Plan Requirements**

To be certified as having completed the minor in Environmental education, students must have a minimum 2.0 grade point average across all courses used toward the minor. The minor will be certified prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for the minor should be completed no later than during the registration period for the student’s final semester at NC State. Other specifications include:

- Enrollment in the minor is open to any student at NC State.
- Students must take 6 hours of required courses and 9 hours of electives for a total of 15 hours, per the course requirements list.
- No more than six (6) hours of transfer credits can be used toward the minor.

**Required Courses**

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<th>Code</th>
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<tr>
<td>EMS 350</td>
<td>Teaching Environmental Education</td>
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<td>PRT 385</td>
<td>Environmental Education in Practice</td>
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**Elective Courses**

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
<td>3</td>
</tr>
<tr>
<td>FW 333</td>
<td>Conservation Biology in Practice</td>
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<tr>
<td>FW 373</td>
<td>Vertebrate Natural History</td>
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</tr>
<tr>
<td>FW 403</td>
<td>Urban Wildlife Management</td>
<td></td>
</tr>
<tr>
<td>NR 350</td>
<td>International Sustainable Resource Use</td>
<td></td>
</tr>
<tr>
<td>FW 411/511</td>
<td>Human Dimensions of Wildlife and Fisheries</td>
<td></td>
</tr>
<tr>
<td>SMT 302</td>
<td>Processing of Biomaterials</td>
<td></td>
</tr>
<tr>
<td>PSE 335</td>
<td>Principles of Green Chemistry</td>
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<tr>
<td>ES 100</td>
<td>Introduction to Environmental Sciences</td>
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<tr>
<td>ES 200</td>
<td>Climate Change and Sustainability</td>
<td></td>
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<tr>
<td>PB 200</td>
<td>Plant Life</td>
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<td>PB 220</td>
<td>Local Flora</td>
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<td>SSC 185</td>
<td>Land and Life</td>
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<td>MEA 135</td>
<td>Introduction to Weather and Climate Laboratory</td>
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**Teaching & Facilitation Courses**

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<tr>
<td>EMS 205</td>
<td>Introduction to Teaching Science</td>
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<tr>
<td>EMS 375</td>
<td>Methods of Teaching Science I</td>
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<tr>
<td>PRT/HESM 214</td>
<td>Introduction to Adventure Education</td>
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</tr>
<tr>
<td>PRT/HESM 215</td>
<td>Principles and Practices of Outdoor Leadership</td>
<td></td>
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<tr>
<td>PRT 442</td>
<td>Recreation and Park Interpretive Services</td>
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</tr>
<tr>
<td>AEE 325</td>
<td>Planning and Delivering Non-Formal Education</td>
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<tr>
<td>AEE 435</td>
<td>Professional Presentations in Agricultural Organizations</td>
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**Interdisciplinary Perspectives on the Environment**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIO 227</td>
<td>Understanding Structural Diversity through Biological Illustration</td>
<td>3</td>
</tr>
<tr>
<td>CNR 250</td>
<td>Diversity and Environmental Justice</td>
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<tr>
<td>IDS 201</td>
<td>Environmental Ethics</td>
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<tr>
<td>IDS/NR 303</td>
<td>Humans and the Environment</td>
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<tr>
<td>HI 440</td>
<td>American Environmental History</td>
<td></td>
</tr>
<tr>
<td>ARE/EC 336</td>
<td>Introduction to Resource and Environmental Economics</td>
<td></td>
</tr>
<tr>
<td>LAR 221</td>
<td>Introduction to Environment and Behavior for Designers</td>
<td></td>
</tr>
<tr>
<td>LAR 444</td>
<td>History of Landscape Architecture</td>
<td></td>
</tr>
</tbody>
</table>

**Total Hours**

1. Students must take 3 hours of Natural Sciences courses, 3 hours of Teaching and Facilitation courses, and 3 additional hours from either one of these categories OR from the Interdisciplinary Perspectives courses. Students who identify other courses more appropriate to their goals should consult with the minor advisor to seek permission for those courses to count.

2. These courses are meant to provide the content knowledge commonly used in environmental education, which usually includes natural history or identification knowledge, knowledge of ecosystems, or knowledge of environmentally friendly practices.

3. These courses are intended to give students a background in teaching and learning theory and practices.

4. Select 3 hours from here OR from any of the courses in the other two areas. These courses are designed to give students a broader view beyond natural science and teaching. These courses may be particularly useful to those interested in a specific topic (e.g., environmental justice) or who anticipate employing EE principals in a diversity of careers (e.g., planning departments).

---

**Parks, Recreation and Tourism Management (BS): Parks and Natural Resource Recreation Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://appsoirp.ncsu.edu/pgas/)!
The curriculum in Parks, Recreation and Tourism Management is a professional program accredited by the Council on Accreditation of Parks, Recreation, Tourism and Related Professions. The curriculum produces graduates with a broad education in natural science, humanities and social science, and communication skills and the professional and technical skills to plan recreation programs and manage facilities, manage parks, and operate tourism services and agencies. General education courses include geology, biology, psychology, sociology, English, mathematics, communication, and economics. A specialized course is required in statistics.

The curriculum is designed to prepare students for a variety of positions in a dynamic and challenging profession. The focus of the curriculum is on management rather than face-to-face leadership. The curriculum provides 35 hours of professional course work that includes recreation philosophy, recreation facility management techniques, fiscal management, supervision, facility and site planning, recreation programming, administration, and evaluation.

In addition to the general education requirements and the core professional requirements, students can attain specialized training through concentration courses. They choose one of the following concentrations: sustainable tourism, park and natural resource management, or program management.

Academic studies on campus are supplemented by practical laboratory experiences in the Raleigh area, out-of-state field trips and service learning opportunities, and a 10-week internship with a park, recreation or tourism agency. Cooperative work-study programs are available. Study abroad opportunities are also encouraged.

Park and Natural Resource Recreation (18 hours)

This concentration is well suited for people who enjoy working outdoors, who are interested in environmental protection and conservation, facility planning and development, and for those wanting to make a positive impact on the lives of others and on the natural environment. Concentration courses include ecology, GIS, outdoor recreation management and adventure education. Students are prepared for positions in planning, managing and maintaining parks and other natural resource oriented areas at the federal, state, regional or local levels in settings ranging from primitive to urban.

Plan Requirements

Parks, Recreation, and Tourism Management (BS): Parks and Natural Resource Recreation Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB 360</td>
<td>Ecology</td>
<td>4</td>
</tr>
<tr>
<td>PRT 351</td>
<td>Outdoor Consortium</td>
<td>3</td>
</tr>
<tr>
<td>PRT 442</td>
<td>Recreation and Park Interpretive Services</td>
<td>3</td>
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<tr>
<td>GIS 280</td>
<td>Introduction to GIS</td>
<td>3</td>
</tr>
<tr>
<td>Concentration Electives (p. 1297)</td>
<td>5</td>
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<tr>
<td>GEP Courses</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Natural Sciences (p. 1429)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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A grade of C- or greater required.

1296  Parks, Recreation and Tourism Management (BS): Parks and Natural Resource Recreation Concentration

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<tr>
<td>PRT 240</td>
<td>Geospatial Applications for Parks, Recreation and Tourism</td>
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<td>PRT 250</td>
<td>Management of Park and Recreation Facilities</td>
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<tr>
<td>PRT 350</td>
<td>Outdoor Recreation Management</td>
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<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<th>Title</th>
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<tr>
<td>PRT 358</td>
<td>Recreation Program Planning</td>
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<td>PRT 359</td>
<td>Leadership and Supervision in Recreation</td>
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<td>PRT 375</td>
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<td>Economics and Business Statistics</td>
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<td>PRT 451</td>
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| Total Hours | 61 |

1297  Hours

1298  Hours

1299  Hours

1300  Hours

1301  Hours
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (Verify Requirements)
GEP Global Knowledge (p. 1419) (Verify Requirements)
Foreign Language Proficiency (p. 1417) (Verify Requirements)
Free Electives
Free Electives (12 Hr S/U Lmt) 15
Total Hours 59

1 Students should consult their academic advisors to determine which courses fill this requirement.

Mathematics Electives

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<td>MA 107</td>
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<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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Concentration Electives

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<td>Introduction to Resource and Environmental Economics</td>
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<tr>
<td>CS 200</td>
<td>Introduction to Turfgrass Management</td>
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<td>CS 210</td>
<td>Lawns and Sports Turf</td>
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<tr>
<td>EC 336</td>
<td>Introduction to Resource and Environmental Economics</td>
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<tr>
<td>FOR 252</td>
<td>Introduction to Forest Science</td>
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<tr>
<td>FOR 339</td>
<td>Dendrology</td>
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<td>FOR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>FOR 520</td>
<td>Watershed and Wetlands Hydrology</td>
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<tr>
<td>FW 221</td>
<td>Conservation of Natural Resources</td>
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<td>FW 353</td>
<td>Wildlife Management</td>
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<td>FW 403</td>
<td>Urban Wildlife Management</td>
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<tr>
<td>FW 404</td>
<td>Wildlife Habitat Management</td>
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<tr>
<td>HESM 214</td>
<td>Introduction to Adventure Education</td>
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<td>HESM 215</td>
<td>Principles and Practices of Outdoor Leadership</td>
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<td>HESM 216</td>
<td>Backcountry Instruction Methodology</td>
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<td>HS 242</td>
<td>Introduction to Small Scale Landscape Design</td>
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<td>HS 471</td>
<td>Landscape Ecosystem Management</td>
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<td>IDS 303</td>
<td>Humans and the Environment</td>
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<td>LAR 221</td>
<td>Introduction to Environment and Behavior for Designers</td>
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<td>LAR 444</td>
<td>History of Landscape Architecture</td>
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<td>NR 303</td>
<td>Humans and the Environment</td>
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<td>NR 400</td>
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<td>NR 420</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>NR 500</td>
<td>Natural Resource Management</td>
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<td>NR 520</td>
<td>Watershed and Wetlands Hydrology</td>
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<td>PB 200</td>
<td>Plant Life</td>
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<td>PB 403</td>
<td>Systematic Botany</td>
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<tr>
<td>PB 503</td>
<td>Systematic Botany</td>
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<td>PP 315</td>
<td>Principles of Plant Pathology</td>
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<td>PRT 214</td>
<td>Introduction to Adventure Education</td>
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<td>PRT 215</td>
<td>Principles and Practices of Outdoor Leadership</td>
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<td>PRT 315</td>
<td>Organization and Administration of Adventure Programs</td>
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<td>U.S. Environmental Law and Politics</td>
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<td>Applied Psychology</td>
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<td>Soil Science</td>
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<tr>
<td>SSC 421</td>
<td>Role of Soils in Environmental Management</td>
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Semester Sequence

This is a sample.

Critical Path Courses – identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
</table>
| Fall Semester
| PRT 150 | Parks, Recreation and Tourism Management Orientation      | 1     |
| PRT 152 | Introduction to Parks, Recreation and Tourism (CP) 1      | 3     |
| ENG 101 | Academic Writing and Research 1                           | 4     |
| Mathematics Elective |                              | 3     |
| GEP Requirement (p. 1417) |                               | 4     |

| Spring Semester
| PRT 220 | Commercial Recreation and Tourism Management              | 3     |
| PRT 238 | Diversity and Inclusion in Recreation and Sport           | 3     |
| GEP Requirement (p. 1417) |                               | 3     |
| GEP Requirement (p. 1417) |                               | 3     |
| GEP Requirement (p. 1417) |                               | 3     |
| GEP Health and Exercise Studies (p. 1422) |                       | 1     |

| Second Year
| Fall Semester
| PRT 250 | Management of Park and Recreation Facilities             | 3     |
| PRT 240 | Geospatial Applications for Parks, Recreation and Tourism | 3     |

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; state agencies, such as state parks; federal government, with agencies such as the National Park Service, U.S. Army Corps of Engineers, and U.S. Forest Service; resorts and country clubs; and sport agencies.

Other major employers include youth and family service organizations, such as the YMCA, YWCA, Boy’s Clubs, and Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments, such as resorts, private clubs, theme parks, and convention and conference centers. Sport management is also a growing profession with career opportunities in sports marketing and sales, game day operations, facility management and community athletics.

### Parks, Recreation, and Tourism Management (BS): Program Management Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The curriculum in Parks, Recreation and Tourism Management is a professional program accredited by the Council on Accreditation of Parks, Recreation, Tourism and Related Professions. The curriculum produces graduates with a broad education in natural science, humanities and social science, and communication skills and the professional and technical skills to plan recreation programs and manage facilities, manage parks, and operate tourism services and agencies. General education courses include geology, biology, psychology, sociology, English, mathematics, communication, and economics. A specialized course is required in statistics.

The curriculum is designed to prepare students for a variety of positions in a dynamic and challenging profession. The focus of the curriculum is on management rather than face-to-face leadership. The curriculum provides 35 hours of professional course work that includes recreation philosophy, recreation facility management techniques, fiscal management, supervision, facility and site planning, recreation programming, administration, and evaluation.

In addition to the general education requirements and the core professional requirements, students can attain specialized training through concentration courses. They choose one of the following concentrations: sustainable tourism, park and natural resource management, or program management.

Academic studies on campus are supplemented by practical laboratory experiences in the Raleigh area, out-of-state field trips and service learning opportunities, and a 10-week internship with a park, recreation or tourism agency. Cooperative work-study programs are available. Study abroad opportunities are also encouraged.

### Program Management (18 hours)

Program Management is designed for students interested in designing and delivering recreation programs or events for diverse audiences in a variety of settings. Students take classes in special event programming

<table>
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<tr>
<th>Course Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td><strong>Hours</strong></td>
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<td>Outdoor Recreation Management</td>
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<td>GEP Requirement (p. 1417)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td><strong>Third Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>PRT 359</td>
<td>Leadership and Supervision in Recreation (CP) ²</td>
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<td>ST 311 or ST 350</td>
<td>Introduction to Statistics or Economics and Business Statistics</td>
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<td>PRT 375</td>
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<td><strong>Summer</strong></td>
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<td>Principles of Recreation Planning and Facility Development</td>
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</table>

1. A grade of C- or greater required.
2. A maximum of 12 credit hours of free electives can be taken for credit only.

### Career Opportunities

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. Tourism and sports are two of the world’s largest industries. A recreation and park professional’s goal is to influence people to use their discretionary time wisely and to improve...
adventure programming, marketing, community development and interpretive programs. Possible professional positions include recreation program director, event planner, outdoor adventures instructor, youth director and facility manager. Positions could be with public agencies, nonprofit group or private companies.

## Plan Requirements

### Parks, Recreation, and Tourism Management (BS): Program Management Concentration: 120 Total Units

<table>
<thead>
<tr>
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<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism</td>
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<td>PRT 220</td>
<td>Commercial Recreation and Tourism Management</td>
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<td>PRT 238</td>
<td>Diversity and Inclusion in Recreation and Sport</td>
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<td><strong>Hours</strong></td>
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<tr>
<td><strong>Second Year</strong></td>
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<tr>
<td>PRT 250</td>
<td>Management of Park and Recreation Facilities</td>
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<td>PRT 240</td>
<td>Geospatial Applications for Parks, Recreation and Tourism</td>
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<td>Outdoor Recreation Management</td>
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<td>COM 110 or COM 112</td>
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<td>Select one of the following:</td>
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<tr>
<td><strong>Third Year</strong></td>
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<tr>
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<td>Introduction to Statistics (Select one of the following:)</td>
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<td>Economics and Business Statistics (Select one of the following:)</td>
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1 A grade of C- or higher is required.

### General Education Program (GEP) Courses

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<td>GEP Natural Sciences (p. 1429)</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirements)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirements)</td>
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### Free Electives

<table>
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<tr>
<td>Free Electives (12 Hr S/U Lmt)</td>
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**Total Hours** 59

1 Students should consult their academic advisors to determine which courses fill this requirement.

### Mathematics Electives

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<tr>
<td>MA 105</td>
<td>Mathematics of Finance</td>
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</tr>
<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
</tr>
<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
<td>3</td>
</tr>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
<td>3</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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### Acad Writing Research

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<td>FLE 101</td>
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### Summer

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<tr>
<td>PRT 475</td>
<td>Recreation and Park Internship</td>
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**Total Hours** 8

### Fourth Year

<table>
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<td>PRT 454</td>
<td>Parks and Recreation Finance and Administration</td>
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**Total Hours** 6

Students should consult their academic advisors to determine which courses fill this requirement.

### Transfer Sequence
**Concentration Electives**

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<tr>
<td>BUS 360</td>
<td>Marketing Methods</td>
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<tr>
<td>COM 226</td>
<td>Introduction to Public Relations</td>
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<td>COM 316</td>
<td>Public Relations Writing</td>
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<td>EDP 304</td>
<td>Educational Psychology</td>
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<td>HESM 214</td>
<td>Introduction to Adventure Education</td>
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<tr>
<td>HESM 215</td>
<td>Principles and Practices of Outdoor Leadership</td>
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</tr>
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<td>HESM 216</td>
<td>Backcountry Instruction Methodology</td>
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<td>HESM 477</td>
<td>Coaching Concepts</td>
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<td>HESM 479</td>
<td>Sport Management</td>
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<tr>
<td>MIE 330</td>
<td>Human Resource Management</td>
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<td>MIE 335</td>
<td>Organizational Behavior</td>
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<td>PRT 215</td>
<td>Principles and Practices of Outdoor Leadership</td>
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<td>PRT 266</td>
<td>Introduction to Sport Management</td>
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<td>PRT 277</td>
<td>Psychological &amp; Cultural Dimensions of Sport</td>
<td>3</td>
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<td>PRT 406</td>
<td>Sports Law</td>
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<td>PRT 420</td>
<td>Destination Planning and Management</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<tr>
<td>PS 312</td>
<td>Introduction to Public Administration</td>
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<td>PSY 311</td>
<td>Social Psychology</td>
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<tr>
<td>PSY 411</td>
<td>The Psychology of Interdependence and Race</td>
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<td>PSY 475</td>
<td>Child Psychology</td>
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<td>SOC 311</td>
<td>Community Relationships</td>
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<tr>
<td>SW 201</td>
<td>Introduction to Social Work</td>
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</table>

**Semester Sequence**

This is a sample.

**Critical Path Courses** – identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<table>
<thead>
<tr>
<th>Course</th>
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<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>Parks, Recreation and Tourism Management Orientation</td>
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<tr>
<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism (CP)</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (CP)</td>
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<tr>
<td>Mathematics Elective (p. 1299)</td>
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<td>GEP Requirement (p. 1417)</td>
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<td>PRT 220</td>
<td>Commercial Recreation and Tourism Management</td>
<td>3</td>
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<tr>
<td>PRT 250</td>
<td>Management of Park and Recreation Facilities</td>
<td>3</td>
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<tr>
<td>PRT 240</td>
<td>Geospatial Applications for Parks, Recreation and Tourism</td>
<td>3</td>
</tr>
<tr>
<td>PRT 350</td>
<td>Outdoor Recreation Management</td>
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<tr>
<td>PRT 359</td>
<td>Leadership and Supervision in Recreation (CP)</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<td>PRT 375</td>
<td>Professional Development and Internship Orientation</td>
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<tr>
<td>PRT 380</td>
<td>Analysis and Evaluation in Parks, Recreation (CP)</td>
<td>3</td>
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<tr>
<td>PRT 475</td>
<td>Recreation and Park Internship</td>
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</tr>
<tr>
<td>PRT 451</td>
<td>Principles of Recreation Planning and Facility Development</td>
<td>3</td>
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</tbody>
</table>
Career Opportunities

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. Tourism and sports are two of the world’s largest industries. A recreation and park professional’s goal is to influence people to use their discretionary time wisely and to improve the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; state agencies, such as state parks; federal government, with agencies such as the National Park Service, U.S. Army Corps of Engineers, and U.S. Forest Service; resorts and country clubs; and sport agencies.

Other major employers include youth and family service organizations, such as the YMCA, YWCA, Boy’s Clubs, and Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments, such as resorts, private clubs, theme parks, and convention and conference centers. Sport management is also a growing profession with career opportunities in sports marketing and sales, gam day operations, facility management and community athletics.

Parks, Recreation, and Tourism Management (BS): Sustainable Tourism Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The curriculum in Parks, Recreation and Tourism Management is a professional program accredited by the Council on Accreditation of Parks, Recreation, Tourism and Related Professions. The curriculum produces graduates with a broad education in natural science, humanities and social science, and communication skills and the professional and technical skills to plan recreation programs and manage facilities, manage parks, and operate tourism services and agencies. General education courses include geology, biology, psychology, sociology, English, mathematics, communication, and economics. A specialized course is required in statistics.

The curriculum is designed to prepare students for a variety of positions in a dynamic and challenging profession. The focus of the curriculum is on management rather than face-to-face leadership. The curriculum provides 35 hours of professional course work that includes recreation philosophy, recreation facility management techniques, fiscal management, supervision, facility and site planning, recreation programming, administration, and evaluation.

In addition to the general education requirements and the core professional requirements, students can attain specialized training through concentration courses. They choose one of the following concentrations: sustainable tourism, park and natural resource management, or program management.

Academic studies on campus are supplemented by practical laboratory experiences in the Raleigh area, out-of-state field trips and service learning opportunities, and a 10-week internship with a park, recreation or tourism agency. Cooperative work-study programs are available. Study abroad opportunities are also encouraged.

Sustainable Tourism (18 hours)

This concentration is for students who enjoy working with people; who are interested in business management, marketing, travel, and event planning; and, for students who want to make a positive impact on the leisure experiences of others. Concentration courses include sustainable tourism, destination management, accounting, tourism, poverty and health, and business management. The tourism and commercial recreation concentration prepares students for positions in planning, marketing and managing tourism facilities, attractions, and products. The positions could be with private companies, nonprofit groups or public agencies.

Plan Requirements

Parks, Recreation, and Tourism Management (BS): Sustainable Tourism Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
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</tr>
<tr>
<td>PRT 150</td>
<td>Parks, Recreation and Tourism Management Orientation</td>
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<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism</td>
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<td>PRT 220</td>
<td>Commercial Recreation and Tourism Management</td>
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<tr>
<td>PRT 238</td>
<td>Diversity and Inclusion in Recreation and Sport</td>
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<tr>
<td>Mathematics Elective (p. 1302)</td>
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<td>Acad Writing Research (p. 1302)</td>
<td>4</td>
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<tr>
<td><strong>Second Year</strong></td>
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<tr>
<td>PRT 250</td>
<td>Management of Park and Recreation Facilities</td>
<td>3</td>
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<td>PRT 240</td>
<td>Geospatial Applications for Parks, Recreation and Tourism</td>
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<td>PRT 350</td>
<td>Outdoor Recreation Management</td>
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<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 201A</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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A grade of C- or greater required.
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### Third Year

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<td>Leadership and Supervision in Recreation ¹</td>
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<td>PRT 375</td>
<td>Professional Development and Internship Orientation</td>
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<tr>
<td>PRT 380</td>
<td>Analysis and Evaluation in Parks, Recreation ¹</td>
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Select one of the following:

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<tbody>
<tr>
<td>BUS 350</td>
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<td>Introduction to Statistics</td>
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<td>ST 350</td>
<td>Economics and Business Statistics</td>
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### Summer

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### Fourth Year

<table>
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<td>PRT 454</td>
<td>Parks and Recreation Finance and Administration</td>
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### Electives

<table>
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<td>Racial and Ethnic Relations</td>
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<td>ANT 431</td>
<td>Tourism, Culture and Anthropology</td>
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<tr>
<td>ANT 433</td>
<td>Anthropology of Ecotourism and Heritage Conservation</td>
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<tr>
<td>ANT 531</td>
<td>Tourism, Culture and Anthropology</td>
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<td>Anthropology of Ecotourism and Heritage Conservation</td>
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<td>Exploring Interdisciplinary Entrepreneurial Thinking</td>
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<tr>
<td>ES 449</td>
<td>Human Dimensions of Natural Resources in Australia/New Zealand</td>
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<td>ES 450</td>
<td>Sustaining Natural Resources in Australia/New Zealand</td>
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<td>GIS 510</td>
<td>Fundamentals of Geospatial Information Science and Technology</td>
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<td>Introduction to International Studies</td>
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<td>International Sustainable Resource Use</td>
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<td>NR 406</td>
<td>Conservation of Biological Diversity</td>
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<td>PRT 407</td>
<td>Services, Facilities and Event Marketing</td>
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<td>Recreation and Park Interpretive Services</td>
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<td>Human Dimensions of Natural Resources in Australia/New Zealand</td>
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<td>International Development</td>
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</table>

¹ Students should consult their academic advisors to determine which courses fill this requirement.
Semester Sequence

This is a sample.

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
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<td>Introduction to Parks, Recreation and Tourism (CP)</td>
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<td>GEP Requirement (p. 1417)</td>
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<tr>
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<td>Diversity and Inclusion in Recreation and Sport (CP)</td>
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<td><strong>Fall Semester</strong></td>
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<td>Management of Park and Recreation Facilities</td>
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<td>Geospatial Applications for Parks, Recreation and Tourism</td>
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<td>EC 205</td>
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<tr>
<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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</tr>
<tr>
<td>GEP Requirement (p. 1417)</td>
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<tr>
<td>COM 110 or COM 112</td>
<td>Public Speaking or Interpersonal Communication</td>
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<td>PRT 350</td>
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<tr>
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<td>GEP Interdisciplinary Perspectives</td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>PRT 359</td>
<td>Leadership and Supervision in Recreation (CP)</td>
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<tr>
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<td></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>PRT 451</td>
<td>Principles of Recreation Planning and Facility Development</td>
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<td>Concentration</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<td>3</td>
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<tr>
<td>Free Electives</td>
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<td>9</td>
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<td><strong>Summer</strong></td>
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<td></td>
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<td>PRT 475</td>
<td>Recreation and Park Internship</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
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<td>120-121</td>
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</table>

1. A grade of C- or greater required.

Career Opportunities

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. Tourism and sports are two of the world’s largest industries. A recreation and park professional’s goal is to influence people to use their discretionary time wisely and to improve the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; state agencies, such as state parks; federal government, with agencies such as the National Park Service, U.S. Army Corps of Engineers, and U.S. Forest Service; resorts and country clubs; and sport agencies.

Other major employers include youth and family service organizations, such as the YMCA, YWCA, Boy’s Clubs, and Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments, such as resorts, private clubs, theme parks, and convention and conference centers. Sport management is also a growing profession with career opportunities in sports marketing and sales, gamday operations, facility management and community athletics.
Parks, Recreation, and Tourism Management (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The academic minor in Parks, Recreation, and Tourism Management is offered to students interested in gaining a basic knowledge of recreation, tourism, and park services and an understanding of the benefits of leisure and recreation in our society. To complete the minor, students must take six hours of required courses and nine hours of electives. These courses provide undergraduates with the opportunity to explore recreation, parks, and leisure services as a potential for graduate work.

Admissions and Certification of Minor

Admission to the Minor is competitive and applicants will be considered based on their overall academic performance. To be eligible for consideration, a student must have successfully completed at least 15 hours of coursework at NC State. Meeting the eligibility requirements does not guarantee admission to the Minor in PRTM. Students are encouraged to begin the PRTM Minor prior to their senior year. Seat availability cannot be guaranteed in Minor classes if a student only has two semesters in which to complete the Minor.

Sport Management and Professional Golf Management majors may not complete the Minor in Parks, Recreation, and Tourism Management.

Application Deadlines: Interested students should submit a completed Declare a Minor Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf) to the Contact Person listed below by one of the following deadlines: September 20, January 20, and June 1. (If the application date falls on a weekend, the application is due Monday following the deadline.) The form is located on Registration and Records Website under Forms.

Students will be notified one month after the application deadline regarding the status of their application. Once accepted into the PRTM Minor, students will be able to sign up for Minor courses. A limited number of minor seats will be reserved in the PRT courses on the minor list.

Certification

Students must earn at least a 2.0 GPA in their PRTM Minor coursework to be certified for a minor. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Students will apply online for the minor during their final semester at NC State.

Contact Person

Dr. Kim Bush
4012F Biltmore Hall
919.515.3688
kabush@ncsu.edu

SIS Code: 15PRM

Plan Requirements

- A minimum of 15 hours (5 courses) are required to complete the minor in Park, Recreation and Tourism Management.

- Students must take 7 hours of required courses and 8 hours of electives.
- A grade of 'C-' or better is required in all courses to be used toward the minor.
- No more than six (6) hours of transfer credits can be used toward the minor. The Parks, Recreation and Tourism Management Director of Undergraduate Programs must approve all transfer credits.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Required Courses</td>
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<tr>
<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism</td>
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<tr>
<td>PRT 358</td>
<td>Recreation Program Planning</td>
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| Elective Courses                                |       |
| PRT 200  | Health, Wellness and the Pursuit of Happiness   |       |
| PRT 220  | Commercial Recreation and Tourism Management   |       |
| PRT 238  | Diversity and Inclusion in Recreation and Sport |       |
| PRT 250  | Management of Park and Recreation Facilities   |       |
| PRT 266  | Introduction to Sport Management               |       |
| PRT 315  | Organization and Administration of Adventure Programs | |
| PRT 350  | Outdoor Recreation Management                   |       |
| PRT 407  | Services, Facilities and Event Marketing       |       |
| PRT 420  | Destination Planning and Management            |       |
| PRT 442  | Recreation and Park Interpretive Services (Prerequisite junior standing) | |
| PRT 451  | Principles of Recreation Planning and Facility Development | |
| PRT 458  | Special Events Planning                        |       |
| GIS 280  | Introduction to GIS                            |       |

| Total Hours | 15    |

1 Prerequisite PRT 152 Introduction to Parks, Recreation and Tourism
2 Prerequisite PRT 358 Recreation Program Planning

Professional Golf Management (BS)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>PRT 150</td>
<td>Parks, Recreation and Tourism Management Orientation</td>
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<td>PRT 152</td>
<td>Introduction to Parks, Recreation and Tourism</td>
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<td>Professional Golf Management Orientation</td>
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<tr>
<td>PRT 210</td>
<td>Golf Management I</td>
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<td>PRT 238</td>
<td>Diversity and Inclusion in Recreation and Sport</td>
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<td>PRT 250</td>
<td>Management of Park and Recreation Facilities</td>
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<tr>
<td>BIO 105</td>
<td>Biology in the Modern World</td>
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<td>Economics (p. 1305)</td>
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<tr>
<td>Acad Writing Research (p. 1305)</td>
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| Summer   |                                                |       |
| COP 100  | Co-Op Work Ist Alt                             | 0     |

<p>| Second Year|                                                |       |</p>
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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PRT 238</td>
<td>Diversity and Inclusion in Recreation and Sport</td>
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### Acad Writing Research

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<td>FLE 101</td>
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### Math Elective

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<tr>
<td>MA 107</td>
<td>Precalculus I</td>
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<tr>
<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<td>MA 121</td>
<td>Elements of Calculus</td>
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### Economics

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<tbody>
<tr>
<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
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</tbody>
</table>

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pagas/)!
## Sport Management (BS)

**To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!**

The Sport Management degree provides students with high quality educational experiences to enable their success as managers in sport and sport related industries and organizations. NC State’s Sport Management program will provide students with a multidisciplinary perspective that includes sound management principles combined with a global understanding of sport and the impact of sport in social, economic, political and technological environments. Sport can be viewed as both an industry and an academic discipline. This program will educate students in the theoretical principles of sport management as well as the application of those principles. The interdisciplinary curriculum, including courses in recreation and accounting, will enable students to develop leadership, communication, evaluation and problem-solving skills in a “real world” environment.

The curriculum provides 38 hours of professional course work that includes recreation philosophy, management techniques and skills, sport finance and economics, sport law, programming, administration, and analysis and evaluation. Students can use the 30 hours of free electives in this program to pursue a minor or design a special track that will meet their career goals. Academic studies on campus are supplemented by a 10-week internship with an approved sport agency.

### Plan Requirements

**Sport Management (BS): 120 Total Units**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Hours</th>
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<tbody>
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<td><strong>First Year</strong></td>
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<tr>
<td>PRT 150</td>
<td>Parks, Recreation and Tourism Management Orientation</td>
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<tr>
<td>PRT 266</td>
<td>Introduction to Sport Management</td>
<td>3</td>
</tr>
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<td>Acad Writing Research (p. 1307)</td>
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<tr>
<td><strong>Second Year</strong></td>
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<tr>
<td>PRT 211</td>
<td>Golf Management II</td>
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<tr>
<td>PB 200</td>
<td>Plant Life</td>
<td>4</td>
</tr>
<tr>
<td>PRT 311</td>
<td>Golf Course Turf Grass Management</td>
<td>3</td>
</tr>
<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
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<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRT 312</td>
<td>Golf Management III</td>
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<tr>
<td>PRT 358</td>
<td>Recreation Program Planning</td>
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<td>ST 311 or ST 350</td>
<td>Introduction to Statistics or Economics and Business Statistics</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>PRT 212</td>
<td>Golf Instructor Development</td>
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<td>Leadership and Supervision in Recreation</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>Free Elective</td>
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<tr>
<td><strong>Summer</strong></td>
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<tr>
<td>COP 400</td>
<td>Co-Op Work 4th Alt</td>
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<td><strong>Fourth Year</strong></td>
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<tr>
<td>COP 500</td>
<td>Co-Op Work Graduate Alt</td>
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<tr>
<td>PRT 410</td>
<td>Food and Beverage Management</td>
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<td>PRT 411</td>
<td>Club Management</td>
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<td>GEP Requirement (p. 1417)</td>
<td></td>
<td>9</td>
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<tr>
<td><strong>Fifth Year</strong></td>
<td></td>
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<tr>
<td>PRT 380</td>
<td>Analysis and Evaluation in Parks, Recreation</td>
<td>3</td>
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<tr>
<td>PRT 406</td>
<td>Sports Law</td>
<td>3</td>
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<tr>
<td>PRT 413</td>
<td>Golf Management IV</td>
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</tbody>
</table>

1. Minimum grade of C-
2. Students must pass the PGA Golf Management Level III Checkpoint and Playing Ability Test prior to graduation
3. A maximum of 12 credit hours of free electives can be taken for credit only
4. Students wishing to earn a Minor in Business must take EC 205 Fundamentals of Economics
5. Students wishing to earn a Minor in Business must take ACC 210 Concepts of Financial Reporting

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## Second Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>PRT 211</td>
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<td>PB 200</td>
<td>Plant Life</td>
<td>4</td>
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<tr>
<td>PRT 311</td>
<td>Golf Course Turf Grass Management</td>
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</tr>
<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

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**Summer**

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## Third Year

**Fall Semester**

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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PRT 312</td>
<td>Golf Management III</td>
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<tr>
<td>PRT 358</td>
<td>Recreation Program Planning</td>
<td>4</td>
</tr>
<tr>
<td>ST 311 or ST 350</td>
<td>Introduction to Statistics or Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Free Elective</td>
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<td>3</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
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</tr>
<tr>
<td>PRT 212</td>
<td>Golf Instructor Development</td>
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<td>PRT 359</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>Free Elective</td>
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**Summer**

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<th>Title</th>
<th>Hours</th>
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## Fourth Year

**Fall Semester**

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<tbody>
<tr>
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**Spring Semester**

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<th>Title</th>
<th>Hours</th>
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<td>PRT 411</td>
<td>Club Management</td>
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**Fifth Year**

**Fall Semester**

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<td>Sports Law</td>
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<tr>
<td>PRT 413</td>
<td>Golf Management IV</td>
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### Mathematics Elective (p. 1307)

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<thead>
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### Second Year

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<th>Title</th>
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<tbody>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>COM 110</td>
<td>Public Speaking</td>
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<td>PRT 286</td>
<td>Writing and Speaking in Sport Organizations</td>
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<td>PRT 277</td>
<td>Psychological &amp; Cultural Dimensions of Sport</td>
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### Third Year

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<tr>
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<td>Sport Programming or Sustainable Sport Facility Management</td>
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<td>ST 350</td>
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<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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### Summer

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<th>Hours</th>
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<tbody>
<tr>
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### Fourth Year

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<th>Code</th>
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<th>Hours</th>
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<td>PRT 476</td>
<td>Sport Marketing</td>
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<td>Sport Finance and Economics</td>
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### Acad Writing Research

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### Mathematics Electives

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<tr>
<td>MA 107</td>
<td>Precalculus I</td>
<td>3</td>
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<td>MA 111</td>
<td>Precalculus Algebra and Trigonometry</td>
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<td>Elements of Calculus</td>
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### Semester Sequence

This is a sample.

**Critical Path Courses** - Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<tr>
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### Course

**First Year**

**Fall Semester**

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**Mathematics Elective**

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### Spring Semester

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1 A grade of C- or better is required.
Plan Requirements

**Sport Management (BS): Professional Golf Management Concentration**

### Course Title Hours

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### Hours

8

### Spring Semester

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### Hours

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### Third Year

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### Hours

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### Hours

3

### Total Hours

120-121

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¹ A grade of C- or better is required.

² A maximum of 12 credit hours of free electives can be taken credit only.

### Career Opportunities

As increased discretionary time becomes available for large segments of the American population, opportunities for growth in the leisure service professions have increased dramatically. Tourism and sports are two of the world’s largest industries. A recreation and park professional’s goal is to influence people to use their discretionary time wisely and to improve the quality of their lives. This goal is accomplished by providing recreation programs and facilities for people in a variety of settings.

Career opportunities include employment by park and recreation departments operated by county and municipal governments; state agencies, such as state parks; federal government, with agencies such as the National Park Service, U.S. Army Corps of Engineers, and U.S. Forest Service; resorts and country clubs; and sport agencies.

Other major employers include youth and family service organizations, such as the YMCA, YWCA, Boy’s Clubs, and Boy and Girl Scouts. Industries employ recreation directors to head employee recreation programs. Areas with perhaps the greatest growth potential for employment are tourism agencies and commercial recreation establishments, such as resorts, private clubs, theme parks, and convention and conference centers. Sport management is also a growing profession with career opportunities in sports marketing and sales, game day operations, facility management and community athletics.
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td><strong>GEP Additional Breadth</strong></td>
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### Sport Management (BS): Professional Golf Management Concentration

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<th>Hours</th>
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<td>Introduction to Business Processes</td>
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<td>PRT 366</td>
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1. A minimum grade of C-  
2. Students must pass the PGA Golf Management tests, complete Work Experience Activities and pass the Playing Ability Test prior to graduation  
3. A maximum of 12 credit hours of free electives can be taken for credit only  
4. Students wishing to complete a Business minor must take EC 205 Fundamentals of Economics  
5. Students wishing to complete a Business minor must take ACC 210 Concepts of Financial Reporting. If not ACC 280 Survey of Financial and Managerial Accounting is also acceptable.
College of Sciences

The College of Sciences offers programs for students interested in working side-by-side with world-class faculty to address the grand challenges of our time, particularly those related to health, energy, safety and security, and the environment. We foster a diverse and inclusive academic community that provides a dynamic, nurturing environment for learning and discovery.

Our graduates, exhibiting well-developed analytical thinking and problem-solving skills, are recruited for technical and administrative positions in industry and laboratories, universities and colleges, non-profit research organizations and government agencies. A large percentage undertake further study leading to master’s and doctoral degrees in their fields or go on to medical, law, business or other professional schools.

Students interested in mathematics, statistics, biology, medicine, chemistry, geology, marine science, meteorology or physics; fascinated by natural phenomena; and want to advance economic, societal and intellectual prosperity for everyone should consider the career opportunities opened by degrees in the sciences. The College of Sciences empowers students to explore opportunities, discover passions and attain an enriched science education.

- The college is a leader in several growing areas of science — such as big data, bioinformatics, environmental health science, geospatial analytics and personalized medicine — that teach students skills highly valued in industry, laboratories, nonprofit research organizations and government agencies.
- Sciences alumni have been named to the Forbes “30 Under 30” list, worked aboard (https://www.ncsu.edu/think-and-do/live-from-the-international-space-station/) the International Space Station, and gone on to prestigious academic and professional careers all over the world.
- More than 400 active research projects and more than $40 million in research expenditures annually provide students with opportunities to explore beyond the classroom, broaden connections with the faculty, and further develop communication and presentation skills.
- The Sciences Ambassadors Program provides outstanding students the opportunity to engage with the college and promote a vibrant campus culture while representing the college at events for prospective students and families, alumni and other special guests.

For more information about our college, including contact information, visit our website (https://sciences.ncsu.edu/).

Senior Associate Dean for Administration
John Blondin

Associate Dean for Academic Affairs
Maria Oliver-Hoyo

Associate Dean for Research
Heather Patisaul

Assistant Dean for Academic Programs, Student Diversity and Engagement
Jamila R. Simpson

Director of Public Science
Vacant

Director of Undergraduate Enrollment
Michael C. Smith

Director of Women in Science and Engineering, College of Sciences
Katherine C. Titus-Becker

Departments
- Department of Biological Sciences (p. 1312)
- Department of Chemistry (p. 1358)
- Department of Marine, Earth and Atmospheric Sciences (p. 1365)
- Department of Mathematics (p. 1392)
- Department of Physics (p. 1404)
- Department of Statistics (p. 1411)
- Life Sciences First Year (p. 1416)
- Toxicology Program (p. 1416)

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- Applied Mathematics (BS): Financial Mathematics Concentration (p. 1398)
- Biological Sciences (BA) (p. 1317)
- Biological Sciences (BS) (p. 1319)
- Biological Sciences (BS): Ecology, Evolution and Conservation Biology Concentration (p. 1322)
- Biological Sciences (BS): Human Biology Concentration (p. 1325)
- Biological Sciences (BS): Integrative Physiology and Neurobiology Concentration (p. 1327)
- Biological Sciences (BS): Molecular, Cellular, and Developmental Biology Concentration (p. 1331)
- Chemistry (BA) (p. 1360)
• Chemistry (BS) (p. 1362)
• Genetics (BS) (p. 1337)
• Geology (BS) (p. 1367)
• Marine Sciences (BS): Biological Oceanography Concentration (p. 1373)
• Marine Sciences (BS): Chemistry Concentration (p. 1375)
• Marine Sciences (BS): Geology Concentration (p. 1377)
• Marine Sciences (BS): Meteorology Concentration (p. 1381)
• Marine Sciences (BS): Physics Concentration (p. 1383)
• Mathematics (BS) (p. 1400)
• Meteorology (BS) (p. 1385)
• Meteorology (BS): Marine Sciences Concentration (p. 1388)
• Microbiology (BS) (p. 1341)
• Microbiology (BS): Microbial Biotechnology Concentration (p. 1344)
• Microbiology (BS): Microbial Health Science Concentration (p. 1347)
• Microbiology (BS): Microbial Research Concentration (p. 1350)
• Natural Resources (BS): Marine and Coastal Concentration (p. 1390)
• Physics (BA) (p. 1406)
• Physics (BS) (p. 1408)
• Statistics (BS) (p. 1413)
• Zoology (BS) (p. 1354)

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• Biological Sciences (Minor) (p. 1334)
• Biology (Honors) (p. 1334)
• Environmental Toxicology (Minor) (p. 1416)
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• Forensic Science (Minor) (p. 1336)
• Genetics (Minor) (p. 1339)
• Geology (Minor) (p. 1371)
• Global Health (Minor) (p. 1339)
• Marine Science (Minor) (p. 1372)
• Mathematics (Minor) (p. 1403)
• Meteorology (Minor) (p. 1390)
• Microbiology (Minor) (p. 1354)
• Physics (Minor) (p. 1410)
• Statistics (Minor) (p. 1415)
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• Microbiology (Certificate) (p. 1353)

Department of Biological Sciences

For more information about this department, including contact information, visit the department (http://bio.sciences.ncsu.edu).

The Department of Biological Sciences provides educational opportunities to undergraduate and graduate students and conducts world class research in a variety of areas in modern biology. Undergraduate Programs in the Department of Biological Sciences have the primary mission of providing our diverse population of students with the opportunity and support to successfully complete their major and prepare for their post-baccalaureate life as independent thinkers, lifelong learners, and contributing members of society.

Undergraduates begin with comprehensive studies of the structure, function, behavior, and evolution of cells, organisms, populations, and ecosystems and then have the opportunity to select upper division courses that reflect their intellectual interests and career goals. Those who earn a Bachelor of Science degree in Biological Sciences, Genetics, Microbiology or Zoology gain a strong background in biology and in related fields. Those who earn a Bachelor of Arts degree in Biology establish a solid foundation in the life sciences and also design a secondary area of focus to complement their studies in the life sciences.

All incoming freshmen interested in majoring in any one of these degree programs will start their studies in the NC State Life Sciences First Year Program (https://departments.sciences.ncsu.edu/lsfy/), and will explore these and related degree options during their first year while they take courses relevant to all life science degree programs at NC State. The Department of Biological Sciences also offers minors in Biological Sciences, Environmental Toxicology, Evolutionary Biology, Genetics, Microbiology, Forensic Science, and Zoology.

To learn more about this department, visit our website (https://bio.sciences.ncsu.edu/).

Department of Biological Sciences
Student Services and Advising Offices
2727 Bostian Hall
Campus Box 7611
Raleigh, NC 27685
Phone: 919-515-3341

Carolyn Mattingly
Department Head
Phone: 919-515-1509
Email: cjmattin@ncsu.edu

Faculty

Departmental Administration

C. J. Mattingly, Department Head
J. L. Lubscher, Associate Department Head

Undergraduate Program Directors and Coordinators

Directors of Undergraduate Degree Programs, L. D. Parks (Bio Sci), J. L. Lubischer (BA in Biology), B. Gardner (Genetics), J. W. Olson (Microbiology), J. L. Campbell (Zoology)

Coordinators within the B.S. in Biological Sciences, M. L. Sikes (Molecular, Cellular, and Developmental Biology), J. R. Godwin (Integrative Physiology and Neurobiology), L. D. Parks (Human Biology), R. B. Langerhans (Ecology, Evolution, and Conservation Biology)

Departmental Honors Program Directors, L. D. Parks, B. Gardner, J. W. Olson, J. L. Campbell

Coordinators of Minors, L. D. Parks (Bio Sci), S. W. Kullman (Environmental Toxicology), R. B. Langerhans (Evolutionary Biology), A. H. Ross (Forensic Science), B. Gardner (Genetics), J. W. Olson (Microbiology), J. L. Campbell (Zoology)
**Graduate Program Directors**
S. W. Kullman, *Environmental and Molecular Toxicology*
R. B. Roberts, *Genetics*
R. E. Irwin, *Biology*

**Named Professors**
W. R. Atchley (Emeritus)
E. Hodgson (Emeritus)
C. S. Levings III (Emeritus)
H. B. Patisaul
J. G. Scandalios (Emeritus)
R. C. Smart
F. A. Wright
Z.-B. Zeng

**Alumni Distinguished Undergraduate Professors**
J. W. Brown
J. L. Campbell
M. G. Ferzli
W. C. Grant (Emeritus)
W. H. Mackenzie (Emeritus)
L. D. Parks
J. F. Roberts (Emeritus)

**University Faculty Scholars**
J. A. Hoppin
C. J. Mattingly
J. E. Melzien
H. B. Patisaul
A. H. Ross

**Professors**
P. C. Bradbury (Emeritus)
P. T. Bromley (Emeritus)
J. W. Brown
D. B. Buchwalter
D. J. Burke
S. E. Curtis (Emeritus)
J. R. Godwin
W. C. Grant (Emeritus)
W. D. Hanson (Emeritus)
H. F. Heatwole (Emeritus)
E. Hodgson (Emeritus)
J. A. Hoppin
C. Hoyo
W. E. Kloos (Emeritus)
S. W. Kullman
S. M. Laster
G. A. LeBlanc
R. B. Leidy (Emeritus)
C. S. Levings III (Emeritus)
J. W. Mahaffey
V. J. Martin
C. J. Mattingly
D. F. Matzinger (Emeritus)
W. H. McKenzie (Emeritus)
J. Ninomiya-Tsuji
H. B. Patisaul
I. T. Petty
E. F. Rissman
J. F. Roberts (Emeritus)
J. G. Scandalios (Emeritus)
H. E. Schaffer (Emeritus)
M. H. Schweitzer
D. Shea
T. J. Sheets (Emeritus)
R. C. Smart
D. E. Smith (Emeritus)
S. L. Spiker (Emeritus)
C. W. Stuber (Emeritus)
J. L. Thorne
A. C. Triantaphyllou (Emeritus)
Y. Tsuji
J. G. Vandenbergh (Emeritus)
F. A. Wright
Z-B. Zeng

Teaching Professors
M.G. Ferzli
M. B. Gardner
L. D. Parks

Research Professors
R. L. Jirtle

Associate Professors
D. L. Aylor
S. M. Belcher
G. C. Conant
A. Hartstone-Rose
R. B. Langerhans
J. E. Meitzen
M. Niedzlek-Feaver
D. M. Nielsen
J. W. Olson
A. J. Planchart
D. M. Reif
R. B. Roberts
F. Scholle
M. L. Sikes
Y. Zhou

Teaching Associate Professors
J. L. Campbell
M. D. Engell

J. F. Flores
J. M. Landin
A. M. Lee
J. L. Lubischer

Research Associate Professors
Z. Drobona
P. A. Estes
L. E. Zanno

Assistant Professors
C. S. Heil
M. S. Bereman
M. Cowley
K. C. Marsden
C. Zakas

Teaching Assistant Professors
J. L. Little
T. A. Gates
C. C. Golier
C. L. Gordy
C. J. Halweg
B. V. Jacquet
W. M. Jones
M. J. Klesath
M. U. Ramirez
M. E. Taveirne

Research Assistant Professors
M. A. Carbone
J. R. Hall
M. B. Reiskind
D. A. Skaar
A. A. Smith

Lecturers
A. F. Potter
Undergraduate Honors Program in Biological Sciences

The Department of Biological Sciences (DBS) Honors Program requires students to design a challenging program of advanced study, including 8 credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants are required to present their scholarly work at a local, regional, or national meeting. A written honors thesis is also required. Invitations to join the DBS Honors Program are sent in the first 3 weeks of the Fall and Spring semesters, based on GPA and number of credit hours completed at NC State, as described in the Admissions Requirements.

Program Requirements

BSC 497 Biological Sciences Honors Project Part 1 and BSC 498 Biological Sciences Honors Project Part 2

- two semesters of mentored research or teaching scholarship in biology
- includes written project proposal (BSC 497 Biological Sciences Honors Project Part 1), and a draft of the honors thesis (BSC 498 Biological Sciences Honors Project Part 2)
- includes completion of reflection prompts posted on Moodle
- enrollment requires a completed contract with the mentor, approved by the DBS Honors Program Committee

BSC 499 Honors Thesis in Biological Sciences

- requires oral presentation of work completed in BSC 497 Biological Sciences Honors Project Part 1 & BSC 498 Biological Sciences Honors Project Part 2
- requires final written honors thesis on the work completed in BSC 497 Biological Sciences Honors Project Part 1 & BSC 498 Biological Sciences Honors Project Part 2
- the honors thesis will be submitted mid-way through the semester for evaluation and to allow time for revisions
- the honors thesis must be approved by the mentor and by the DBS Honors Program Committee

Honors Coursework (8 cr)

- courses must be completed with a B- or higher
- courses must be numbered 300 or higher
- courses must focus on a topic in biology
- eligible courses include: (1) any course designated as an honors course by the DBS Honors Program Committee, (2) any course for which an honors contract is approved by the DBS Honors Program Committee, and (3) any Study Abroad course approved by the DBS Honors Program Committee.

Admissions Requirement

Students in any major offered by the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30 (but fewer

Plans

- Biological Sciences (BA) (p. 1317)
- Biological Sciences (BS) (p. 1319)
- Biological Sciences (BS): Ecology, Evolution and Conservation Biology Concentration (p. 1322)
- Biological Sciences (BS): Human Biology Concentration (p. 1325)
- Biological Sciences (BS): Integrative Physiology and Neurobiology Concentration (p. 1327)
- Biological Sciences (BS): Molecular, Cellular, and Developmental Biology Concentration (p. 1331)
- Biological Sciences (Minor) (p. 1334)
- Biology (Honors) (p. 1334)
- Evolutionary Biology (Minor) (p. 1335)
- Forensic Science (Minor) (p. 1336)
- Genetics (BS) (p. 1337)
- Genetics (Minor) (p. 1339)
- Global Health (Minor) (p. 1339)
- Microbiology (BS) (p. 1341)
- Microbiology (BS): Microbial Biotechnology Concentration (p. 1344)
- Microbiology (BS): Microbial Health Science Concentration (p. 1347)
- Microbiology (BS): Microbial Research Concentration (p. 1350)
- Microbiology (Certificate) (p. 1353)
- Microbiology (Minor) (p. 1354)
- Zoology (BS) (p. 1354)
- Zoology (Minor) (p. 1357)
than 65) credit hours at NC State will receive an invitation to join the DBS Honors Program.

Transfer Students in any major offered by the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 15 credit hours at NC State (and a total of 30 credit hours of college coursework), will receive an invitation to join the DBS Honors Program.

**Graduation Requirements**

complete the Program Requirements described above

maintain an overall GPA of 3.40 or higher

complete the graduation requirements for an undergraduate degree program offered by the Department of Biological Sciences

**Program Director**

Dr. Betty Gardner
2727 Bostian Hall
919.515.3341


**Undergraduate Honors Program In Genetics**

The Honors Program in Genetics encourages qualified students to design a program of advanced study, including at least 2 semesters of research or teaching experience, to challenge themselves as scholars. Honors participants are required to present their scholarly work at a local, regional, or national symposium or conference. Students in the B.S. in Genetics program who are currently in the CALS Honors Program and who completed ALS 398 Agriculture and Life Sciences Honors Seminar no later than Spring 2013 are eligible to remain in the CALS Honors Program or to switch into the Honors Program in Genetics. Other students majoring in Genetics can qualify for the Honors Program in Genetics by completing 30 credit hours at NC State with an overall GPA of 3.50 or better. Transfer students majoring in Genetics can qualify by completing their first semester at NC State with a GPA of 3.50 or better.

**Program Requirements**

Two semesters (6 cr) of mentored research or teaching experience in their discipline includes written project proposal, a paper, and a poster presentation describing your work

Eight (8) credit hours of honors coursework:

- must be completed with a C or better
- must be numbered 300 or higher
- can include ALS 398 Agriculture and Life Sciences Honors Seminar for those who completed it no later than Spring 2013

Honors coursework is defined as including any course designated as an honors course by the University Honors Program, any course for which an Honors Contract is approved by the University Honors Program, any course at the 500 level, and any approved study abroad course.

**Admissions Requirements**

Genetics majors currently in the CALS Honors Program will be allowed to switch into the Honors Program in Genetics, if they desire to do so. Genetics majors who have earned an overall GPA of 3.50 after completing 30 credit hours at NC State (or transfer students who earn a GPA of 3.50 after completing 15 credit hours at NC State), will receive an invitation to join the Honors Program in Genetics.

**Graduation Requirements**

Students must complete the Program Requirements as described above and must maintain an overall GPA of 3.35 or higher throughout their remaining undergraduate career, and must graduate In Genetics.

**Program Director**

Dr. Stephanie Curtis
Thomas Hall 2532, Box 7614
919.515.5747


**Undergraduate Honors Program In Microbiology**

The Honors Program in Microbiology encourages qualified students to design a program of advanced study, including at least 2 semesters of research or teaching experience, to challenge themselves as scholars. Honors participants are required to present their scholarly work at a local, regional, or national symposium or conference. Students in the B.S. in Microbiology program who are currently in the CALS Honors Program and who completed ALS 398 Agriculture and Life Sciences Honors Seminar no later than Spring 2013 are eligible to remain in the CALS Honors Program or to switch into the Honors Program in Microbiology. Other students majoring in Microbiology can qualify for the Honors Program in Microbiology by completing 30 credit hours at NC State with an overall GPA of 3.50 or better. Transfer students majoring in Microbiology can qualify by completing 15 credit hours at NC State with a GPA of 3.50 or better.

**Program Requirements**

Two semesters (6 cr) of mentored research or teaching experience in their discipline

- includes a written project proposal, a paper, and a poster presentation describing your work
- requires a completed contract with the mentor, approved by the Program Director in advance of the experience

Eight (8) credit hours of honors coursework

- must be completed with a C or better
- must be numbered 300 or higher
- can include ALS 398 Agriculture and Life Sciences Honors Seminar for those who completed it no later than Spring 2013

Honors coursework is defined as including any course designated as an honors course by the University Honors Program, any course for which an Honors Contract is approved by the University Honors Program, any course at the 500 level, and any approved study abroad course.

**Admissions Requirements**

Microbiology majors currently in the CALS Honors Program will be allowed to switch into the Honors Program in Microbiology, if they desire
to do so. Microbiology majors who have earned an overall GPA of 3.50 after completing 30 credit hours at NC State (or transfer students who earn a GPA of 3.50 after completing 15 credit hours at NC State), will receive an invitation to join the Honors Program in Microbiology.

Graduation Requirements

Students must complete the Program Requirements as described above and must maintain an overall GPA of 3.35 or higher throughout their remaining undergraduate career, and must graduate in Microbiology.

Program Director

Dr. Jonathan Olson
4544B Thomas Hall
919.515.7860


Undergraduate Honors Program In Zoology

The Honors Program in Zoology encourages qualified students to design a program of advanced study, including at least 2 semesters of research or teaching experience, to challenge themselves as scholars. Honors participants are required to present their scholarly work at a local, regional, or national symposium or conference. Students in the B.S. in Zoology program who are currently in the CALS Honors Program and who completed ALS 398 Agriculture and Life Sciences Honors Seminar no later than Spring 2013 are eligible to remain in the CALS Honors Program or to switch into the Honors Program in Zoology. Other students majoring in Zoology can qualify for the Honors Program in Zoology by completing 30 credit hours at NC State with an overall GPA of 3.50 or better. Transfer students majoring in Zoology can qualify by completing their first semester at NC State with a GPA of 3.50 or better.

Program Requirements

Two semesters (6 cr) of mentored research or teaching experience in their discipline

• includes written project proposal, a paper, and a poster presentation describing your work
• requires a completed contract with the mentor, approved by the Program Director in advance of the experience

Eight (8) credit hours of honors coursework

• must be completed with a C or better
• must be numbered 300 or higher
• can include ALS 398 Agriculture and Life Sciences Honors Seminar for those who completed it no later than Spring 2013

Honors coursework is defined as including any course designated as an honors course by the University Honors Program, any course for which an Honors Contract is approved by the University Honors Program, any course at the 500 level, and any approved Study Abroad course.

Admissions Requirements

Zoology majors currently in the CALS Honors Program will be allowed to switch into the Honors Program in Zoology, if they desire to do so. Zoology majors who have earned an overall GPA of 3.50 after completing 30 credit hours at NC State (or transfer students who earn a GPA of 3.50 after completing 15 credit hours at NC State), will receive an invitation to join the Honors Program in Zoology.

Graduation Requirements

Students must complete the Program Requirements as described above, must maintain an overall GPA of 3.35 or higher throughout their remaining undergraduate career, and must graduate in Zoology.

Program Director

Dr. Jennifer Campbell
David Clark Labs 120, Box 7617
919.513.7570


Biological Sciences (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The NC State Bachelor of Arts degree in Biology is designed for students who want to combine studies in the life sciences with studies in a second discipline of interest (chosen from outside of the life sciences). Students in the B.A. are required to take just as much biology (through their Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biology B.A. students identify a second area of interest outside the life sciences and create a focal area of study in that area (e.g., psychology, social work, communication, political science, anthropology, education, mathematics, statistics). Their proposed list of Cross Discipline Electives is reviewed and approved by their academic advisor and the program director.

At the end of their undergraduate studies, students in this degree program complete a Senior Capstone Project through which they draw on both the life sciences (or a sub-discipline within the life sciences) and their chosen Cross Discipline to address a problem or issue that they identify. Experiential learning (related to their academic and/or career interests) is also required of all students in this program.

Students who graduate with a B.A. in Biology will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying. Depending on their course choices, students will be prepared for a wide range of careers or further studies. This is a relatively new program, but so far our Biology B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology, and psychology.

Plan Requirements

Biological Sciences: 120 Total Units
## Biological Sciences (BA)

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<td>Critical and Creative Thinking in the Life Sciences</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (Verify Requirement)</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine how to complete this requirement.

## Communication and Writing Electives

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<td>COM 112</td>
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<td>Introduction to Persuasion Theory</td>
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## Semester Sequence

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<td>Introductory Biology: Cellular and Molecular Biology</td>
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Second Year
Fall Semester
Statistics 3
Communication Requirement 3
Life Science 3
GEP Elective 3
Free Elective 3
Hours 15
Spring Semester
Life Science Elective 3
Life Science Elective 3
Cross Discipline Elective (Advised) 3
GEP Elective 3
Free Elective 3
Hours 15
Third Year
Fall Semester
PY 131 Conceptual Physics 4
Experiential Learning Requirement 3
Cross Discipline Elective (Advised) 3
GEP Elective 3
Free Elective 3
Hours 16
Spring Semester
Life Science Elective 3
Life Science Elective 3
Cross Discipline Elective (Advised) 3
Writing 3
GEP Elective 3
Hours 15
Fourth Year
Fall Semester
Life Science Elective 3
Life Science Elective 3
Cross Discipline Elective (Advised) 3
Cross Discipline Elective (Advised) 3
GEP Elective 3
Hours 15
Spring Semester
Life Science Elective 3
Cross Discipline Elective (Advised) 3
Free Elective 3
Cross Discipline Elective (Advised) 3
GEP Health and Exercise Studies (p. 1422) 1
BIO 481 Senior Capstone Project 1
Hours 14
Total Hours 120

Career Opportunities
Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

Biological Sciences (BS)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

There are five different avenues to earning a B.S. in Biological Sciences at NC State. Students studying for a degree in Biological Sciences can opt for a general curriculum (BLS) or can choose to focus in a particular area by selecting one of four areas of concentration: Molecular, Cellular, and Developmental Biology (MCD), Integrative Physiology and Neurobiology (IPN), Human Biology (HB), or Ecology, Evolution, and Conservation Biology (EEC).

The MCD curriculum offers students in-depth studies of the molecular and cellular basis of life and the development of multicellular organisms.

The IPN curriculum provides a comprehensive grounding in basic principles of physiology and neuroscience, as well as in-depth exposure to the application of these principles in understanding whole-organism function and the ways in which animals (including humans) cope with challenges presented by their environments.

The HB curriculum provides training in those areas of science most important to health-related professions as well as relevant aspects of the humanities and social sciences. It is designed to provide students with a solid education in the scientific and humanistic concepts that underlie modern health sciences and related areas of scientific research.

The EEC curriculum offers students in-depth studies in areas of biology at the level of the organism, populations, and ecosystems. It is designed for students who have an interest in whole organisms and their biodiversity.

A grade of C- or higher is required.
— what maintains it, what environmental changes affect it, and how to protect it in the face of various challenges.

**Plan Requirements**

**Biological Sciences (17BIOSCBS)**

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<th>Code</th>
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<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>GN 311</td>
<td>Principles of Genetics</td>
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<td>Elementary Genetics Laboratory</td>
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<td>MB 351</td>
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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

**Advanced Writing Requirement Elective**

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<td>Literature and Medicine</td>
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<td>Explorations in Creative Writing</td>
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<td>Writing About Film</td>
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**Physiology Requirement Electives**

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<td>BIO 245</td>
<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
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Semester Sequence

This is a sample.

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| Fourth Year |                                            |       |
| **Fall Semester** |                                     |       |
| Life Science Elective |                          | 3     |
| Life Science Elective |                          | 3     |
| Science and Math Elective |                      | 4     |
| Science and Math Elective |                      | 3     |
| Free Elective |                                | 3     |
| **Hours** |                                          | 16    |
| **Spring Semester** |                                     |       |
| Life Science Elective |                          | 4     |
| Science and Math Elective |                      | 3     |
| Free Elective |                                | 3     |
| GEP Additional Breadth (p. 1417) | 3     |
| GEP Humanities (p. 1423) | 3     |
| **Hours** |                                          | 16    |
| **Total Hours** |                                      | 120   |

1 A grade of C- or higher is required.

Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced
degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

**Biological Sciences (BS): Ecology, Evolution and Conservation Biology Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The NC State Bachelor of Arts degree in Biology is designed for students who want to combine studies in the life sciences with studies in a second discipline of interest (chosen from outside of the life sciences). Students in the B.A. are required to take just as much biology (through their Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biology B.A. students identify a second area of interest outside the life sciences and create a focal area of study in that area (e.g., psychology, social work, communication, political science, anthropology, education, mathematics, statistics). Their proposed list of Cross Discipline Electives is reviewed and approved by their academic advisor and the program director.

At the end of their undergraduate studies, students in this degree program complete a Senior Capstone Project through which they draw on both the life sciences (or a sub-discipline within the life sciences) and their chosen Cross Discipline to address a problem or issue that they identify. Experiential learning (related to their academic and/or career interests) is also required of all students in this program.

Students who graduate with a B.A. in Biology will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying. Depending on their course choices, students will be prepared for a wide range of careers or further studies. This is a relatively new program, but so far our Biology B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology, and psychology.

**Plan Requirements**

**Biological Sciences (BA): Ecology, Evolution and Conservation Biology Concentration: 120 Total Units**

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Select one of the following: 3

|        | PB 321 | Introduction to Whole Plant Physiology | 3     |
|        | PB 421 | Plant Physiology | 3     |
|        | ZO 250 | Animal Anatomy and Physiology | 3     |

**Physical & Mathematical Sciences**

|        | MA 131 | Calculus for Life and Management Sciences A | 3     |
| or MA 141 | Calculus I | 3     |
|        | MA 231 | Calculus for Life and Management Sciences B | 3     |
| or MA 241 | Calculus II | 3     |
|        | CH 101 | Chemistry - A Molecular Science | 3     |
|        | CH 102 | General Chemistry Laboratory | 1     |
|        | CH 201 | Chemistry - A Quantitative Science | 3     |
|        | CH 202 | Quantitative Chemistry Laboratory | 1     |
|        | CH 221 | Organic Chemistry | 3     |
|        | CH 222 | Organic Chemistry I Lab | 1     |
|        | CH 223 | Organic Chemistry II | 3     |
|        | CH 224 | Organic Chemistry II Lab | 1     |

Select one of the following: 4

|        | PY 211 | College Physics I | 4     |
|        | PY 205 | Physics for Engineers and Scientists I | 4     |
| & PY 206 | and Physics for Engineers and Scientists I | 4     |
|        | CH 211 | Plant Physiology I | 4     |
|        | CH 212 | Plant Physiology | 4     |
|        | CH 208 | Physics for Engineers and Scientists II | 4     |
| & CH 209 | and Physics for Engineers and Scientists II | 4     |
|        | ST 311 | Introduction to Statistics | 3     |

**Major Electives**

|        | EECB Electives (p. 1323) | 18     |
|        | Organismal Biology Elective (p. 1324) | 3     |
|        | Learning Experience Elective (p. 1324) | 3     |
|        | Plant Co-Requisite (verify requirement) (p. 1324) | 3     |

**GEP Courses**

|        | ENG 101 | Academic Writing and Research | 4     |
|        | GEP Humanities (p. 1423) | 6     |
|        | GEP Social Sciences (p. 1430) | 6     |
|        | GEP Health and Exercise Studies (p. 1422) | 2     |
|        | GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) | 3     |
|        | GEP U.S. Diversity (p. 1431) (verify requirement) | 3     |
|        | GEP Global Knowledge (p. 1419) (verify requirement) | 3     |
Advanced Writing Requirement Electives

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<td>Explorations in Creative Writing</td>
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<td>ENG 288</td>
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<td>Introduction to News and Article Writing</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>Communication for Business and Management</td>
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<td>Writing Theory and the Writing Process</td>
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<td>Analysis of Scientific and Technical Writing</td>
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EECB Electives

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### Organismal Biology Electives

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### Learning Experience Electives

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<td>Research in the Life Sciences II: Guided Research</td>
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### Plant Co-Requisites

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<td>Introduction to Agroecology</td>
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<td>FOR 565</td>
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<td>4</td>
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<td>Introduction to Whole Plant Physiology</td>
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<td>PP 222</td>
<td>Kingdom of Fungi</td>
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### Semester Sequence

This is a sample.

#### First Year

**Fall Semester**

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<td>Chemistry - A Molecular Science</td>
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<td>MA 131</td>
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<td>Exploring Opportunities in the Life Sciences</td>
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**Spring Semester**

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**Second Year**

**Fall Semester**

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<td>Elementary Genetics Laboratory</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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**Third Year**

**Fall Semester**

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<td>Dendrology</td>
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<tr>
<td>FOR 565</td>
<td>Plant Community Ecology</td>
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<td>Local Flora</td>
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<td>PB 250</td>
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<td>Introduction to Whole Plant Physiology</td>
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<td>PB 445</td>
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<td>Systematic Botany</td>
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**Spring Semester**

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<td>Chemistry - A Quantitative Science</td>
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<td>CH 202</td>
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**Third Year**

**Fall Semester**

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<td>CS 230</td>
<td>Introduction to Agroecology</td>
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<td>PB 545</td>
<td>Paleobotany</td>
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</tbody>
</table>
in the Department of Science, Technology, Engineering & Mathematics Education.

**Biological Sciences (BS): Human Biology Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The NC State Bachelor of Arts degree in Biology is designed for students who want to combine studies in the life sciences with studies in a second discipline of interest (chosen from outside of the life sciences). Students in the B.A. are required to take just as much biology (through their Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biology B.A. students identify a second area of interest outside the life sciences and create a focal area of study in that area (e.g., psychology, social work, communication, political science, anthropology, education, mathematics, statistics). Their proposed list of Cross Discipline Electives is reviewed and approved by their academic advisor and the program director.

At the end of their undergraduate studies, students in this degree program complete a Senior Capstone Project through which they draw on both the life sciences (or a sub-discipline within the life sciences) and their chosen Cross Discipline to address a problem or issue that they identify. Experiential learning (related to their academic and/or career interests) is also required of all students in this program.

Students who graduate with a B.A. in Biology will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying.

Depending on their course choices, students will be prepared for a wide range of careers or further studies. This is a relatively new program, but so far our Biology B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology, and psychology.

**Plan Requirements**

### Biological Sciences (BA): Human Biology Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
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<tr>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology (^1)</td>
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<tr>
<td></td>
<td>Physiology Electives (p. 1326) (^1)</td>
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\(^1\) A grade of C- or higher is required.

**Career Opportunities**

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major

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**Table of Content**

- [GEP Health and Exercise Studies](#)
- [Spring Semester](#)
  - Learning Experience Elective
  - College Physics II \(^1\)
  - Evolutionary Biology \(^1\)
  - Organismal Biology Elective
- [Hours](#)
- [Fourth Year](#)
  - Fall Semester
    - Conservation of Biological Diversity
    - EEC Elective
    - GEP Humanities (p. 1423)
    - Free Elective
  - Hours
  - Spring Semester
    - EEC Elective
    - GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)
  - Hours
  - Total Hours

---

**Notes**

1. A grade of C- or higher is required.

**NC State University**

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**Visual and Performing Arts**

- [EEC Elective](#)
- [EEC Elective](#)
- [EEC Elective](#)

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**GEP Health and Exercise Studies (p. 1422)**

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<td>ENG 232</td>
<td>Literature and Medicine</td>
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<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
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<td>ENG 288</td>
<td>Fiction Writing</td>
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<td>ENG 289</td>
<td>Poetry Writing</td>
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<td>Writing About Film</td>
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<td>Introduction to News and Article Writing</td>
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<td>Writing in the Rhetorical Tradition</td>
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<td>Communication for Business and Management</td>
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<td>Editorial and Opinion Writing</td>
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<td>Writing Theory and the Writing Process</td>
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<td>Analysis of Scientific and Technical Writing</td>
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<td>Principles of Human Anatomy &amp; Physiology (A): Nervous, Skeletal, Muscular, &amp; Digestive Systems</td>
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<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
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<td>BIO 424</td>
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### Semester Sequence

This is a sample.

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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>Calculus for Life and Management Sciences A</td>
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<td>Exploring Opportunities in the Life Sciences</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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### Spring Semester

**BIO 183**  Introductory Biology: Cellular and Molecular Biology  
4

**CH 221**  Organic Chemistry I  
3

**CH 222**  Organic Chemistry II and Lab  
1

**ENG 101**  Academic Writing and Research  
4

**MA 231**  Calculus for Life and Management Sciences  
3

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**Hours**  15

### Second Year

#### Fall Semester

**Physiology Requirement**  4

**CH 223**  Organic Chemistry II  
3

**CH 224**  Organic Chemistry II Lab  
1

**ST 311**  Introduction to Statistics  
3

**GEP Humanities (p. 1423)**  
3

**Free Elective**  
3

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**Hours**  17

#### Spring Semester

**Physiology Requirement or HB Elective**  3-4

**PY 211**  College Physics I  
4

**CH 201**  Chemistry - A Quantitative Science  
3

**CH 202**  Quantitative Chemistry Laboratory  
1

**Advanced Writing Requirement**  3

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**Hours**  14-15

### Third Year

#### Fall Semester

**BCH 351**  General Biochemistry  
4

or **BCH 451**  Principles of Biochemistry  

**PY 212**  College Physics II  
4

**MB 351**  General Microbiology  
3

**MB 352**  General Microbiology Laboratory  
1

or **MB 354**  Inquiry-Guided Microbiology Lab  

**GEP Interdisciplinary Perspectives (p. 1426)**  
3

**GEP Health and Exercise Studies (p. 1422)**  
1

---

**Hours**  16

#### Spring Semester

**GN 311**  Principles of Genetics  
4

**GEP Social Sciences (p. 1430)**  
3

**Science & Math Elective**  
3

**Physiology Requirement or HB Elective**  3-4

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**Hours**  13-14

### Fourth Year

#### Fall Semester

**HB Elective**  
3

**HB Elective**  
3

**GEP Social Sciences (p. 1430)**  
3

**GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)**  
3

**Science and Math Elective**  
3

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**Hours**  15

#### Spring Semester

**HB Elective**  
3

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1 A grade of C or higher is required.

### Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

### Biological Sciences (BS): Integrative Physiology and Neurobiology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://outcomes.oirp.ncsu.edu/pgas/)

The NC State Bachelor of Arts degree in Biology is designed for students who want to combine studies in the life sciences with studies in a second discipline of interest (chosen from outside of the life sciences). Students in the B.A. are required to take just as much biology (through their Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biology B.A. students identify a second area of interest outside the life sciences and create a focal area of study in that area (e.g., psychology, social work, communication, political science, anthropology, education, mathematics, statistics). Their
Students who graduate with a B.A. in Biology will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying. Depending on their course choices, students will be prepared for a wide range of careers or further studies. This is a relatively new program, but so far our Biology B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology, and psychology.

**Plan Requirements**

**Biological Sciences (BA): Integrative Physiology and Neurobiology Concentration: 120 Total Units**

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<td>Cell Biology</td>
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<td>BIO 488</td>
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<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
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<td>ZO 250</td>
<td>Animal Anatomy and Physiology</td>
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**MA 231** | Calculus for Life and Management Sciences B | 3               |
| or MA 241| Calculus II                                         |       |
| CH 101  | Chemistry - A Molecular Science                     | 3     |
| CH 102  | General Chemistry Laboratory                        | 1     |
| CH 201  | Chemistry - A Quantitative Science                  | 3     |
| CH 202  | Quantitative Chemistry Laboratory                    | 1     |
| CH 221  | Organic Chemistry I                                  | 3     |
| CH 222  | Organic Chemistry I Lab                              | 1     |
| CH 223  | Organic Chemistry II                                 | 3     |
| CH 224  | Organic Chemistry II Lab                             | 1     |

Select one of the following: 4

- PY 211 College Physics I
- PY 205 & PY 206 Physics for Engineers and Scientists I Laboratory
- PY 212 College Physics II
- PY 208 & PY 209 Physics for Engineers and Scientists II Laboratory

**ST 311** | Introduction to Statistics                         | 3     |

**Major Electives**

- IPN Electives (p. 1329) | 1 | 9
- Supraorganismal Elective (p. 1329) | 1 | 3
- Additional Science & Math Electives | 6 |

**GEP Courses**

- ENG 101 Academic Writing and Research | 1 | 4
- GEP Humanities (p. 1423) | 6 |
- GEP Social Sciences (p. 1430) | 6 |
- GEP Health and Exercise Studies (p. 1422) | 2 |
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |
- GEP Interdisciplinary Perspectives (p. 1426) | 3 |
- GEP U.S. Diversity (p. 1431) (verify requirement) | 3 |
- GEP Global Knowledge (p. 1419) (verify requirement) | 3 |
- Foreign Language Proficiency (p. 1417) (verify requirement) | 3 |

**Free Electives**

- Free Electives (12 Hr S/U Lmt) | 2 | 9

Total Hours | 120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

**Advanced Writing Requirement Electives**

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<td>Introduction to Editing</td>
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<td>ENG 232</td>
<td>Literature and Medicine</td>
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<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
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<td>ENG 288</td>
<td>Fiction Writing</td>
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<td>ENG 289</td>
<td>Poetry Writing</td>
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<td>Writing About Film</td>
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IPN Electives

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<td>Hormones and Behavior</td>
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<td>BIO 444</td>
<td>The Biology of Love and Sex</td>
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<td>Capstone Course in Integrative Physiology and Neurobiology</td>
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<td>Experience and the Brain</td>
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<td>Protein Purification</td>
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<td>Animal Cell Culture Techniques</td>
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<td>BIT 471</td>
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<td>Protein Purification</td>
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Research/Professional Exp.

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Supraorganismal Electives

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Semester Sequence

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<td>BIO 424</td>
<td>Endocrinology 1</td>
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</table>

1 A grade of C- or higher is required.

**Career Opportunities**

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.
Biological Sciences (BS): Molecular, Cellular, and Developmental Biology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The NC State Bachelor of Arts degree in Biology is designed for students who want to combine studies in the life sciences with studies in a second discipline of interest (chosen from outside of the life sciences). Students in the B.A. are required to take just as much biology (through their Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biology B.A. students identify a second area of interest outside the life sciences and create a focal area of study in that area (e.g., psychology, social work, communication, political science, anthropology, education, mathematics, statistics). Their proposed list of Cross Disciplinary Electives is reviewed and approved by their academic advisor and the program director.

At the end of their undergraduate studies, students in this degree program complete a Senior Capstone Project through which they draw on both the life sciences (or a sub-discipline within the life sciences) and their chosen Cross Discipline to address a problem or issue that they identify. Experiential learning (related to their academic and/or career interests) is also required of all students in this program.

Students who graduate with a B.A. in Biology will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying. Depending on their course choices, students will be prepared for a wide range of careers or further studies. This is a relatively new program, but so far our Biology B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology, and psychology.

Plan Requirements

Biological Sciences (BA): Molecular, Cellular, and Developmental Biology Concentration: 120 Total Units

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<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>Cell Biology</td>
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<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
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<td>ZO 250</td>
<td>Animal Anatomy and Physiology</td>
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Physical & Mathematical Sciences

| MA 131  | Calculus for Life and Management Sciences A                           | 3     |
| or MA 141 | Calculus I                                                           |       |
| MA 231  | Calculus for Life and Management Sciences B                           | 3     |
| or MA 241 | Calculus II                                                          |       |
| CH 101  | Chemistry - A Molecular Science                                       | 3     |
| CH 102  | General Chemistry Laboratory                                         | 1     |
| CH 201  | Chemistry - A Quantitative Science                                   | 3     |
| CH 202  | Quantitative Chemistry Laboratory                                    | 1     |
| CH 221  | Organic Chemistry                                                    | 3     |
| CH 222  | Organic Chemistry I Lab                                              | 1     |
| CH 223  | Organic Chemistry II Lab                                             | 3     |
| CH 224  | Organic Chemistry II Lab                                             | 1     |
| Select one of the following: |                                                                      |       |
| PY 211  | College Physics                                                      | 4     |
| PY 205  | Physics for Engineers and Scientists I                               |       |
| & PY 206 | Physics for Engineers and Scientists I Laboratory                    |       |
| Select one of the following: |                                                                      |       |
| PY 212  | College Physics                                                      | 4     |
| PY 208  | Physics for Engineers and Scientists II                              |       |
| & PY 209 | Physics for Engineers and Scientists II Laboratory                    |       |

Major Electives

MCDB Electives (p. 1332) | 9
Additional Science & Math Electives | 8
Learning Experience Elective (p. 1332) | 3

GEP Courses

ENG 101  | Academic Writing and Research                                       | 4     |
GEP Humanities (p. 1423) | 6
GEP Social Sciences (p. 1430) | 6
GEP Health and Exercise Studies (p. 1422) | 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) | 3
GEP Interdisciplinary Perspectives (p. 1426) | 3
GEP U.S. Diversity (p. 1431) (verify requirement) | 6
GEP Global Knowledge (p. 1419) (verify requirement) | 6
Foreign Language Proficiency (p. 1417) (verify requirement) | 6
### Advanced Writing Requirement Electives

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<td>ENG 214</td>
<td>Introduction to Editing</td>
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<tr>
<td>ENG 232</td>
<td>Literature and Medicine</td>
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<tr>
<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
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<td>ENG 288</td>
<td>Fiction Writing</td>
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<tr>
<td>ENG 289</td>
<td>Poetry Writing</td>
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<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
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<tr>
<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
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<tr>
<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td>ENG 381</td>
<td>Creative Nonfiction Writing Workshop</td>
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<tr>
<td>ENG 388</td>
<td>Intermediate Fiction Writing Workshop</td>
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<td>ENG 389</td>
<td>Intermediate Poetry Writing Workshop</td>
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<td>ENG 416</td>
<td>Advanced News and Article Writing</td>
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<td>ENG 417</td>
<td>Editorial and Opinion Writing</td>
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<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
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<td>ENG 425</td>
<td>Analysis of Scientific and Technical Writing</td>
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<td>Analyzing Style</td>
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### Free Electives

Free Electives (12 Hr/U Lmt) 2  
Total Hours 120

1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

### MCDB Electives

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<td>Biochemistry of Gene Expression</td>
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<td>BCH 455</td>
<td>Proteins and Molecular Mechanisms</td>
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<td>BCH 553</td>
<td>Biochemistry of Gene Expression</td>
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<td>BCH 555</td>
<td>Proteins and Molecular Mechanisms</td>
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<td>BEC 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
<td>BEC 563</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<td>BIO 269</td>
<td>Research in the Life Sciences II: Guided Research</td>
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<td>BIO 370</td>
<td>Developmental Anatomy of the Vertebrates</td>
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<td>Developmental Anatomy Laboratory</td>
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<td>BIO 405</td>
<td>Functional Histology</td>
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<td>Capstone Course in Molecular, Cellular, and Developmental Biology</td>
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<td>BIT 462</td>
<td>Gene Expression Analysis: Microarrays</td>
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<td>Protein Purification</td>
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<td>Real-time PCR Techniques</td>
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<td>Animal Cell Culture Techniques</td>
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<td>BIT 467</td>
<td>PCR and DNA Fingerprinting</td>
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<td>BIT 468</td>
<td>Genome Mapping</td>
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<td>RNA Interference and Model Organisms</td>
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<td>BIT 473</td>
<td>Protein Interactions</td>
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<td>BIT 474</td>
<td>Plant Genetic Engineering</td>
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<td>Applied Bioinformatics</td>
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<td>BIT 478</td>
<td>Mapping the Brain</td>
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<td>BIT 481</td>
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<td>Gene Expression Analysis: Microarrays</td>
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<td>BIT 564</td>
<td>Protein Purification</td>
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<td>GN 427</td>
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<td>Human and Biomedical Genetics</td>
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<td>GN 451</td>
<td>Genome Science</td>
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<td>GN 456</td>
<td>Epigenetics, Development, and Disease</td>
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<td>MB 414</td>
<td>Microbial Metabolic Regulation</td>
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### Learning Experience Electives

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<td>Honors Project Part 2</td>
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<td>BSC 492</td>
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BSC 493 Research Experience 1-3
BSC 498 Biological Sciences Honors Project Part 2 3

**Semester Sequence**

This is a sample.

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<td>Academic Writing and Research ¹</td>
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<td>GN 311</td>
<td>Principles of Genetics ¹</td>
<td>4</td>
</tr>
<tr>
<td>GN 312</td>
<td>Elementary Genetics Laboratory ¹</td>
<td>1</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science ¹</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory ¹</td>
<td>1</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Learning Experience Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hours</strong></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Third Year</strong></td>
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<tr>
<td></td>
<td><strong>Fall Semester</strong></td>
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</tr>
<tr>
<td>PY 211</td>
<td>College Physics I ¹</td>
<td>4</td>
</tr>
<tr>
<td>BIO 361</td>
<td>Developmental Biology ¹</td>
<td>3</td>
</tr>
<tr>
<td>or GN 434</td>
<td>or Genes and Development</td>
<td></td>
</tr>
<tr>
<td>BCH 351</td>
<td>General Biochemistry ¹</td>
<td>4</td>
</tr>
<tr>
<td>or BCH 451</td>
<td>or Principles of Biochemistry</td>
<td></td>
</tr>
</tbody>
</table>

Advanced Writing Requirement 3
GEP Humanities (p. 1423) 3

|          | **Spring Semester**                                                    |       |
|          | **Fall Semester**                                                      |       |
| PY 212   | College Physics II ¹                                                   | 4     |
| Cell Biology Requirement                        | 3     |
| BIT 410  | Manipulation of Recombinant DNA ¹                                      | 4     |
| GEP Humanities (p. 1423)                         | 3     |
|          | **Hours**                                                              | 17    |
|          | **Fourth Year**                                                        |       |
|          | **Fall Semester**                                                      |       |
| MCD Elective                                    | 3     |
| MCD Elective                                    | 3     |
| Science and Math Elective                        | 4     |
| GEP Additional Breadth (p. 1417)                 | 3     |
| Free Elective                                   | 3     |
|          | **Hours**                                                              | 16    |
|          | **Spring Semester**                                                    |       |
| MCD Elective                                    | 3     |
| Science and Math Elective                        | 4     |
| GEP Social Sciences (p. 1430)                    | 3     |
| Free Elective                                   | 3     |
|          | **Hours**                                                              | 13    |
|          | **Total Hours**                                                        | 120   |

¹ A grade of C- or higher is required.

**Career Opportunities**

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major...
in the Department of Science, Technology, Engineering & Mathematics Education.

**Biological Sciences (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The Department of Biological Sciences in the College of Sciences offers an undergraduate minor in Biological Sciences that is intended to enhance the programs of students whose major fields are outside the biological sciences and who are interested in obtaining either a broad-based perspective in biology or a more focused experience in a particular area within biology. The required courses (8 hours) provide an overview of the field of biology and students then select additional courses (at least 7 hours) within the biological sciences that best match their interests. It is possible to complete this minor entirely through Distance Education ([http://distance.ncsu.edu/courses/](http://distance.ncsu.edu/courses/)) course offerings.

The minor in Biological Sciences is open to all baccalaureate students except those majoring in Animal Science, Biochemistry, Biological Sciences, Fisheries, Wildlife and Conservation Biology: Conservation Biology; Fisheries Science; Wildlife Science, Genetics, Microbiology, Nutrition, Plant Biology, Plant and Soil Sciences, Science Education – Biology Concentration, Turfgrass Science, or Zoology. Courses will count toward the minor only if they are completed with a grade of C- or better.

**Admissions**

Students who plan to minor in Biological Sciences should contact the person listed below for consultation and approval. This person will assign the student a minor advisor who will help the student design a program of study to meet the academic needs of the student and monitor the student's progress.

**Certification**

The contact person below will certify the completion of the student’s minor program. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found below and should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact People**

Dennis Kauffman
2727 Bostian Hall
919.515.3341
BioSciHelp@ncsu.edu

**SIS Code: 17BLM**

**Plan Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Courses</strong></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>1</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
<td>1</td>
</tr>
<tr>
<td><strong>Elective Courses</strong></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry</td>
<td>1</td>
</tr>
</tbody>
</table>

**Elective Courses**

BCH 452 Introductory Biochemistry Laboratory
BIO 140 Survey of Animal Diversity
ENT 425 General Entomology
GN 311 Principles of Genetics
MB 351 General Microbiology
MB 352 General Microbiology Laboratory
PB 200 Plant Life
PB 250 Plant Biology
PB 321 Introduction to Whole Plant Physiology
PB 360 Ecology
PB 400 Plant Diversity and Evolution
PB 403 Systematic Botany
PB 413 Plant Anatomy
PB 421 Plant Physiology
PB 480 Introduction to Plant Biotechnology
PP 315 Principles of Plant Pathology

- BIO or ZO 2** 1
- BIO or ZO 3** 1
- BIO or ZO 4** 1
- BIO or ZO 5** 1

Total Hours 15

1 A minimum of 7 credit hours must be taken from the list below and/or from BIO courses at the 200 level and above, excluding courses numbered BSC 295 Special Topics in Biological Sciences, BSC 492 Professional Experience, BSC 493 Research Experience, BSC 495 Special Topics in Biological Sciences, or BIO 592 Topical Problems. At least 3 of the 7 elective hours must be at the 300 level or higher.

**Biology (Honors)**

**Undergraduate Honors Program in Biological Sciences**

The Department of Biological Sciences (DBS) Honors Program requires students to design a challenging program of advanced study, including 8 credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants are required to present their scholarly work at a local, regional, or national meeting. A written honors thesis is also required. Invitations to join the DBS Honors Program are sent in the first 3 weeks of the Fall and Spring semesters, based on GPA and number of credit hours completed at NC State, as described in the Admissions Requirements.

**Program Requirements**

BSC 497 Biological Sciences Honors Project Part 1 and BSC 498 Biological Sciences Honors Project Part 2

- two semesters of mentored research or teaching scholarship in biology
- includes written project proposal (BSC 497 Biological Sciences Honors Project Part 1), and a draft of the honors thesis (BSC 498 Biological Sciences Honors Project Part 2)
- includes completion of reflection prompts posted on Moodle
- enrollment requires a completed contract with the mentor, approved by the DBS Honors Program Committee
BSC 497 Biological Sciences Honors Project Part 1
BSC 498 Biological Sciences Honors Project Part 2

Admissions Requirement
Students in any major offered by the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30 (but fewer than 65) credit hours at NC State will receive an invitation to join the DBS Honors Program.

Transfer Students in any major offered by the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 15 credit hours at NC State (and a total of 30 credit hours of college coursework), will receive an invitation to join the DBS Honors Program.

Graduation Requirements
Complete the Program Requirements described above and maintain an overall GPA of 3.40 or higher.

Elective Courses

Evolutionary Biology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website:

The Minor in Evolutionary Biology provides undergraduate students with an understanding of agents of evolutionary change, how evolutionary processes are monitored across various time scales, and how these processes are quantified in extant and extinct populations. Offered by the Department of Biological Sciences, the Evolutionary Biology Minor is available to all baccalaureate degree students at North Carolina State University except for those in the B.S. in Biological Sciences with a concentration in Ecology, Evolution, and Conservation Biology. This minor is especially appropriate for (but not limited to) students majoring in the life sciences, agricultural sciences, physical sciences, natural resources, or science education. At least 9 credit hours of the minor must be completed at NC State.

Admissions
Students who plan to minor in Evolutionary Biology should contact the contact person listed below for information on how to do so. Students are strongly encouraged to declare the minor early in their studies so they receive information on relevant courses, events, and other opportunities from the Department of Biological Sciences.

Contact Person
Dennis Kauffman
Bostian Hall 2727
919-515-3341
BioSciHelp@ncsu.edu

Coordinator
Dr. Brian Langerhans
David Clark Labs 246
919-515-3514
langerhans@ncsu.edu

Plan Requirements
The Evolutionary Biology Minor consists of a minimum of 18 credit hours.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
<tr>
<td>GN 312</td>
<td>Elementary Genetics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BIO 330</td>
<td>Evolutionary Biology</td>
<td>3</td>
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</tbody>
</table>

Elective Courses
Select 10 credits of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>ANT 371</td>
<td>Human Variation</td>
</tr>
<tr>
<td>BIO 230</td>
<td>The Science of Studying Dinosaurs</td>
</tr>
<tr>
<td>BIO 325</td>
<td>Paleontological Field Methods</td>
</tr>
<tr>
<td>BIO 440</td>
<td>The Human Animal: An Evolutionary Perspective</td>
</tr>
<tr>
<td>BIO 444</td>
<td>The Biology of Love and Sex</td>
</tr>
<tr>
<td>GN 423</td>
<td>Population, Quantitative and Evolutionary Genetics</td>
</tr>
</tbody>
</table>
Forensic Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!

The Department of Biological Sciences in the College of Sciences offers an undergraduate Minor in Forensic Science, an interdisciplinary field of study that involves the application of scientific principles and methodology from numerous scientific disciplines to criminal investigations. The Forensic Science Minor is available to undergraduates majoring in any field, but might be most appropriate for students majoring or planning to pursue advanced studies in the sciences or in science education. Students in the Minor in Forensic Science take one required introduction to forensic science (3 credit hours), three required foundational courses (9 credit hours), and then they have the opportunity to further explore a variety of scientific disciplines as they relate to the legal system (minimum 6 credit hours). At least 9 credit hours of the minor must be completed at NC State.

Admissions and Certification of Minor

The minor in Forensic Science is administered within the Department of Biological Sciences in the College of Sciences. Students who plan to minor in Forensic Science should contact the contact person listed below for information on how to do so. Students are strongly encouraged to declare the minor early in their studies so they receive information on relevant courses, events, and other opportunities from the Department of Biological Sciences.

Certification

All requirements for the minor must be completed no later than the semester in which the student expects to graduate from his or her major degree program. Students apply to graduate in the minor through MyPack at the same time that they apply to graduate in their major program.

Contact Person

Dennis Kauffman
Bostian Hall 2727
919-515-3341
BioSciHelp@ncsu.edu

Coordinator

Dr. Ann Ross
David Clark Labs 140
919-515-3122
ahross@ncsu.edu

Plan Requirements

The Forensic Science minor consists of a minimum of 18 credit hours.

- A grade of C- or better is required for all Minor courses with a 2.0 GPA required in the minor for graduation.
- No course used in the minor can be taken for credit only (S/U).
- Courses taken for the minor can also be used toward major requirements, GEP Electives, or Free Electives.
- At least 9 credit hours of the minor must be completed at NC State.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PCC 274</td>
<td>Introduction to Forensic Science</td>
<td>3</td>
</tr>
<tr>
<td>ANT 371</td>
<td>Human Variation</td>
<td>3</td>
</tr>
<tr>
<td>BIO 240</td>
<td>Principles of Human Anatomy &amp; Physiology (A): Nervous, Skeletal, Muscular, &amp; Digestive Systems</td>
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<tr>
<td>BIO 405</td>
<td>Functional Histology</td>
<td></td>
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<tr>
<td>BIO 414</td>
<td>Cell Biology</td>
<td></td>
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<tr>
<td>ET 310</td>
<td>Environmental Monitoring and Analysis</td>
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<tr>
<td>GN 301</td>
<td>Genetics in Human Affairs</td>
<td></td>
</tr>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
<td></td>
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<tr>
<td>MB 351</td>
<td>General Microbiology</td>
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<tr>
<td>SSC 442</td>
<td>Soil and Environmental Biogeochemistry</td>
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<tr>
<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
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<tr>
<td>TOX 401</td>
<td>Principles of Toxicology</td>
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<tr>
<td>ST 101</td>
<td>Statistics by Example</td>
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<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<tr>
<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<tr>
<td>PHI/STS 325</td>
<td>Bio-Medical Ethics</td>
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<tr>
<td>PHI 375</td>
<td>Ethics</td>
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Elective Courses

<table>
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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
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</tr>
<tr>
<td>ANT 421/521</td>
<td>Human Osteology</td>
<td></td>
</tr>
<tr>
<td>ANT 422</td>
<td>Forensic Anthropology Crime Scene Investigation Field Methods</td>
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<tr>
<td>ANT 529</td>
<td>Advanced Methods in Forensic Anthropology</td>
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<tr>
<td>CH 441</td>
<td>Forensic Chemistry</td>
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<tr>
<td>ENT 305</td>
<td>Introduction to Forensic Entomology</td>
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<tr>
<td>GN 453</td>
<td>Personal Genomics</td>
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<tr>
<td>MSE 480</td>
<td>Materials Forensics and Degradation</td>
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</table>
Genetics (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Genetics program offers undergraduate majors classroom training in fundamentals of genetics and other sciences, as well as opportunities for meaningful research experience. The degree in genetics is the only genetics major offered in the UNC system.

The genetics major complements other degree programs in the biological and life sciences at N.C. State, as it prepares students for further graduate study, professional schools (such as medical, dental, veterinary, genetic counseling) or careers in industries whose products are based on biological and agricultural research, including biopharmaceutical and biotechnology companies. Building on the strength of NC State as a leader in science and technology, students in the program can easily earn a concurrent minor in any of the other life sciences curricula, as well as other programs such as statistics or biotechnology.

Responsible conduct as a scientist and citizen are emphasized in the genetics coursework, and students will also have opportunities for public service and engagement through participation in the genetics outreach program. Students will be challenged to master their coursework while practicing hands-on problem-solving in both the classroom and active research settings. Genetics students will also be required to read the primary literature and present papers and their research findings, thus gaining valuable experience in scientific communication.

Plan Requirements

Genetics (BS): 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Orientation</th>
<th>Hours</th>
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<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<td>3</td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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</tr>
<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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Mathematical Sciences & Physics

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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
<td>1</td>
</tr>
<tr>
<td>or MA 241</td>
<td>Calculus II</td>
<td>1</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>1</td>
</tr>
<tr>
<td>or ST 371</td>
<td>Introduction to Probability and Distribution</td>
<td>1</td>
</tr>
<tr>
<td>Theory</td>
<td></td>
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<tr>
<td>PY 211</td>
<td>College Physics I</td>
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<tr>
<td>PY 212</td>
<td>College Physics II</td>
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</table>

Chemistry

<table>
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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
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<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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</tbody>
</table>

PCC 474 Forensic Chemistry Laboratory

Total Hours 18

CH 202 | Quantitative Chemistry Laboratory | 1
CH 221 | Organic Chemistry I                | 3
CH 222 | Organic Chemistry I Lab            | 1
CH 223 | Organic Chemistry II               | 3
CH 224 | Organic Chemistry II Lab           | 1

Required Life Sciences

LSC 101 | Critical and Creative Thinking in the Life Sciences | 1
BIO 181 | Introductory Biology: Ecology, Evolution, and Biodiversity | 4
BIO 183 | Introductory Biology: Cellular and Molecular Biology | 4
GN 311 | Principles of Genetics               | 4
GN 312 | Elementary Genetics Laboratory      | 1
GN 421 | Molecular Genetics                   | 1
GN 423 | Population, Quantitative and Evolutionary Genetics | 3
GN 425 | Advanced Genetics Laboratory        | 2
BCH 451 | Principles of Biochemistry           | 4

Select one of the following: 1

BIO 240 | Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems | 3
BIO 245 | Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems | 3
BIO 414 | Cell Biology                        | 3
PB 421 | Plant Physiology                    | 3

Genetics Electives

Select two of the following: 1

GN 427 | Introductory Bioinformatics            | 4
GN 434 | Genes and Development                 | 4
GN 441 | Human and Biomedical Genetics         | 4
GN 451 | Genome Science                        | 4
GN 456 | Epigenetics, Development, and Disease | 4
GN 541 | Human and Biomedical Genetics         | 4

GEP Courses

ENG 101 | Academic Writing and Research           | 4
GEP Humanities (p. 1423) | 6
GEP Social Sciences (p. 1430) | 6
GEP Health and Exercise Studies (p. 1422) | 6
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3
GEP Interdisciplinary Perspectives (p. 1426) | 3
GEP U.S. Diversity (p. 1431) (verify requirement) | 3
GEP Global Knowledge (p. 1419) (verify requirement) | 3
Foreign Language Proficiency (p. 1417) (verify requirement) | 3

Restricted Electives

Restricted Electives (p. 1338) 1 | 8

Free Electives

NC State University 1337
Free Electives (12 Hr S/U Lmt) 2
Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Restricted Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANT 370</td>
<td>Introduction to Forensic Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 432</td>
<td>Evolutionary Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIO 434</td>
<td>Hormones and Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIO 440</td>
<td>The Human Animal: An Evolutionary Perspective</td>
<td>3</td>
</tr>
<tr>
<td>BIO 444</td>
<td>The Biology of Love and Sex</td>
<td>3</td>
</tr>
<tr>
<td>BIO 488</td>
<td>Neurobiology</td>
<td>3</td>
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<td>BIO 588</td>
<td>Neurobiology</td>
<td>3</td>
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<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
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<td>ENT 425</td>
<td>General Entomology</td>
<td>3</td>
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<tr>
<td>MA 331</td>
<td>Conservation Genetics</td>
<td>3</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
<td>3</td>
</tr>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>3</td>
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<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
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<td>MB 441</td>
<td>Immunology</td>
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<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
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<td>PB 400</td>
<td>Plant Diversity and Evolution</td>
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<tr>
<td>PSY 430</td>
<td>Biological Psychology</td>
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<tr>
<td>TOX 401</td>
<td>Principles of Toxicology</td>
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<td>TOX 501</td>
<td>Principles of Toxicology</td>
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<tr>
<td>ZO 350</td>
<td>Animal Phylogeny and Diversity</td>
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<tr>
<td>ZO 402</td>
<td>Invertebrate Biology</td>
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<tr>
<td>ZO 410</td>
<td>Introduction to Animal Behavior</td>
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</tbody>
</table>

Semester Sequence

This is a sample.

Course | Title                                                                 | Hours |
--------|-----------------------------------------------------------------------|-------|
**First Year**

**Fall Semester**

LSC 101  | Critical and Creative Thinking in the Life Sciences 1                | 2     |
BIO 181  | Introductory Biology: Ecology, Evolution, and Biodiversity 1         | 4     |
CH 101   | Chemistry - A Molecular Science 1                                     | 3     |
CH 102   | General Chemistry Laboratory 1                                         | 1     |
MA 131   | Calculus for Life and Management Sciences A 1                         | 3     |
LSC 103  | Exploring Opportunities in the Life Sciences 1                        | 1     |
GEP Health and Exercise Studies (p. 1422)      | 1     |

**Spring Semester**

BIO 183  | Introductory Biology: Cellular and Molecular Biology 1               | 4     |

**Second Year**

**Fall Semester**

CH 223   | Organic Chemistry II 1                                               | 3     |
CH 224   | Organic Chemistry II Lab 1                                           | 1     |
ST 311   | Introduction to Statistics 1                                          | 3     |
Restricted Elective (p. 1338) 1                  | 4     |
GEP Social Sciences (p. 1430)                    | 3     |
GEP Health and Exercise Studies (p. 1422)        | 1     |

**Spring Semester**

GN 311   | Principles of Genetics 1                                             | 4     |
GN 312   | Elementary Genetics Laboratory 1                                      | 1     |
CH 201   | Chemistry - A Quantitative Science 1                                 | 3     |
CH 202   | Quantitative Chemistry Laboratory 1                                  | 1     |
Restricted Elective (p. 1338) 1                   | 4     |
Communications Requirement 1                     | 3     |

**Third Year**

**Fall Semester**

GN 421   | Molecular Genetics 1                                                 | 3     |
BCH 451  | Principles of Biochemistry 1                                          | 4     |
PY 211   | College Physics I 1                                                  | 4     |
ENG 333  | Communication for Science and Research 1                              | 3     |
GEP Humanities (p. 1423)                         | 3     |

**Spring Semester**

GN 425   | Advanced Genetics Laboratory 1                                       | 2     |
GN 423   | Population, Quantitative and Evolutionary Genetics 1                 | 3     |
PY 212   | College Physics II 1                                                 | 4     |
GEP Social Sciences (p. 1430)                    | 3     |
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |

**Fourth Year**

**Fall Semester**

Genetics Research/Teaching Requirement                       | 3     |
Select one of the following: 1                              | 3-4   |
BIO 414   | Cell Biology                                                         |       |
PB 421   | Plant Physiology                                                     |       |
GEP Interdisciplinary Perspectives (p. 1426)               | 3     |
Free Elective                                             | 4-5   |

**Spring Semester**

Genetics Electives 1                                        | 6     |
GEP Humanities (p. 1423)                                   | 3     |

CH 221   | Organic Chemistry I 1                                                | 3     |
CH 222   | Organic Chemistry I Lab 1                                            | 1     |
MA 231   | Calculus for Life and Management Sciences B 1                        | 3     |
ENG 101  | Academic Writing and Research 1                                      | 4     |

Hours 15

Hours 16

Hours 17

Hours 15

Hours 13-15
The Department of Genetics offers an undergraduate Minor in Genetics to provide students with strong preparation in the principles of Genetics and Molecular Biology, as well as preparation in ancillary fields such as Statistics and Biochemistry. This Minor is appropriate for (but not limited to) students with majors in Plant and Soil Sciences, Animal Science, Biochemistry, Biological Sciences, Computer Science, Crop Science, Environmental Technology, Mathematics, Microbiology, Natural Resources, Nutrition Science, Plant Biology, Poultry Science, and Zoology.

### Plan Requirements

- **Specified Courses**
  - GN 311 Principles of Genetics (4 cr)
  - GN 312 Elementary Genetics Laboratory (1 cr)
  - ST 311 Introduction to Statistics (3 cr)
  - GN 421 Molecular Genetics (3 cr)

- **Elective Courses**
  - Select two of the following: (6 cr)
    - GN 423 Population, Quantitative and Evolutionary Genetics
    - GN 427 Introductory Bioinformatics
    - GN 434 Genes and Development
    - GN 441 Human and Biomedical Genetics
    - GN 451 Genome Science
    - GN 456 Epigenetics, Development, and Disease

A grade of ‘C’ or better is required for all Genetics Minor courses.

The advisor will certify the minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

### Contact Person

Dr. Betty Gardner  
2532 Thomas Hall  
919.515.5776  
bgardner@ncsu.edu

**SIS Code:** 17GNM

### Global Health (Minor)

The minor in Global Health provides undergraduate students with an understanding of current global health challenges, and an appreciation of interdisciplinary approaches to addressing global health needs. Offered by the Department of Biological Sciences, the Global Health Minor is available to all baccalaureate degree students at North Carolina State University. This minor is especially appropriate for (but not limited to) students majoring in the life sciences, social sciences, engineering and international studies. At least 9 credit hours of the minor must be completed at NC State.
Admission to the Minor

Students who plan to minor in Global Health should contact the contact person listed below for information on how to do so. Students are strongly encouraged to declare the minor early in their studies so they receive information on relevant courses, events, and other opportunities from the Department of Biological Sciences.

Completion of the Minor

All requirements for the minor must be completed no later than the semester in which the student expects to graduate from his or her major degree program. Students apply to graduate in the minor through MyPack at the same time that they apply to graduate in their major program.

Contact Person

Dennis Kauffman
Bostian Hall 2727
919-515-3341
BioSciHelp@ncsu.edu

Coordinator

Dr. Julie Casani
Student Health Services
919-513-3290
jppiero@ncsu.edu

SIS Code: 17GHM

Plan Requirements

The Global Health Minor consists of a minimum of 18 credit hours.

- A grade of C- or better is required for all minor courses and a 2.0 GPA in the minor is required for graduation.
- No course used in the minor can be taken for credit only (S/U).
- Courses taken for the minor can also be used toward major requirements, GEP Electives or Free Electives.
- At least 9 credit hours of the minor must be completed at NC State.

Required Course

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GPH 201</td>
<td>Fundamentals of Global Public Health</td>
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<tr>
<td>GPH 404</td>
<td>Epidemiology and Statistics in Global Public Health</td>
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Elective Courses

Group I: Society Aspects of Global Health 6

Select two of the following: 1

<table>
<thead>
<tr>
<th>Code</th>
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<tr>
<td>FS 540</td>
<td>Food Safety and Public Health</td>
</tr>
<tr>
<td>IS 200</td>
<td>Introduction to International Studies</td>
</tr>
<tr>
<td>or IS 393</td>
<td>Theories of Globalization</td>
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<td>PHI 420</td>
<td>Global Justice</td>
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<td>PS 335</td>
<td>International Law</td>
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<td>PS 336</td>
<td>Global Environmental Politics</td>
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<tr>
<td>SOC 350</td>
<td>Food and Society</td>
</tr>
<tr>
<td>or NTR 330</td>
<td>Public Health Nutrition</td>
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<tr>
<td>SOC 381</td>
<td>Sociology of Medicine</td>
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<tr>
<td>STS/PHI 325</td>
<td>Bio-Medical Ethics</td>
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Group II: Scientific Aspects of Global Health 6

Select two of the following: 1

<table>
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<tr>
<td>AEC 380</td>
<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
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<td>ES 150</td>
<td>Water and the Environment</td>
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<tr>
<td>or ES 200</td>
<td>Climate Change and Sustainability</td>
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<tr>
<td>GPH 425</td>
<td>Global Health and Physiology (can use 3 cr out of 6 cr total) 2</td>
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<tr>
<td>MB 200</td>
<td>The Fourth Horseman: Plagues that Changed the World</td>
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<tr>
<td>or MB 411</td>
<td>Medical Microbiology</td>
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<tr>
<td>ET 320</td>
<td>Fundamentals of Air Pollution</td>
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</table>

Total Hours 18

1 Take 2 courses in each group, unless you replace one of those credits with 3 credits of the Experiential Learning Option (see below).
2 GPH 425 Global Health and Physiology is currently a 6 credit course: 3 credits of coursework and 3 credits of experiential learning.

Experiential Learning Option

Experiential Learning Option: Global Health Research or Immersion Experience (maximum 3 cr)

You can use up to 3 credits of relevant experiential learning toward the Electives requirement of 12 total. The focus of the research or immersion experience must be in global health and the experience must be approved by the Minor Coordinator (through review of the signed contract or syllabus specific to the course) prior to your beginning the work. Research and immersion experience must address at least one of the core elements of global health: social determinants of health, implementation or evaluation of a global health program, or investigation that impacts global health. Options include BSC 492 Professional Experience, BSC 493 Research Experience, BSC 494 Teaching Experience, BSC 498 Biological Sciences Honors Project Part 2, and 3 credits of GPH 425 Global Health and Physiology (It is currently a 6 credit course: 3 credits of coursework and 3 credits of experiential learning).

Other Relevant Courses

Other relevant courses, including some capstone and special topics course offerings, can be approved by the Minor Coordinator on a case-by-case basis after review of the syllabus and discussions with the course instructor where necessary. These activities must address at least one of the core elements of global health: social determinants of health, implementation or evaluation of a global health program, or investigation that impacts global health.

Pre-requisite Course Notification

A number of courses in the minor require prerequisite courses. Thus, the minor is not one that is begun in the freshman year, but rather on, after foundation courses in science, social science and humanities have been taken. Still, it is best to think about this minor as early as possible in your academic career so that you can incorporate any prerequisites for future minor courses into your existing degree requirements. Allowances for counting a course toward both a major and a minor differ between Colleges at NC State.
**Microbiology (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics, and other aspects of the life process of an array of microscopic, generally single-celled, organisms and viruses. These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced spectacular advances in biology and genomic science during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human and animal health will rely heavily on understanding microbial processes.

There are 4 avenues to earning a B.S. in Microbiology. Students can opt for a general curriculum (MBIO) or can choose to focus in a particular area by selecting one of three areas of concentration: Microbial Biotechnology (MBIO-MT) or Microbial Research (MBIO-MR) or Microbial Health Sciences (MBIO-HS). These concentrations mirror the three most common career paths of Microbiology majors: work in research laboratories and production facilities, further study in graduate school (at the Masters or Doctoral level), and further study in professional schools such as medical and dental schools.

### Plan Requirements

#### Microbiology (BS): 120 Total Units

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>Orientation</strong></td>
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<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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<tr>
<td>or MB 103</td>
<td>Introductory Topics in Microbiology</td>
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<tr>
<td><strong>Communication</strong></td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
<td>3</td>
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<tr>
<td>MA 141</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>or ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<tr>
<td><strong>Mathematical Sciences</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<td>Quantitative Chemistry Laboratory</td>
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<td>CH 221</td>
<td>Organic Chemistry I</td>
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<td>CH 222</td>
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<td>CH 223</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td><strong>Natural and Physical Sciences</strong></td>
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<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I &amp; Physics for Engineers and Scientists I Laboratory</td>
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<td>PY 211</td>
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<tr>
<td>PY 202</td>
<td>University Physics II</td>
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<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II &amp; Physics for Engineers and Scientists II Laboratory</td>
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<td>PY 212</td>
<td>College Physics II</td>
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#### Major Requirements

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<td>LSC 101</td>
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<td>MB 351</td>
<td>General Microbiology</td>
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<td>MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
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<td>MB 411</td>
<td>Medical Microbiology</td>
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<tr>
<td>MB 412</td>
<td>Medical Microbiology Laboratory</td>
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<tr>
<td>MB 414</td>
<td>Microbial Metabolic Regulation</td>
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<tr>
<td>MB 451</td>
<td>Microbial Diversity</td>
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<td>MB 452</td>
<td>Microbial Diversity Lab</td>
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<tr>
<td>MB 480</td>
<td>Current Issues in Microbiology</td>
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<td>GN 311</td>
<td>Principles of Genetics</td>
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<tr>
<td>BCH 351</td>
<td>General Biochemistry</td>
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<tr>
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<td>Principles of Biochemistry</td>
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<td>Biochemistry of Gene Expression</td>
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<td>BCH 553</td>
<td>Biochemistry of Gene Expression</td>
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<td>GN 421</td>
<td>Molecular Genetics</td>
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<td>GN 521</td>
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<td>BIO 240</td>
<td>Principles of Human Anatomy &amp; Physiology (A): Nervous, Skeletal, Muscular, &amp; Digestive Systems</td>
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<tr>
<td>BIO 245</td>
<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
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<td>BIO 414</td>
<td>Cell Biology</td>
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<td>PB 421</td>
<td>Plant Physiology</td>
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<td>Microbiology Electives (p. 1342)</td>
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#### GEP Courses

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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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#### Free Electives

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**Total Hours** 120
A grade of C- or higher is required.

# Laboratory Elective

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<tbody>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BBS 526</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BCH 452</td>
<td>Introductory Biochemistry Laboratory</td>
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<td>BE 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<tr>
<td>BE 436</td>
<td>Introduction to Downstream Process Development</td>
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<tr>
<td>BE 440</td>
<td>Expression Systems in Biomanufacturing I</td>
<td>3</td>
</tr>
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<td>BE 441</td>
<td>Expression Systems in Biomanufacturing II</td>
<td>3</td>
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<tr>
<td>BE 462</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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<tr>
<td>BE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
<td>BE 475</td>
<td>Global Regulatory Affairs for Medical Products</td>
<td>3</td>
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<tr>
<td>BE 480</td>
<td>cGMP Fermentation Operations</td>
<td>2</td>
</tr>
<tr>
<td>BE 483</td>
<td>Tissue Engineering Technologies</td>
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<td>BE 485</td>
<td>cGMP Downstream Operations</td>
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<tr>
<td>BE 488</td>
<td>Animal Cell Culture Engineering</td>
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<td>BE 495</td>
<td>Special Topics in Biomanufacturing</td>
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<td>BE 497</td>
<td>Biomanufacturing Research Projects</td>
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<td>BE 526</td>
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<td>BE 536</td>
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<td>BE 540</td>
<td>Expression Systems in Biomanufacturing I</td>
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<td>BE 541</td>
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<td>cGMP Downstream Operations</td>
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<td>BE 402</td>
<td>Biotechnology Networking and Professional Development</td>
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<tr>
<td>BE 410</td>
<td>Manipulation of Recombinant DNA</td>
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# Microbiology Electives

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<tbody>
<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BBS 526</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BE 426</td>
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<tr>
<td>BE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
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### Semester Sequence

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Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

Microbiology (BS): Microbial Biotechnology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics, and other aspects of the life process of an array of microscopic, generally single-celled, organisms and viruses. These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced spectacular advances in biology and genomic science during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human and animal health will rely heavily on understanding microbial processes.

There are 4 avenues to earning a B.S. in Microbiology. Students can opt for a general curriculum (MBIO) or can choose to focus in a particular area by selecting one of three areas of concentration: Microbial Biotechnology (MBIO-MT) or Microbial Research (MBIO-MR) or Microbial Health Sciences (MBIO-HS). These concentrations mirror the three most common career paths of Microbiology majors: work in research laboratories and production facilities, further study in graduate school (at the Masters or Doctoral level), and further study in professional schools such as medical and dental schools.

Plan Requirements

Microbiology (BS): Microbial Biotechnology: 120 Total Units

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Major Requirements

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1 A grade of C- or higher is required.
### Microbial Biotech Electives

Select one of the following:  
- BIT 453 Biochemistry of Gene Expression  
- BCH 553 Biochemistry of Gene Expression  
- GN 421 Molecular Genetics  
- GN 521 Molecular Genetics  

Select one of the following:  
- BIO 240 Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems  
- BIO 245 Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems  
- BIO 414 Cell Biology  
- PB 421 Plant Physiology  

**Microbial Biotech Electives (p. 1345)**

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### Laboratory Elective

**Laboratory Elective**

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<td>BIT 465</td>
<td>Real-time PCR Techniques</td>
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<td>BIT 466</td>
<td>Animal Cell Culture Techniques</td>
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<td>BIT 467</td>
<td>PCR and DNA Fingerprinting</td>
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<tr>
<td>BIT 468</td>
<td>Genome Mapping</td>
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</table>

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1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.
**Semester Sequence**

This is a sample.

### Course Title Hours

#### First Year

**Fall Semester**

- **BIO 181** Introductory Biology: Ecology, Evolution, and Biodiversity 4

#### Second Year

**Fall Semester**

- **CH 101** Chemistry - A Molecular Science 3
- **CH 102** General Chemistry Laboratory 1
- **LSC 101** Critical and Creative Thinking in the Life Sciences 2
- **MA 131** Calculus for Life and Management Sciences 3
- **MB 103** Introductory Topics in Microbiology 1
- **GEP Health and Exercise Studies (p. 1422)** 1

**Spring Semester**

- **BIO 183** Introductory Biology: Cellular and Molecular Biology 4
- **CH 221** Organic Chemistry I 3
- **CH 222** Organic Chemistry I Lab 1
- **PY 211** College Physics I 1
- **MB 351** General Microbiology 3
- **GEP Social Sciences (p. 1430)** 3
- **MB 354** Inquiry-Guided Microbiology Lab 1

**Hours** 15

#### Third Year

**Fall Semester**

- **CH 201** Chemistry - A Quantitative Science 3
- **CH 202** Quantitative Chemistry Laboratory 1
- **PY 212** College Physics II 1
- **GEP Humanities (p. 1423)** 3
- **MB 411** Medical Microbiology 3
- **MB 412** Medical Microbiology Laboratory 1

**Hours** 15

**Spring Semester**

- **ENG 333** Communication for Science and Research 3
- **GN 311** Principles of Genetics 4
- **ST 311** Introduction to Statistics 3
- **GEP Health and Exercise** 1
- **Microbial Biotechnology Elective** 1

**Hours** 14

#### Fourth Year

**Fall Semester**

- **MB 414** Microbial Metabolic Regulation 3
These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced spectacular advances in biology and genomic science during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human and animal health will rely heavily on understanding microbial processes.

There are 4 avenues to earning a B.S. in Microbiology. Students can opt for a general curriculum (MBIO) or can choose to focus in a particular area by selecting one of three areas of concentration: Microbial Biotechnology (MBIO-MT) or Microbial Research (MBIO-MR) or Microbial Health Sciences (MBIO-HS). These concentrations mirror the three most common career paths of Microbiology majors: work in research laboratories and production facilities, further study in graduate school (at the Masters or Doctoral level), and further study in professional schools such as medical and dental schools.

### Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

### Microbiology (BS): Microbial Health Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics, and other aspects of the life process of an array of microscopic, generally single-celled, organisms and viruses. These organisms frequently serve as model systems for elucidation

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**Spring Semester**

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**Total Hours | 120**


1 A grade of C- or higher is required.

### Plan Requirements

**Microbiology (BS): Microbial Health Science Concentration: 120 Units**

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**Natural and Physical Sciences**

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**Major Requirements**

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<td>Microbial Metabolic Regulation</td>
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**Laboratory Elective**

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<td>BIT 410</td>
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<td>Genome Mapping</td>
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<td>BIT 471</td>
<td>RNA Interference and Model Organisms</td>
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<td>BIT 473</td>
<td>Protein Interactions</td>
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<td>BIT 478</td>
<td>Mapping the Brain</td>
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<td>BIT 565</td>
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1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.
Microbial Health Electives

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<td>GN 441</td>
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Semester Sequence

This is a sample.
Microbiology (BS): Microbial Research Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Microbiology is concerned with the growth and development, physiology, classification, ecology, genetics, and other aspects of the life process of an array of microscopic, generally single-celled, organisms and viruses. These organisms frequently serve as model systems for elucidation of fundamental processes that are common to all living cells. Most of the major discoveries that have produced spectacular advances in biology and genomic science during the past decade have resulted from studies of microbial systems. Future developments in biotechnology, production of food and fuel, and human and animal health will rely heavily on understanding microbial processes.

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Plan Requirements

Microbiology (BS): Microbial Research Concentration: 120 Total Units

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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>or MB 103</td>
<td>Introductory Topics in Microbiology</td>
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</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research ¹</td>
<td>3</td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A ¹</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
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<td>ST 311</td>
<td>Introduction to Statistics ¹</td>
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<tr>
<td>or ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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</tr>
</tbody>
</table>

¹ A grade of C- or higher is required.

Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

Microbial Health Sciences Elective ¹  3

<table>
<thead>
<tr>
<th>Fourth Year</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>MB 414</td>
<td>Microbial Metabolic Regulation ¹</td>
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<tr>
<td>Microbial Health Sciences Elective ¹</td>
<td>3</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
<td>3</td>
</tr>
<tr>
<td>MB 480</td>
<td>Current Issues in Microbiology ¹</td>
</tr>
<tr>
<td>MB 451</td>
<td>Microbial Diversity ¹</td>
</tr>
<tr>
<td>MB 452</td>
<td>Microbial Diversity Lab ¹</td>
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<tr>
<td><strong>Hours</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>Microbial Health Sciences Elective ¹</td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>3</td>
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<tr>
<td>Microbial Health Sciences Elective ¹</td>
<td>3</td>
</tr>
<tr>
<td>Gene Expression Elective ¹</td>
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</tr>
<tr>
<td>Free Elective</td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
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<td><strong>Total Hours</strong></td>
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1 A grade of C- or higher is required.
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<tr>
<td>BBS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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</tr>
<tr>
<td>BBS 526</td>
<td>Upstream Biomanufacturing Laboratory</td>
<td>2</td>
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<tr>
<td>BCH 452</td>
<td>Introductory Biochemistry Laboratory</td>
<td>2</td>
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<tr>
<td>BEC 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
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<td>BEC 436</td>
<td>Introduction to Downstream Process Development</td>
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<tr>
<td>BEC 440</td>
<td>Expression Systems in Biomanufacturing 1</td>
<td>3</td>
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<tr>
<td>BEC 441</td>
<td>Expression Systems in Biomanufacturing II</td>
<td>3</td>
</tr>
<tr>
<td>BEC 462</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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<tr>
<td>BEC 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
<td>2</td>
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<td>BEC 475</td>
<td>Global Regulatory Affairs for Medical Products</td>
<td>3</td>
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<td>BEC 480</td>
<td>cGMP Fermentation Operations</td>
<td>2</td>
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<tr>
<td>BEC 483</td>
<td>Tissue Engineering Technologies</td>
<td>2</td>
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<td>BEC 485</td>
<td>cGMP Downstream Operations</td>
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<tr>
<td>BEC 488</td>
<td>Animal Cell Culture Engineering</td>
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<tr>
<td>BEC 495</td>
<td>Special Topics in Biomanufacturing</td>
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<td>BEC 497</td>
<td>Biomanufacturing Research Projects</td>
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<td>BEC 526</td>
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<tr>
<td>BEC 536</td>
<td>Introduction to Downstream Process Development</td>
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<td>BEC 540</td>
<td>Expression Systems in Biomanufacturing 1</td>
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<td>BEC 541</td>
<td>Expression Systems in Biomanufacturing II</td>
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<td>BEC 562</td>
<td>Fundamentals of Bio-Nanotechnology</td>
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<td>BEC 563</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
<td>BEC 575</td>
<td>Global Regulatory Affairs for Medical Products</td>
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<tr>
<td>BEC 580</td>
<td>cGMP Fermentation Operations</td>
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<tr>
<td>BEC 583</td>
<td>Tissue Engineering Technologies</td>
<td>2</td>
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<tr>
<td>BEC 585</td>
<td>cGMP Downstream Operations</td>
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<tr>
<td>BIT 402</td>
<td>Biotechnology Networking and Professional Development</td>
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<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
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<td>BIT 462</td>
<td>Gene Expression Analysis: Microarrays</td>
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<td>BIT 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
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<tr>
<td>BIT 464</td>
<td>Protein Purification</td>
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<td>BIT 465</td>
<td>Real-time PCR Techniques</td>
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<tr>
<td>BIT 466</td>
<td>Animal Cell Culture Techniques</td>
<td>2</td>
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<tr>
<td>BIT 467</td>
<td>PCR and DNA Fingerprinting</td>
<td>2</td>
</tr>
<tr>
<td>BIT 468</td>
<td>Genome Mapping</td>
<td>2</td>
</tr>
<tr>
<td>BIT 471</td>
<td>RNA Interference and Model Organisms</td>
<td>2</td>
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<tr>
<td>BIT 473</td>
<td>Protein Interactions</td>
<td>2</td>
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<tr>
<td>BIT 474</td>
<td>Plant Genetic Engineering</td>
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</tr>
<tr>
<td>BIT 476</td>
<td>Applied Bioinformatics</td>
<td>2</td>
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<tr>
<td>BIT 477</td>
<td>Metagenomics</td>
<td>2</td>
</tr>
<tr>
<td>BIT 478</td>
<td>Mapping the Brain</td>
<td>2</td>
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<tr>
<td>BIT 479</td>
<td>High-Throughput Discovery</td>
<td>2</td>
</tr>
<tr>
<td>BIT 480</td>
<td>Yeast Metabolic Engineering</td>
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**GEP Courses**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>6</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<td>6</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
<td>3</td>
<td></td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>3</td>
</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
<td></td>
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</tr>
<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

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<tr>
<td>PHY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<tr>
<td>PHY 206</td>
<td>Physics for Engineers and Scientists I</td>
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<tr>
<td>PHY 211</td>
<td>College Physics I</td>
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<tr>
<td>PHY 202</td>
<td>University Physics II</td>
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<tr>
<td>PHY 208</td>
<td>Physics for Engineers and Scientists II</td>
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</tr>
<tr>
<td>PHY 209</td>
<td>Physics for Engineers and Scientists II</td>
<td></td>
</tr>
<tr>
<td>PHY 212</td>
<td>College Physics II</td>
<td></td>
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<tr>
<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences</td>
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</tr>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>3</td>
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<tr>
<td>MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
<td>1</td>
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<tr>
<td>MB 360</td>
<td>Scientific Inquiry in Microbiology: At the Bench</td>
<td>3</td>
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<tr>
<td>MB 411</td>
<td>Medical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 412</td>
<td>Medical Microbiology Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>MB 414</td>
<td>Microbial Metabolic Regulation</td>
<td>3</td>
</tr>
<tr>
<td>MB 451</td>
<td>Microbial Diversity</td>
<td>3</td>
</tr>
<tr>
<td>MB 452</td>
<td>Microbial Diversity Lab</td>
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<tr>
<td>MB 480</td>
<td>Current Issues in Microbiology</td>
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<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
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<td>BCH 351</td>
<td>General Biochemistry</td>
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<td>BCH 451</td>
<td>Principles of Biochemistry</td>
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<tr>
<td>BCS 421</td>
<td>Plant Physiology</td>
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<td>BSC 492</td>
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<tr>
<td>BSC 493</td>
<td>Research Experience</td>
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**Lab Requirement**

- Select one of the following:
- BCS 421 - Plant Physiology (1-3 credits)
- BSC 492 - Professional Experience (1-3 credits)
- BSC 493 - Research Experience (1-3 credits)
**Semester Sequence**

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>First Year</strong></td>
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<tr>
<td>Fall Semester</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity $^1$</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science $^1$</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory $^1$</td>
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<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences $^1$</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A $^1$</td>
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<tr>
<td>MB 103</td>
<td>Introductory Topics in Microbiology</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology $^1$</td>
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<tr>
<td>CH 221</td>
<td>Organic Chemistry I $^1$</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab $^1$</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td><strong>Second Year</strong></td>
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<tr>
<td>CH 223</td>
<td>Organic Chemistry II $^1$</td>
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<td>CH 224</td>
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<td>PY 211</td>
<td>College Physics I $^1$</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology $^1$</td>
<td>3</td>
</tr>
<tr>
<td>MB 354</td>
<td>Inquiry-Guided Microbiology Lab $^1$</td>
<td>1</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science $^1$</td>
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<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory $^1$</td>
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<td>PY 212</td>
<td>College Physics II $^1$</td>
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</tr>
<tr>
<td>MB 360</td>
<td>Scientific Inquiry in Microbiology: At the Bench $^1$</td>
<td>3</td>
</tr>
<tr>
<td>MB 411</td>
<td>Medical Microbiology $^1$</td>
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<tr>
<td>MB 412</td>
<td>Medical Microbiology Laboratory $^1$</td>
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<tr>
<td><strong>Third Year</strong></td>
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<td>Fall Semester</td>
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<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td>GN 311</td>
<td>Principles of Genetics $^1$</td>
<td>4</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>Micro Research Elective $^1$</td>
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<td><strong>Fourth Year</strong></td>
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<tr>
<td>Fall Semester</td>
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<tr>
<td>MB 414</td>
<td>Microbial Metabolic Regulation $^1$</td>
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<td>Microbial Research Elective $^1$</td>
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<tr>
<td>MB 480</td>
<td>Current Issues in Microbiology $^1$</td>
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<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>MB 451</td>
<td>Microbial Diversity $^1$</td>
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<td>MB 452</td>
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</tr>
<tr>
<td><strong>Spring Semester</strong></td>
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</tbody>
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---

**Notes:**
- $^1$ indicates prerequisite courses.
- Hours are listed for each course.

---

**Microbiology (BS): Microbial Research Concentration**

Animal Cell Culture Techniques
Animal Cell Culture Techniques
Plant Tissue Culture and Transformation
Fundamentals of Microbial Cell Biotransformations
Scientific Inquiry in Microbiology: At the Bench
Elementary Genetics Laboratory
Upstream Biomanufacturing Laboratory
Fermentation of Recombinant Microorganisms
Fundamentals of Bio-Nanotechnology
Animal Cell Culture Engineering
Fermentation of Recombinant Microorganisms
Tissue Engineering Technologies
Yeast Metabolic Engineering
High-Throughput Discovery
Yeast Metabolic Engineering
Tissue Engineering Technologies
Fundamentals of Bio-Nanotechnology
Animal Cell Culture Engineering
Fermentation of Recombinant Microorganisms
Upstream Biomanufacturing Laboratory
Fermentation of Recombinant Microorganisms
Gene Expression Analysis: Microarrays
RNA Interference and Model Organisms
Protein Interactions
Plant Genetic Engineering
Metagenomics
Mapping the Brain
High-Throughput Discovery
Plant Tissue Culture and Transformation
Cell/Physiology Elective
GEP Health and Exercise Studies (p. 1422)
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Micro Research Elective $^1$
Microbiology (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The University Undergraduate Certificate in Microbiology offers students the opportunity to further their understanding of microorganisms and the roles they play in the world in which we live. The intended audience of this certificate includes degree-seeking undergraduate students at institutions where a Microbiology major or minor is not available, and non-degree students seeking additional experience in microbiology for career advancement or to enhance their applications to professional, graduate, or allied health schools. This certificate may also improve the ability of K-12 science teachers to compete for positions or teach more effectively. Finally, this certificate would provide an in-depth understanding of microbiology for those interested out of personal satisfaction.

Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

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Program Coordinator

The Certificate advisor is:

Dr. Melissa Ramirez  
Certificate Coordinator  
1567A Thomas Hall  
919.513.3309  
mvramire@ncsu.edu

Program Website: http://online.microbiology.ncsu.edu/

Admissions Requirements

Students apply by submitting their academic record and a letter of interest. Admission to the program is not required to take certificate courses. The requirements for admission are:

• A high school diploma (or equivalent)
• Completion of high-school level chemistry and biology
• Completion of college-level organic chemistry and either genetics or biochemistry courses (required as prerequisites for upper-level certificate courses) OR current enrollment in a program offering these courses OR other access to these courses
• Degree-seeking students at NCSU are not eligible (these students should enroll in the Microbiology minor)
• Students who have completed or are currently enrolled in a Microbiology degree program (including a minor) are not eligible

Academic Structure

College: College of Sciences  
Term Effective: 1/2013  
Plan Code: 32MBCTU  
CIP Code: 26.0502  
Description: Undergraduate Certificate in Microbiology

Offered: On-Campus and Distance Education formats

Plan Requirements

The Microbiology Certificate requires 12 undergraduate credit hours, as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 411</td>
<td>Medical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 451</td>
<td>Microbial Diversity 1</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Course

Select one of the following:  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 200</td>
<td>The Fourth Horseman: Plagues that Changed the World 1</td>
<td>3</td>
</tr>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>MB 360</td>
<td>Scientific Inquiry in Microbiology: At the Bench</td>
<td></td>
</tr>
<tr>
<td>MB 492</td>
<td>External Learning Experience 2</td>
<td></td>
</tr>
<tr>
<td>BSC 493</td>
<td>Research Experience</td>
<td>1-3</td>
</tr>
<tr>
<td>MB 4XX</td>
<td>Any 400-level Microbiology course, with prior program approval</td>
<td>13-15</td>
</tr>
</tbody>
</table>

Total Hours 120

1 A grade of C- or higher is required.
Microbiology (Minor)

1 Available via distance education.
2 Contact instructors about possible remote instruction.

Prerequisites are required for some courses.

At least 9 credits counted toward the certificate must be taken from NCSU. A grade of C- or better (“S” is only allowed for MB 492 External Learning Experience or BSC 493 Research Experience) is required of all required or elective courses. An overall 2.0 or greater GPA in coursework taken to complete the certificate is required.

Estimated Total Credit Hours Required: 12

Plan of study: The certificate requires 12 credit hours. Students pursuing university certificate programs are considered non-degree studies (NDS) students for the purpose of university registration. Because General Microbiology is a prerequisite for Medical Microbiology, which in turn is a prerequisite for Microbial Diversity, this program will take a minimum of 3 semesters to complete if all courses are taken from NCSU.

Microbiology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

A minor in Microbiology is available to undergraduates majoring in any field, but may be especially appropriate for students in biological or agricultural sciences, physical sciences or science education. This minor will be useful to students who want to strengthen their understanding of either basic cellular processes or applied areas such as the role of microorganisms in industry, agriculture or health.

Admissions

Students may declare their intention to complete the Microbiology minor by consulting with Dr. Olson (as listed below) or Kim Orlowski in the departmental office, 2727 Bostian Hall, 515-6146.

Certification

The student’s minor advisor will review the student’s record and certify that the student has completed the requirements for the minor by signing the “Application for Minor” form. Copies of the signed form will be forwarded to the student’s major department and the Dean’s office of the college in which the student is completing the requirements for a major. Upon certification, the student’s transcript will include the statement “Minor in Microbiology.” The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Jonathan Olson
Biological Sciences
4544B Thomas Hall
919-515-7860
jwolson@ncsu.edu

Plan Requirements

• A grade of ‘C-’ or better will be required for all courses taken to fulfill the minor requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 351</td>
<td>General Microbiology</td>
<td>8</td>
</tr>
<tr>
<td>MB 352</td>
<td>General Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>or MB 354</td>
<td>Inquiry-Guided Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>BCH 451</td>
<td>Principles of Biochemistry</td>
<td></td>
</tr>
<tr>
<td>or BCH 351</td>
<td>General Biochemistry</td>
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Elective Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BBS/FS 426</td>
<td>Upstream Biomanufacturing Laboratory</td>
<td></td>
</tr>
<tr>
<td>BEC/CHE 463</td>
<td>Fermentation of Recombinant Microorganisms</td>
<td></td>
</tr>
<tr>
<td>BEC 480</td>
<td>cGMP Fermentation Operations</td>
<td></td>
</tr>
<tr>
<td>BIT/MB 210</td>
<td>Phage Hunters</td>
<td></td>
</tr>
<tr>
<td>BIT/MB 211</td>
<td>Phage Genomics</td>
<td></td>
</tr>
<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
<td></td>
</tr>
<tr>
<td>BIT 466</td>
<td>Animal Cell Culture Techniques</td>
<td></td>
</tr>
<tr>
<td>BSC 493</td>
<td>Research Experience</td>
<td></td>
</tr>
<tr>
<td>BSC 495</td>
<td>Special Topics in Biological Sciences</td>
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</tr>
<tr>
<td>MB/FS 405</td>
<td>Food Microbiology</td>
<td></td>
</tr>
<tr>
<td>MB 406/</td>
<td>Food Microbiology Lab</td>
<td></td>
</tr>
<tr>
<td>FS 506</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB 411</td>
<td>Medical Microbiology</td>
<td></td>
</tr>
<tr>
<td>MB 412</td>
<td>Medical Microbiology Laboratory</td>
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</tr>
<tr>
<td>MB 414</td>
<td>Microbial Metabolic Regulation</td>
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</tr>
<tr>
<td>MB 420/520</td>
<td>Fundamentals of Microbial Cell Biotransformations</td>
<td></td>
</tr>
<tr>
<td>MB 441</td>
<td>Immunology</td>
<td></td>
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<tr>
<td>MB 451</td>
<td>Microbial Diversity</td>
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<tr>
<td>MB 452</td>
<td>Microbial Diversity Lab</td>
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<tr>
<td>MB 455</td>
<td>Microbial Biotechnology</td>
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<tr>
<td>MB 461</td>
<td>Molecular Virology</td>
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<tr>
<td>MB 492</td>
<td>External Learning Experience 1</td>
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<tr>
<td>MB/SSC 532</td>
<td>Soil Microbiology</td>
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</table>

Zoology (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Science in Zoology curriculum concentrates on organismal biology, with an emphasis on animals. Required courses are designed to develop breadth and depth in core areas, providing a strong base for all Zoology majors. Students acquire a knowledge of zoology from the organizational level of molecules and cells to the organizational level of ecosystems, with flexibility in the selection of upper level courses to specialize or remain generalized, according to individual interests and career goals.

Plan Requirements

Zoology (BS): 120 Total Units
### Exploring the Life Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>LSC 103</td>
<td>Exploring Opportunities in the Life Sciences</td>
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### Communication

#### Advanced Writing Requirement Elective (p. 1355) $^1$

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>3</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
<td>3</td>
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</table>

### Math & Statistical Sciences

#### Calculus for Life and Management Sciences A $^1$

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences B $^1$</td>
<td>3</td>
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<tr>
<td>or MA 241</td>
<td>Calculus II</td>
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#### Introduction to Statistics $^1$

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>or ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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### Natural Sciences

#### Critical and Creative Thinking in the Life Sciences $^1$

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<th>Hours</th>
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<tbody>
<tr>
<td>LSC 101</td>
<td>Critical and Creative Thinking in the Life Sciences</td>
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#### Introductory Biology: Ecology, Evolution, and Biodiversity $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
<td>4</td>
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#### Introductory Biology: Cellular and Molecular Biology $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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#### Animal Anatomy and Physiology $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ZO 250</td>
<td>Animal Anatomy and Physiology</td>
<td>4</td>
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#### Ecology $^1$

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEC 360</td>
<td>Ecology</td>
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<td>or PB 360</td>
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#### Chemistry - A Molecular Science $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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</table>

#### General Chemistry Laboratory $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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#### Chemistry - A Quantitative Science $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
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#### Quantitative Chemistry Laboratory $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
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#### Organic Chemistry I $^1$

<table>
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<tr>
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<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 221</td>
<td>Organic Chemistry I</td>
<td>3</td>
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</table>

#### Organic Chemistry I Lab $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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#### Organic Chemistry II $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CH 223</td>
<td>Organic Chemistry II</td>
<td>3</td>
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#### Organic Chemistry II Lab $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 224</td>
<td>Organic Chemistry II Lab</td>
<td>1</td>
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#### Principles of Genetics $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GN 311</td>
<td>Principles of Genetics</td>
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#### University Physics I

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY 201</td>
<td>University Physics I</td>
<td>4</td>
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#### Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
<td>4</td>
</tr>
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</table>

#### College Physics I

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY 211</td>
<td>College Physics I</td>
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#### University Physics II

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>PY 202</td>
<td>University Physics II</td>
<td>4</td>
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</tbody>
</table>

#### Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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</table>

#### College Physics II

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PY 212</td>
<td>College Physics II</td>
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</table>

### Major Electives

#### Animal Phylogeny and Diversity $^1$

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZO 350</td>
<td>Animal Phylogeny and Diversity</td>
<td>4</td>
</tr>
</tbody>
</table>

### Zoology Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZO 402</td>
<td>Invertebrate Biology</td>
<td>4</td>
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</tbody>
</table>

### Additional Science & Math Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td>GEP Humanities (p. 1423)</td>
<td>4</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td>GEP Social Sciences (p. 1430)</td>
<td>4</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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### GEP Courses

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td>3</td>
</tr>
<tr>
<td>GEP U.S. Diversity (p. 1431)</td>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
<td>3</td>
</tr>
<tr>
<td>GEP Global Knowledge (p. 1419)</td>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
<td>3</td>
</tr>
<tr>
<td>Foreign Language Proficiency (p. 1417)</td>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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### Free Electives

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 289</td>
<td>Poetry Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td>3</td>
</tr>
<tr>
<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
<td>3</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td>3</td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
<td>3</td>
</tr>
<tr>
<td>ENG 381</td>
<td>Creative Nonfiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 388</td>
<td>Intermediate Fiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 389</td>
<td>Intermediate Poetry Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 416</td>
<td>Advanced News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 417</td>
<td>Editorial and Opinion Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
<td>3</td>
</tr>
<tr>
<td>ENG 425</td>
<td>Analysis of Scientific and Technical Writing</td>
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<tr>
<td>ENG 426</td>
<td>Analyzing Style</td>
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### Total Hours

<table>
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<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>120</td>
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</table>

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

### Advanced Writing Requirement Electives

<table>
<thead>
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<th>Hours</th>
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<tbody>
<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>ENG 214</td>
<td>Introduction to Editing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 232</td>
<td>Literature and Medicine</td>
<td>3</td>
</tr>
<tr>
<td>ENG 287</td>
<td>Explorations in Creative Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 288</td>
<td>Fiction Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 289</td>
<td>Poetry Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 292</td>
<td>Writing About Film</td>
<td>3</td>
</tr>
<tr>
<td>ENG 316</td>
<td>Introduction to News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 323</td>
<td>Writing in the Rhetorical Tradition</td>
<td>3</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td>3</td>
</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td>3</td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
<td>3</td>
</tr>
<tr>
<td>ENG 381</td>
<td>Creative Nonfiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 388</td>
<td>Intermediate Fiction Writing Workshop</td>
<td>3</td>
</tr>
<tr>
<td>ENG 389</td>
<td>Intermediate Poetry Writing Workshop</td>
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</tr>
<tr>
<td>ENG 416</td>
<td>Advanced News and Article Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 417</td>
<td>Editorial and Opinion Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 422</td>
<td>Writing Theory and the Writing Process</td>
<td>3</td>
</tr>
<tr>
<td>ENG 425</td>
<td>Analysis of Scientific and Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>ENG 426</td>
<td>Analyzing Style</td>
<td>3</td>
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</tbody>
</table>

### Zoology Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEC 380</td>
<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
<td>3</td>
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<tr>
<td>AEC 400</td>
<td>Applied Ecology</td>
<td>3</td>
</tr>
<tr>
<td>AEC 419</td>
<td>Freshwater Ecology</td>
<td>4</td>
</tr>
<tr>
<td>AEC 441</td>
<td>Biology of Fishes</td>
<td>3</td>
</tr>
<tr>
<td>AEC 442</td>
<td>Biology of Fishes Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>AEC 460</td>
<td>Field Ecology and Methods</td>
<td>4</td>
</tr>
<tr>
<td>AEC 501</td>
<td>Ornithology</td>
<td>4</td>
</tr>
<tr>
<td>AEC 509</td>
<td>Biology of Aquatic Insects</td>
<td>3</td>
</tr>
<tr>
<td>AEC 515</td>
<td>Fish Physiology</td>
<td>3</td>
</tr>
<tr>
<td>AEC 519</td>
<td>Freshwater Ecology</td>
<td>4</td>
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<tr>
<td>AEC 761</td>
<td>Conservation and Climate Science</td>
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<tr>
<td>BIO 315</td>
<td>General Parasitology</td>
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</tr>
<tr>
<td>BIO 330</td>
<td>Evolutionary Biology</td>
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</table>
Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIO 361</td>
<td>Developmental Biology</td>
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<td>BIO 370</td>
<td>Developmental Anatomy of the Vertebrates</td>
<td></td>
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<td>BIO 375</td>
<td>Developmental Anatomy Laboratory</td>
<td></td>
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<tr>
<td>BIO 444</td>
<td>The Biology of Love and Sex</td>
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<tr>
<td>ENT 402</td>
<td>Forest Entomology</td>
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<tr>
<td>ENT 425</td>
<td>General Entomology</td>
<td></td>
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<tr>
<td>ENT 509</td>
<td>Biology of Aquatic Insects</td>
<td></td>
</tr>
<tr>
<td>ENT 582</td>
<td>Medical and Veterinary Entomology</td>
<td></td>
</tr>
<tr>
<td>FOR 402</td>
<td>Forest Entomology</td>
<td></td>
</tr>
<tr>
<td>FW 444</td>
<td>Mammalogy</td>
<td></td>
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<tr>
<td>FW 515</td>
<td>Fish Physiology</td>
<td></td>
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<tr>
<td>FW 544</td>
<td>Mammalogy</td>
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<tr>
<td>MB 435</td>
<td>Bacterial Pathogenesis</td>
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<tr>
<td>MB 470</td>
<td>Emerging and Re-emerging Infectious Diseases</td>
<td></td>
</tr>
<tr>
<td>MB 535</td>
<td>Bacterial Pathogenesis</td>
<td></td>
</tr>
<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
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<tr>
<td>PHY 524</td>
<td>Comparative Endocrinology</td>
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<tr>
<td>PO 524</td>
<td>Comparative Endocrinology</td>
<td></td>
</tr>
<tr>
<td>ZO 317</td>
<td>Primate Ecology and Evolution</td>
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</tr>
<tr>
<td>ZO 333</td>
<td>Captive Animal Biology</td>
<td></td>
</tr>
<tr>
<td>ZO 410</td>
<td>Introduction to Animal Behavior</td>
<td></td>
</tr>
<tr>
<td>ZO 486</td>
<td>Capstone Course in Zoology</td>
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</tr>
<tr>
<td>ZO 512</td>
<td>Animal Symbiosis</td>
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<tr>
<td>ZO 513</td>
<td>Comparative Physiology</td>
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<tr>
<td>ZO 522</td>
<td>Biological Clocks</td>
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<tr>
<td>ZO 524</td>
<td>Comparative Endocrinology</td>
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<tr>
<td>ZO 542</td>
<td>Herpetology</td>
<td></td>
</tr>
<tr>
<td>ZO 582</td>
<td>Medical and Veterinary Entomology</td>
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</tr>
</tbody>
</table>

| MA 231     | Calculus for Life and Management Sciences B             |       |
|           | Hours                                                  |       |
| Second Year|                                                         |       |
| Fall Semester|                                               |       |
| CH 223     | Organic Chemistry II                                   |       |
| CH 224     | Organic Chemistry II Lab                               |       |
| ST 311     | Introduction to Statistics                             |       |
| or ST 371  | Introduction to Probability and Distribution Theory    |       |
| ZO 250     | Animal Anatomy and Physiology                           |       |
| GEP Humanities (p. 1423) |                                           |       |

| Hours      |       |
| Spring Semester|                                           |       |
| Eco Requirements |                                         |       |
| GN 311     | Principles of Genetics                        |       |
| CH 201     | Chemistry - A Quantitative Science             |       |
| CH 202     | Quantitative Chemistry Laboratory              |       |
| GEP Interdisciplinary Perspectives (p. 1426) |                                           |       |

| Hours      |       |
| Third Year |                                                         |       |
| Fall Semester|                                               |       |
| Animal Phylogeny Requirement |                                         |       |
| Free Elective |                                          |       |
| PY 211     | College Physics I                                |       |
| GEP Social Sciences (p. 1430) |                                           |       |

| Hours      |       |
| Spring Semester|                                           |       |
| Advanced Writing Requirement |                                         |       |
| Zoology Elective |                                         |       |
| PY 212     | College Physics II                            |       |
| GEP Social Sciences (p. 1430) |                                           |       |
| Free Elective |                                          |       |

| Hours      |       |
| Fourth Year|                                                         |       |
| Fall Semester|                                               |       |
| Zoology Elective |                                         |       |
| Zoology Elective |                                         |       |
| Science & Math Elective |                                         |       |
| Science & Math Elective |                                         |       |
| GEP Humanities (p. 1423) |                                           |       |

| Hours      |       |
| Spring Semester|                                           |       |
| Zoology Elective |                                         |       |
| Science & Math Elective |                                         |       |
| Free Elective |                                          |       |
| GEP Additional Breadth (p. 1417) |                                           |       |
| Free Elective |                                          |       |

| Hours      |       |
| Total Hours|       |
Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

Zoology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! The Department of Biological Sciences in the College of Sciences offers an undergraduate minor in Zoology intended to enhance the programs of students who are interested in obtaining a solid foundation in zoological concepts, including diversity in the animal kingdom, animal behavior, and the comparative physiology of animals. It is open to all baccalaureate students except those majoring in Zoology (17ZOOBS) or Biological Sciences with a concentration in Ecology, Evolution, and Conservation Biology (17BIOSCEEC). At least 9 credit hours of the minor must be completed at NC State.

Admissions

The minor in Zoology is administered within the Department of Biological Sciences in the College of Sciences. Students who plan to minor in Zoology should contact the contact person listed below for information on how to do so. Students are strongly encouraged to declare the minor early in their studies so they receive information on relevant courses, events, and other opportunities from the Department of Biological Sciences.

Certification

All requirements for the minor must be completed no later than the semester in which the student expects to graduate from their major degree program. Students apply to graduate in the minor through MyPack at the same time that they apply to graduate in their major program.

Contact Person

Kim Orłowski
2727 Bostian Hall
919.513.3341
BioSciHelp@ncsu.edu

Coordinator

Jenny Campbell
120 David Clark Labs
919.513.7570
jenny_campbell@ncsu.edu

SIS Code:  17ZOM

Plan Requirements

- The Zoology minor consists of a minimum of 17 credit hours.
- A grade of C- or better is required for all minor courses with a 2.0 GPA required in the minor for graduation.
- No course used in the minor can be taken for credit only (S/U).
- Courses taken for the minor can also be used toward major requirements, GEP Electives, or Free Electives.
- At least 9 credit hours of the minor must be completed at NC State.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ZO 250</td>
<td>Animal Anatomy and Physiology</td>
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</tr>
<tr>
<td>ZO 350</td>
<td>Animal Phylogeny and Diversity</td>
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</tr>
<tr>
<td>or ZO 402</td>
<td>Invertebrate Biology</td>
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Electives

Select nine credits of the following:

<table>
<thead>
<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td>ZO 233</td>
<td>Human-Animal Interactions</td>
<td></td>
</tr>
<tr>
<td>ZO 317</td>
<td>Primate Ecology and Evolution</td>
<td></td>
</tr>
<tr>
<td>ZO 333</td>
<td>Captive Animal Biology</td>
<td></td>
</tr>
<tr>
<td>ZO 334</td>
<td>Captive Animal Biology Field Laboratory</td>
<td></td>
</tr>
<tr>
<td>ZO 410</td>
<td>Introduction to Animal Behavior</td>
<td></td>
</tr>
<tr>
<td>ZO 486</td>
<td>Capstone Course in Zoology</td>
<td></td>
</tr>
<tr>
<td>ZO 2**, 3**, or 4**</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
<td></td>
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<tr>
<td>MEA 252</td>
<td>Biology of Marine Mammals</td>
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<td>MEA 449</td>
<td>Principles of Biological Oceanography</td>
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<td>FW 444</td>
<td>Mammalogy</td>
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<td>ENT 425</td>
<td>General Entomology</td>
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<tr>
<td>BIO 330</td>
<td>Evolutionary Biology</td>
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<tr>
<td>or BIO 432</td>
<td>Evolutionary Medicine</td>
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<td>BIO 370</td>
<td>Developmental Anatomy of the Vertebrates</td>
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<td>BIO 375</td>
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<td>ANS 415</td>
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<td>Comparative Nutrition</td>
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<td>Ecology</td>
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<tr>
<td>or PB 360</td>
<td>Ecology</td>
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</table>
Department of Chemistry

The Department of Chemistry is a place where the best and brightest undergraduate students come together to learn, building the foundation for bright futures. Our two degree programs (https://chemistry.sciences.ncsu.edu/undergraduate/programs/) offer flexibility in choosing the appropriate academic path to fulfill your interests and career goals. Our Bachelor of Science (B.S.) program is certified by the American Chemical Society (https://www.acs.org/content/acs/en.html) and trains you for entry in the chemical workforce or graduate school in the chemical sciences. Our Bachelor of Arts (B.A.) program is built around the core sub-disciplines of chemistry with the addition of elective coursework in a chosen field. This program is designed to train you for a career outside of traditional laboratory work. And excellent students looking for a challenging curriculum can enroll in our Chemistry Honors Program (https://chemistry.sciences.ncsu.edu/undergraduate/programs/chemistry-honors-program/).

Our undergraduate researchers work alongside our expert faculty and top-notch graduate students and postdoctoral researchers, making big discoveries that affect us all. They leave our department with real-world skills and understanding that prepare them to shape the future of chemistry. Being at a large university means a wealth of opportunities — you can choose to participate in research opportunities offered through our department or to partner with researchers in other colleges and departments around campus on interdisciplinary projects.

The Department of Chemistry combines excellent teaching with unique opportunities for research and community engagement to prepare undergraduates for future success.

To learn more about this department, visit our website (https://chemistry.sciences.ncsu.edu/).

Department of Chemistry
Dabney Hall, Room 208
2620 Yarbrough Dr.
NC State University
Raleigh, NC 27695
Phone: 919-515-2355

Edmond F. Bowden
Department Head
Phone: 919-515-4563
Email: efbowden@ncsu.edu

Faculty

Department Head
Edmond Bowden

Associate Department Head
Gavin Williams

Director of Undergraduate Programs
Jeremiah Feducia

Director of Graduate Programs
Reza Ghiladi

Glaxo Distinguished University Professor
Jonathan Lindsey

Jacob and Betty Belin Distinguished Professor
David Muddiman

Goodnight Innovation Distinguished Professor
Felix Castellano

Alumni Distinguished Undergraduate Professors
M. T. Gallardo-Williams

Professors

E.F. Bowden
F. Castellano
S.F. Franzen
C. B. Gorman
J.S. Lindsey
J.D. Martin
D.C. Muddiman
M.T. Oliver-Hoyo
D.A. Shultz
A.I. Smirnov

Professors Emeriti

A.J. Banks
R.D. Bereman
C.L. Bumgardner
H.H. Carmichael
D.L. Comins
Adjunct Professors

V. Bornemann
V. S. De Serrano

Associate Professors

E. Baker
R.A. Ghiladi
E. Ison
E. Jakubikova
P.A. Maggard
A.A. Nevzorov
J. Pierce
T.L. Smirnova
D.S. Argyropoulos, Forest Biomaterials
L.A. Lucia, Forest Biomaterials
D.W. Brenner, Materials Science and Engineering
L. Sombers
G. Williams

Associate Professor Emeriti

C.B. Boss
W.L. Switzer
D.W. Wertz

Adjunct Associate Professors

R. Mantz
J.L. White

Research Associate Professor

G. S. McCarty

Assistant Professors

W.C. Chang
D. Fourches
V. Lindsay
J. Ohata
C. Proulx
T. Theis

Research Assistant Professors

M. Voynov

Teaching Professors

P.A. Brown
M. T. Gallardo-Williams
L.E. Sremaniak

Teaching Associate Professors

J. Feducia
M.T. Gallardo-Williams
A. Ison
G. Neyhart
L.M. Petrovich
G. Rabah
R.W. Warren

Teaching Assistant Professor

M. Martin
L. Del Negro

Lecturer

K. Daykin

Plans

• Chemistry (BA) (p. 1360)
• Chemistry (BS) (p. 1362)
Chemistry (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Chemistry is a diverse and growing field that is full of academic and career opportunities for undergraduate students. Our two degree programs offer flexibility in choosing the appropriate academic path to fulfill your interest and career goals.

The Bachelor of Arts (B.A.) in Chemistry is built around the core sub-disciplines of chemistry with the addition of elective coursework in a chosen field. This program is designed to train you for a career outside of traditional laboratory work.

The Bachelor of Science (B.S.) in Chemistry program is certified by the American Chemical Society and trains you for entry in the chemical workforce or graduate school in the chemical sciences.

The Chemistry Honors Program offers students a challenging program of advanced study where they can develop independence, collaborative skills and a deeper understanding of chemistry required for careers in both industry and graduate school.

Outside of the classroom, students in Chemistry actively share their passion for chemistry with others, including the next generation of scientists. Opportunities in this area are possible through participation in our student groups:

- **Alpha Chi Sigma** – professional co-ed chemistry fraternity; benefits students not only by helping with their studies but also by providing projects and activities that teach the roles of leadership and management
- **American Chemical Society** – the student chapter of the ACS takes part in activities including tours of local research facilities, trips to national and regional conferences, and presentations by guest speakers
- **Cosmetic Chemistry Club** - open to all students interested in learning about cosmetics and the industry behind them; connects students to the cosmetic industry through guest speakers, company visits, and other activities

Undergraduate research can be one of the most rewarding aspects of your academic experience at NC State. Research offers opportunities to make pioneering discoveries at the forefront of science, using instrumentation and techniques far more sophisticated than those you would encounter in standard laboratory courses. Students often co-author publications in peer-reviewed journals and present their research at conferences. For more information on getting involved, please contact our Undergraduate Research Coordinator.

For more information about this program, visit our website (https://chemistry.sciences.ncsu.edu/undergraduate/programs/).

**Contact**

Dr. Jeremiah Feducia  
Director of Undergraduate Programs  
Phone: 919-515-2296  
Email: jeremiah_feducia@ncsu.edu

Ms. Robin Tanner  
Undergraduate Programs Coordinator  
Phone: 919-515-2561

Email: robin_tanner@ncsu.edu

Dr. Erin Baker  
Undergraduate Research Coordinator  
Email: ebaker@ncsu.edu

Dr. Ana Ison  
Chemistry Honors Program Director  
Email: aison@ncsu.edu

**Plan Requirements**

**Chemistry (BA):** 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tr>
<td><strong>Orientation</strong></td>
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<tr>
<td>COS 100</td>
<td>Science of Change</td>
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<tr>
<td>or E 115</td>
<td>Introduction to Computing Environments</td>
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<tr>
<td><strong>Writing and Speaking</strong></td>
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<td>Academic Writing and Research ¹</td>
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<tr>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td><strong>Basic Math &amp; Sciences</strong></td>
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<td>PY 205</td>
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<td>&amp; PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>Select one of the following:</td>
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</tr>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
<td>4</td>
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<tr>
<td>&amp; PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
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<tr>
<td>PY 212</td>
<td>College Physics II</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A ¹</td>
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</tr>
<tr>
<td>or MA 141</td>
<td>Calculus I</td>
<td></td>
</tr>
<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B ¹</td>
<td>3</td>
</tr>
<tr>
<td>or MA 241</td>
<td>Calculus II</td>
<td></td>
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<tr>
<td>BCH 351</td>
<td>General Biochemistry ¹</td>
<td>4</td>
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<tr>
<td>or BCH 451</td>
<td>Principles of Biochemistry</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics ¹</td>
<td>3</td>
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<td><strong>Chemistry Core Courses</strong></td>
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<tr>
<td>CH 103</td>
<td>General Chemistry I for Students in Chemical Sciences ¹</td>
<td>3</td>
</tr>
<tr>
<td>CH 104</td>
<td>General Chemistry Laboratory I for Students in Chemical Sciences ¹</td>
<td>1</td>
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<tr>
<td>CH 203</td>
<td>General Chemistry II for Students in Chemical Sciences ¹</td>
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<td>General Chemistry Laboratory II for Students in Chemical Sciences ¹</td>
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<tr>
<td>CH 226</td>
<td>Organic Chemistry Laboratory I for Students in Chemical Sciences ¹</td>
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<tr>
<td>CH 227</td>
<td>Organic Chemistry II for Students in Chemical Sciences ¹</td>
<td>3</td>
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</tbody>
</table>

¹ Students may choose one major (B.S. or B.A.) and one minor (B.S. or B.A.) from the corresponding set of courses in the major.

For more information on the Chemistry Core Courses, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).
Chemistry Advanced Electives

CH 228 Organic Chemistry Laboratory II for Students in Chemical Sciences 1 1
CH 315 Quantitative Analysis 1 3
CH 316 Quantitative Analysis Laboratory 1 1
CH 401 Systematic Inorganic Chemistry I 1 3
CH 331 Introductory Physical Chemistry 1 4
Chemistry Advanced Elective (p. 1361) 1 3

Advised Electives
Advised Electives 2 21

GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 6
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives
Free Electives (12 Hr S/U Lmt) 2 18

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Chemistry Advanced Electives

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<td>CH 403</td>
<td>Systematic Inorganic Chemistry II</td>
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CH 732 Advanced Physical Chemistry in Biological Applications 3
CH 734 Spectroscopic Methods in Chemical Biology 3
CH 735 Magnetic Resonance in Chemistry 3
CH 736 Chemical Spectroscopy 3
CH 737 Quantum Chemistry 3
CH 743 Electrochemistry 3
CH 745 Chemical Separation 3
CH 747 Nanobiotechnology 3
CH 749 Analytical Spectroscopy 3
CH 755 Organic Reaction Mechanisms 3
CH 757 Combinatorial Bioorganic Synthetic Chemistry 3
CH 759 Natural Products 3
CH 765 Chemistry of Materials 3
CH 770 Bioinorganic Chemistry 3
CH 772 Solid State Chemistry 3
CH 795 Special Topics in Chemistry 1-6
PSE 335 Principles of Green Chemistry 4

Semester Sequence

This is a sample.

Course Title Hours
First Year
Fall Semester
CH 103 General Chemistry I for Students in Chemical Sciences 1 3
CH 104 General Chemistry Laboratory I for Students in Chemical Sciences 1 1
MA 131 or MA 141 Calculus for Life and Management Sciences A 1 or Calculus I 3-4
ENG 101 Academic Writing and Research 1 4
COS 100 Science of Change 2
GEP Requirement (p. 1417) 3
Hours 16-17

Spring Semester
CH 203 General Chemistry II for Students in Chemical Sciences 1 3
CH 204 General Chemistry Laboratory II for Students in Chemical Sciences 1 1
MA 231 or MA 241 Calculus for Life and Management Sciences B 1 or Calculus II 3-4
GEP Health and Exercise Studies (p. 1422) 1
GEP Requirement (p. 1417) 3
GEP Requirement (p. 1417) 3
Hours 14-15

Second Year
Fall Semester
CH 225 Organic Chemistry I for Students in Chemical Sciences 1 3
CH 226 Organic Chemistry Laboratory I for Students in Chemical Sciences 1 1
Select one of the following:  

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### Hours

14-15

### Third Year

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| Hours | 16 |

#### Spring Semester

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| Hours | 16 |

### Fourth Year

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| Hours | 14 |

#### Spring Semester

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### Total Hours

119-123

1 A grade of C- or higher is required.

---

**Chemistry (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/)](https://apps.oirp.ncsu.edu/pgas/)

Chemistry is a diverse and growing field that is full of academic and career opportunities for undergraduate students. Our two degree programs offer flexibility in choosing the appropriate academic path to fulfill your interest and career goals.

The Bachelor of Arts (B.A.) in Chemistry is built around the core sub-disciplines of chemistry with the addition of elective coursework in a chosen field. This program is designed to train you for a career outside of traditional laboratory work.

The Bachelor of Science (B.S.) in Chemistry program is certified by the American Chemical Society and trains you for entry in the chemical workforce or graduate school in the chemical sciences.

Outside of the classroom, students in Chemistry actively share their passion for chemistry with others, including the next generation of scientists. Opportunities in this area are possible through participation in our student groups:

- **Alpha Chi Sigma** – professional co-ed chemistry fraternity; benefits students not only by helping with their studies but also by providing projects and activities that teach the roles of leadership and management

- **American Chemical Society** – the student chapter of the ACS takes part in activities including tours of local research facilities, trips to national and regional conferences, and presentations by guest speakers

- **Cosmetic Chemistry Club** - open to all students interested in learning about cosmetics and the industry behind them; connects students to the cosmetic industry through guest speakers, company visits, and other activities

Undergraduate research can be one of the most rewarding aspects of your academic experience at NC State. Research offers opportunities to make pioneering discoveries at the forefront of science, using instrumentation and techniques far more sophisticated than those you would encounter in standard laboratory courses. Students often co-author publications in peer-reviewed journals and present their research at conferences. For more information on getting involved, please contact our Undergraduate Research Coordinator.

For more information about this program, visit our website ([https://chemistry.sciences.ncsu.edu/undergraduate/programs/](https://chemistry.sciences.ncsu.edu/undergraduate/programs/)).

### Contact

Dr. Jeremiah Feducia
### Plan Requirements

**Chemistry (BS): 120 Total Units**

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$^1$ A grade of C- or higher is required.

$^2$ Students should consult their academic advisors to determine which courses fill this requirement.

### Advanced Writing Electives

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<td>Explorations in Creative Writing</td>
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<td>Fiction Writing</td>
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### Chemistry Electives

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**Semester Sequence**

This is a sample.

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| **Spring Semester** |                                                               |       |
| CH 227  | Organic Chemistry II for Students in Chemical Sciences                  | 3     |
| CH 228  | Organic Chemistry Laboratory II for Students in Chemical Sciences       | 1     |
| CH 315  | Quantitative Analysis                                                 | 3     |
| CH 316  | Quantitative Analysis Laboratory                                       | 1     |
| MA 341  | Applied Differential Equations I                                      | 3     |
| GEP Health and Exercise Studies (p. 1422) |                                      | 1     |
| GEP Requirement (p. 1417) |                                        | 3     |
| **Hours** |                                                                | 15    |

| **Fall Semester** |                                                               |       |
| CH 431  | Physical Chemistry I                                                 | 3     |
| CH 401  | Systematic Inorganic Chemistry I                                     | 3     |
| CH 442  | Advanced Synthetic Techniques                                         | 4     |
| Advanced Writing Elective |                                                | 3     |
| Advised Elective |                                        | 3     |
| **Hours** |                                                                | 16    |
| **Spring Semester** |                                                               |       |
| CH 433  | Physical Chemistry II                                                | 3     |
| CH 415  | Analytical Chemistry II                                              | 3     |
| BCH 451 | Principles of Biochemistry                                           | 4     |
| GEP Additional Breadth (p. 1417) |                                | 3     |
| Advised Elective |                                        | 3     |
| **Hours** |                                                                | 16    |

| **Fall Semester** |                                                               |       |
| Chemistry Advanced Elective |                                                | 3     |
| CH 452  | Advanced Measurement Techniques I                                   | 4     |
| GEP Requirement (p. 1417) |                                        | 3     |
| Advised Elective |                                        | 2     |
| Free Elective |                                        | 3     |
| **Hours** |                                                                | 15    |
| **Spring Semester** |                                                               |       |
| Chemistry Advanced Laboratory Option |                                        | 4     |
| Chemistry Advanced Elective |                                                | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) |                                | 3     |
Advised Elective  3

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1 A grade of C- or higher is required.

Department of Marine, Earth and Atmospheric Sciences

The Department of Marine, Earth and Atmospheric Sciences (MEAS) covers a broad range of disciplines with one overarching goal: a deeper understanding of the Earth’s environment. MEAS takes an interdisciplinary, integrated systems-based approach to studying our planet’s air, earth and water. This interdisciplinary viewpoint is particularly important today, in light of accelerating global changes and increasing corporate and public interest in environmental health and the stewardship of our natural resources. Addressing these complex issues requires more than narrow training in a single discipline. MEAS graduates can be equipped for tasks as diverse as improving severe storm forecasting; assessing the potential effects of oil exploration and mining; modeling global climate trends or coastal flooding; understanding the transport of air pollutants from industrial centers, remote satellite observation of our planet’s surface; or devising plans to minimize erosion, harmful algal blooms and the pollution of our streams, lakes and estuaries.

MEAS offers:

• Degrees and minors in meteorology, geology, marine sciences, and natural resources
• Minors in meteorology, geology, and marine sciences
• Semester at CMAST, an opportunity to spend a spring semester on the shore of Bogue Sound, in Morehead City
• A departmental honors program in which participants receive enhanced coverage of academic material and are involved in research.
• Opportunities for undergraduate research, cooperative education, and Internships
• Award-winning facilities that include state of the art classrooms, teaching laboratories, computing facilities, and research
• Partnerships with the State Climate Office and the National Weather Service, which are housed on NC State’s Centennial Campus

For more information about this department, visit our website (https://meas.sciences.ncsu.edu/).

Contact

Campus mailing address:
Department of Marine, Earth, and Atmospheric Sciences
Campus Box 8208,
NC State University Raleigh,
NC 27695-8208

Physical Address:
Department of Marine, Earth and Atmospheric Sciences
2800 Faucette Dr.
Rm. 1125 Jordan Hall
NC State University
Raleigh, NC 27695

Program contact:
Maggie Puryear,
Associate Director of Undergraduate Programs
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919.513.1093

Faculty

Department Head
L. A. Owen

Director of Graduate Programs
V. Aneja, Co-Director
L. Leithold, Co-Director

Associate Director of Undergraduate Programs
M. Puryear

Director, CMAST
D.B. Eggleston, Professor

Director, NC-CICS-Asheville
O. Brown, Research Professor

Professors
V.P. Aneja
D. Bohnenstiehl
D. DeMaster
D.B. Eggleston
D.P. Genereux
P.J. Harries, Dean, Graduate School, Professor-MEAS
R. He, Goodnight Innovation Distinguished Professor
G.M. Lackmann
E.L. Leithold
J. Levine
P. Liu
D.A. McConnell
N. Meskhidze
H. Mitasova
L. A. Owen, Department Head
Research Professors
O. Brown
K.E. Kunkel
C.R. Philbrick

Professor Emeriti
S.P. Arya
T. Clark
J.M. Davis
R. Fodor
J.C. Fountain
J. Hibbard
T. S. Hopkins
D.L. Kamykowski
L.J. Langfelder
L.J. Pietrafesa
S. Raman
F. Semazzi
C. Welby
T.G. Wolcott

Adjunct Professor Emeritus
D.A. Russell

Associate Professors
A.R. Aiyyer
P. Byrne
C. L. Osburn
A. Schnetzer
K.W. Wegmann

Research Associate Professors
C.J. Thomas

Associate Professor Emeriti
C.E. Knowles
A.J. Riordan
P.T. Shaw
E.F. Stoddard
D.L. Wolcott

Assistant Professors
C. Arendt
S.P. Bishop
E. Hyland
S. Larson
R. Paerl

Research Assistant Professors
J. Zambon

Senior Research Scholar
M. Miller

Adjunct Professors
S. Bulusu
B. Celler
D. Easterling
B. Eder
P. Hamilton
R.S. Harmon
D. Kingsmill
E. Koster
S.T. Rao
S. Yu
Y. Zhang

Adjunct Associate Professors
W. H. Battye
The degree of Bachelor of Science in Geology is offered in the Department of Marine, Earth and Atmospheric Sciences. Geological science — or Earth science — is a broad and interdisciplinary field that encompasses other disciplines such as biology, chemistry, math, and physics. Knowledge of Earth processes provides a critical framework for the assessment of resources, geologic hazards, and environmental stewardship. Many geologists work in the petroleum or natural gas exploration industry or in the mineral industry. Many other geoscientists find work related to natural hazards (e.g., earthquakes, volcanoes, and landslides), as geologists on some of the world's largest engineering projects (dams, tunnels, bridges, tall buildings), in the geothermal and alternative energy sectors, in the remediation of hazardous waste and groundwater pollution control, and in the field of environmental rehabilitation (e.g., stream restoration). Geoscientists work across industries — from Fortune 100 companies to small environmental consulting and law firms, state agencies and nonprofit organizations. Many others are employed in the education sector including at universities, community colleges and high schools.

For more information about our geology program, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/earth-science/) or contact:

Maggie Puryear
Associate Director of Undergraduate Programs
mwpollar@ncsu.edu
919.513.1093

Plan Requirements

Geology (BS): 120 Total Units

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<td>COS 100</td>
<td>Science of Change</td>
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Select one of the following:       

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas)!
PY 208 & PY 209  Physics for Engineers and Scientists II Laboratory
PY 212  College Physics II

**Geology Core Courses**

Select one of the following:

- MEA 101  Geology I: Physical
- MEA 150  Environmental Issues in Water Resources
- MEA 200  Introduction to Oceanography
- MEA 100  Earth System Science: Exploring the Connections
- MEA 110  Geology I Laboratory
- MEA 202  Geology II: Historical
- MEA 211  Geology II Laboratory
- MEA 410  Introduction to Mineralogy and Petrology
- MEA 450  Introductory Sedimentology and Stratigraphy
- MEA 451  Structural Geology
- MEA 465  Geologic Field Camp
- MEA 495  Junior Seminar in the Marine, Earth, and Atmospheric Sciences

**Restricted Electives**

Select one of the following:

- MEA 411  Marine Sediment Transport
- MEA 459  Field Investigation of Coastal Processes
- MEA 481  Geomorphology: Earth's Dynamic Surface

Select one of the following:

- MEA 323  Geochemistry of Natural Waters
- MEA 471  Exploration and Engineering Geophysics
- MEA 485  Introduction to Hydrogeology

Restricted Earth Science Electives (p. 1368)

Math/Science Option Electives (p. 1368)

Advised Electives

Advised Electives

GEP Courses

- GEP Humanities (p. 1423)
- GEP Social Sciences (p. 1430)
- GEP Health and Exercise Studies (p. 1422)
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt)  

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

**Computer Literacy Electives**

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<td>Introduction to Computing - MATLAB</td>
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**Restricted Earth Science Electives**

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<td>MEA 440</td>
<td>Igneous and Metamorphic Petrology</td>
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**Math/Science Option**

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<td>ECE 489</td>
<td>Solid State Solar and Thermal Energy Harvesting</td>
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<td>ECE 589</td>
<td>Solid State Solar and Thermal Energy Harvesting</td>
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<tr>
<td>ENT 425</td>
<td>General Entomology</td>
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<tr>
<td>FW 353</td>
<td>Wildlife Management</td>
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<tr>
<td>GN 456</td>
<td>Epigenetics, Development, and Disease</td>
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<td>GPH 404</td>
<td>Epidemiology and Statistics in Global Public Health</td>
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<td>LOG 335</td>
<td>Symbolic Logic</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>MA 302</td>
<td>Numerical Applications to Differential Equations</td>
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<tr>
<td>MA 303</td>
<td>Linear Analysis</td>
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<td>Introductory Linear Algebra and Matrices</td>
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<td>Mathematics Methods in Atmospheric Sciences</td>
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<td>Differential Equations for the Life Sciences</td>
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<td>Applied Differential Equations I</td>
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<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models</td>
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<td>MA 401</td>
<td>Applied Differential Equations II</td>
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<tr>
<td>MA 403</td>
<td>Introduction to Modern Algebra</td>
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<td>MA 405</td>
<td>Introduction to Linear Algebra</td>
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<td>Introduction to Modern Algebra for Mathematics Majors</td>
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<td>Foundations of Euclidean Geometry</td>
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<td>Theory of Numbers</td>
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<td>Introduction to Combinatorics</td>
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<td>Game Theory</td>
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<td>Methods of Applied Mathematics I</td>
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<td>Reading in Honors Mathematics</td>
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<td>Special Topics in Mathematics</td>
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<td>Mathematics Methods in Atmospheric Sciences</td>
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<td>Geochemistry of Natural Waters</td>
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<td>PY 301</td>
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<td>PY 328</td>
<td>Stellar and Galactic Astrophysics</td>
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<td>PY 341</td>
<td>Relativity, Gravitation and Cosmology</td>
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<td>PY 411</td>
<td>Mechanics I</td>
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<td>PY 412</td>
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PY 415  Electromagnetism II  3
PY 452  Advanced Physics Laboratory  3
PY 489  Solid State Solar and Thermal Energy Harvesting  3
PY 495  Special Topics in Physics  1-4
PY 499  Independent Research in Physics  1-6
PY 511  Mechanics I  3
PY 512  Mechanics II  3
PY 514  Electromagnetism I  3
PY 515  Electromagnetism II  3
PY 589  Solid State Solar and Thermal Energy Harvesting  3
ST 307  Introduction to Statistical Programming- SAS  1
ST 308  Introduction to Statistical Programming - R  1
ST 311  Introduction to Statistics  3
ST 312  Introduction to Statistics II  3
ST 350  Economics and Business Statistics  3
ST 370  Probability and Statistics for Engineers  3
ST 371  Introduction to Probability and Distribution Theory  3
ST 372  Introduction to Statistical Inference and Regression  3
ST 380  Probability and Statistics for the Physical Sciences  3
ST 401  Experiences in Data Analysis  4
ST 404  Epidemiology and Statistics in Global Public Health  3
ST 405  Applied Nonparametric Statistics  3
ST 412  Long-Term Actuarial Models  3
ST 413  Short-Term Actuarial Models  3
ST 421  Introduction to Mathematical Statistics I  3
ST 422  Introduction to Mathematical Statistics II  3
ST 430  Introduction to Regression Analysis  3
ST 431  Introduction to Experimental Design  3
ST 432  Introduction to Survey Sampling  3
ST 433  Applied Spatial Statistics  3
ST 434  Applied Time Series  3
ST 435  Statistical Methods for Quality and Productivity Improvement  3
ST 437  Applied Multivariate and Longitudinal Data Analysis  3
ST 440  Applied Bayesian Analysis  3
ST 442  Introduction to Data Science  3
ST 445  Introduction to Statistical Computing and Data Management  3
ST 446  Intermediate SAS Programming with Applications  3
ST 491  Statistics in Practice  3
ST 495  Special Topics in Statistics  1-6
ST 497  Professional Experience in Statistics  1-3
ST 498  Independent Study In Statistics  1-6
ST 499  Research Experience in Statistics  1-3
ST 505  Applied Nonparametric Statistics  3
ST 533  Applied Spatial Statistics  3
ST 534  Applied Time Series  3
ST 535  Statistical Methods for Quality and Productivity Improvement  3
ST 537  Applied Multivariate and Longitudinal Data Analysis  3
ST 540  Applied Bayesian Analysis  3
ZO 317  Primate Ecology and Evolution  3
ZO 333  Captive Animal Biology  3
ZO 350  Animal Phylogeny and Diversity  4
ZO 402  Invertebrate Biology  4
ZO 410  Introduction to Animal Behavior  3
ZO 486  Capstone Course in Zoology  3

Semester Sequence
This is a sample.

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<th>Course</th>
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<th>Hours</th>
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<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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<td>Calculus I ² or Calculus for Life and Management Sciences A</td>
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<td>or MA 131</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>COS 100</td>
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<td>Chemistry - A Molecular Science</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>Geology II: Historical</td>
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<td>MEA 211</td>
<td>Geology II Laboratory</td>
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<td></td>
<td>Hours</td>
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<td><strong>Second Year</strong></td>
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<td>Math/Science Option Elective</td>
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<tr>
<td>MEA 410</td>
<td>Introduction to Mineralogy and Petrology ¹</td>
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<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<td></td>
<td>Hours</td>
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<td><strong>Spring Semester</strong></td>
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<td>Computer Science Option Elective</td>
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<tr>
<td>MEA 450</td>
<td>Introductory Sedimentology and Stratigraphy ¹</td>
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</table>
manage our coastal resources, model air-sea interaction, and explore Marine Sciences graduates go on to become oceanographers, to pursue careers in industry, at government agencies and in academia. Many students pursue graduate degrees and the foundation of scientific knowledge required for careers in government, industry, or academia. Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone. Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences. Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone. Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

**Career Opportunities**

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone. Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

**Geology (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Marine, Earth and Atmospheric Sciences offers a minor in Geology to majors in any field except geology. This program provides a means of recognition for students in any field who have a curiosity about the materials, structures and processes of the solid earth.

**Admissions**

Admission into this minor program requires that the student be in good academic standing at the university. To officially enroll in the Minor program, students should see Dr. Karl Wegmann, 2123 Jordan Hall, 919.515.0380, kwegman@ncsu.edu. Dr. Wegmann will provide the student with the name of a geology faculty member who will act as the advisor for the student’s minor program.

**Certification**

Students should see Dr. Wegmann for certification of the minor, 2123 Jordan Hall. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program.

---

1 No more than one D will be allowed in MEA courses and Restricted and Advised Electives.

2 A grade of C- or higher is required.

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### Third Year

#### Fall Semester
- Math/Science Option Elective 3
- MEA 451 Structural Geology 4
- Restricted Earth Science Elective 3
- Free Elective 3
  **Hours** 13

#### Spring Semester
- Advanced Writing Elective 3
- Advised Elective 3
- COM 110 Public Speaking 3
- MEA 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences 1
- Surface Processes Elective 3
- GEP Social Sciences (p. 1430) 3
  **Hours** 16

#### Summer
- MEA 465 Geologic Field Camp 4
  **Hours** 4

#### Fourth Year

#### Fall Semester
- Applied Earth Science Elective 3
- Advised Elective 4
- GEP Humanities (p. 1423) 3
- GEP Additional Breadth (p. 1417) 3
  **Hours** 14

#### Spring Semester
- Advised Elective 3
- Advised Elective 3
- Restricted Earth Science Elective 3
- GEP Humanities (p. 1423) 3
- Free Elective 3
  **Hours** 15

**Total Hours** 120-122
**Contact Person**

Dr. Karl Wegmann  
Department of Marine, Earth and Atmospheric Sciences  
2123 Jordan Hall  
919.515.0380  
kwwegman@ncsu.edu

*SIS Code: 17GM*

**Plan Requirements**

- A grade of ‘C’ or better in all course work used toward minor.

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<td>BIO 230</td>
<td>The Science of Studying Dinosaurs</td>
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<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<tr>
<td>MEA 150</td>
<td>Environmental Issues in Water Resources</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>MEA 110</td>
<td>Geology I Laboratory</td>
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<td>MEA 202</td>
<td>Geology II: Historical</td>
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<tr>
<td>MEA 211</td>
<td>Geology II Laboratory</td>
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**Elective Courses**

Select 6-7 credits at the 300-level or higher approved by the minor coordinator

Total Hours: 14-16

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**Marine Science (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The Department of Marine, Earth and Atmospheric Sciences offers a Minor in Marine Science to majors in any field except marine science or natural resources with a concentration in marine and coastal resources. The minor provides a means of recognition for students who desire a deeper understanding of the world's ocean.

**Requirements for Admission and Completion of the Minor**

- Students must have completed MEA 200 Introduction to Oceanography with a letter grade of C or better and have a GPA of 2.5 or above to be admitted into the minor.
- For completion, students must complete MEA 200 Introduction to Oceanography, MEA 210 Oceanography Lab and MEA 250 Introduction to Coastal Environments and at least 9 additional credit hours from the list of minor elective courses. All course work must be letter-graded and completed with a C or better.

**Admissions**

Students must have completed MEA 200 Introduction to Oceanography with a letter grade of C or better and have a GPA of 2.5 or above to be admitted into the minor. To officially enroll in the Minor program, students should see Dr. Carrie Thomas, 4136 Jordan Hall, 919.515.7839, cjthomas@ncsu.edu.

**Contact Person**

Carrie Thomas  
Room 4136 Jordan Hall  
919-515-7839  
cjthomas@ncsu.edu

*SIS Code: 17MRM*

**Plan Requirements**

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<th>Title</th>
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<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>MEA 210</td>
<td>Oceanography Lab</td>
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<td>MEA 250</td>
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<td>MEA 251</td>
<td>Introduction to Coastal Environments Laboratory</td>
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<td>MEA 252</td>
<td>Biology of Marine Mammals (Semester @ CMAST course)</td>
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<td>MEA 323</td>
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<td>MEA 350</td>
<td>Marine Conservation Biology (Semester @ CMAST course)</td>
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<td>MEA 449</td>
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<td>Observational Methods and Data Analysis in Marine Physics</td>
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<td>MEA 467</td>
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<td>Exploration and Engineering Geophysics</td>
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<td>Worldwide River and Delta Systems: Their Evolution and Human Impacts</td>
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<td>MEA 493</td>
<td>Special Topics in MEAS</td>
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<td>Geological Oceanography</td>
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Total Hours: 16

1 Enrollment in special topics courses should be approved by the minor coordinator in advance to ensure they are appropriate and relevant to the minor.
Marine Sciences (BS): Biological Oceanography Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

The degree of Bachelor of Science in Natural Resources is available with a concentration in Marine and Coastal Resources.

Marine scientists explore all aspects of the seas and coastal regions, seeking to understand how the oceans, their biological communities, the solid earth and the atmosphere interact. As professionals with interdisciplinary training, marine scientists are needed to advise business, industry and governments on the potential impact of human activities and the wise use of marine resources. Marine scientists work for consulting firms; regulatory agencies; the mass media; business and industry; federal, state and local governments; academic laboratories; research and education organizations; and nonprofit environmental watchdog groups.

For more information about our marine science programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919-513-1093

Plan Requirements

Marine Sciences (BS): Biological Oceanography Concentration: 120 Total Units

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<thead>
<tr>
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<th>Hours</th>
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<td>Core Courses/Marine Science</td>
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<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<td>MEA 210</td>
<td>Oceanography Lab</td>
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<td>MEA 250</td>
<td>Introduction to Coastal Environments</td>
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<td>MEA 459</td>
<td>Field Investigation of Coastal Processes</td>
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<td>MEA 460</td>
<td>Principles of Physical Oceanography</td>
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<td>MEA 462</td>
<td>Observational Methods and Data Analysis in</td>
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<td>Organic Chemistry I</td>
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<td>Chemistry - A Quantitative Science 1</td>
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<td>MA 131</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B 1</td>
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<tr>
<td>or MA 241</td>
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<td>CSC 112</td>
<td>Introduction to Computing-FORTRAN</td>
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<td>CSC 113</td>
<td>Introduction to Computing - MATLAB</td>
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<td>GIS 280</td>
<td>Introduction to GIS</td>
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<td>COS 100</td>
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<td>ENG 101</td>
<td>Academic Writing and Research 1</td>
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<td>Communication for Science and Research</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.
Statistics Electives

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<td>EC 351</td>
<td>Econometrics I</td>
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<td>ST 305</td>
<td>Statistical Methods</td>
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<td>ST 307</td>
<td>Introduction to Statistical Programming - SAS</td>
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<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>ST 312</td>
<td>Introduction to Statistics II</td>
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<td>ST 350</td>
<td>Economics and Business Statistics</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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Semester Sequence

This is a sample.

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<td>Introductory Biology: Ecology, Evolution, and Biodiversity ¹</td>
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<td>Science of Change</td>
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<td>Calculus for Life and Management Sciences A (CP) ¹ or Calculus I</td>
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<td>Earth System Science: Exploring the Connections ²</td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology ¹</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
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<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography (CP) ²</td>
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<td>MEA 210</td>
<td>Oceanography Lab ²</td>
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<td>MA 231 or MA 241</td>
<td>Calculus for Life and Management Sciences B ¹ or Calculus II</td>
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<td><strong>Hours</strong></td>
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<td><strong>Second Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td>Botany Elective ²</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science (CP) ¹</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory ³</td>
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<td>PY 211</td>
<td>College Physics I ¹</td>
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<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>ZO 350</td>
<td>Animal Phylogeny and Diversity ²</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science ¹</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory ³</td>
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<td>MEA 250</td>
<td>Introduction to Coastal Environments ²</td>
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<td>PY 212</td>
<td>College Physics II</td>
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<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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& PY 209                     | and Physics for Engineers and Scientists II Laboratory ³              |       |
| **Hours**                   |                                                                       | 15    |
| **Third Year**              |                                                                       |       |
| **Fall Semester**           |                                                                       |       |
| Concentration Elective ²    |                                                                       | 4     |
| Organic Chemistry Elective ² |                                                                       | 3     |
| CH 222                      | Organic Chemistry I Lab                                              | 1     |
| MEA 449/549                 | Principles of Biological Oceanography ²                               | 3     |
| MEA 460                     | Principles of Physical Oceanography ²                                 | 3     |
| **Hours**                   |                                                                       | 14    |
| **Spring Semester**         |                                                                       |       |
| Concentration Elective ²    |                                                                       | 3     |
| GEP Humanities (p. 1423)    |                                                                       | 3     |
| GEP Health and Exercise Studies (p. 1422) |                                 | 1     |
| MEA 462                     | Observational Methods and Data Analysis in Marine Physics ²           | 3     |
| MEA 495                     | Junior Seminar in the Marine, Earth, and Atmospheric Sciences         | 1     |
| **Hours**                   |                                                                       | 3     |
| **Statistical Science Option ³** |                                 | 3     |
| **Hours**                   |                                                                       | 14    |
| **Summer**                  |                                                                       |       |
| MEA 459                     | Field Investigation of Coastal Processes ²                             | 5     |
| **Hours**                   |                                                                       | 5     |
| **Fourth Year**             |                                                                       |       |
| **Fall Semester**           |                                                                       |       |
| Advanced Writing Elective   |                                                                       | 3     |
| Concentration Elective ²    |                                                                       | 3     |
| PB 360                      | Ecology                                                               | 4     |
| GEP Humanities (p. 1423)    |                                                                       | 3     |
| **Hours**                   |                                                                       | 13    |
| **Spring Semester**         |                                                                       |       |
| Concentration Elective ²    |                                                                       | 3     |
| Concentration Elective ²    |                                                                       | 3     |
| Computer Science Option Elective ³ |                                 | 3     |
| GEP Additional Breadth (p. 1417) |                                 | 3     |
| GEP Social Sciences (p. 1430) |                                                                       | 3     |
| **Hours**                   |                                                                       | 15    |
| **Total Hours**             |                                                                       | 120-122 |

¹ A grade of C- or higher is required.
² No more than one D will be accepted in MEA core courses and concentration courses.
Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

Marine Sciences (BS): Chemistry Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

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For more information about our marine science programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919-513-1093

Plan Requirements

Marine Sciences (BS): Chemistry Concentration: 120 Total Units

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<thead>
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<td>Earth System Science: Exploring the Connections</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<tr>
<td>MEA 210</td>
<td>Oceanography Lab</td>
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<td>MEA 250</td>
<td>Introduction to Coastal Environments</td>
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<td>Field Investigation of Coastal Processes</td>
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<td>MEA 460</td>
<td>Principles of Physical Oceanography</td>
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<td>Observational Methods and Data Analysis in Marine Physics</td>
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<td>MEA 495</td>
<td>Junior Seminar in the Marine, Earth, and Atmospheric Sciences</td>
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Chemistry Concentration

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<td>CH 221</td>
<td>Organic Chemistry I (^1)</td>
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<td>CH 222</td>
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<td>CH 223</td>
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<td>CH 401</td>
<td>Systematic Inorganic Chemistry I</td>
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<td>CH 442</td>
<td>Advanced Synthetic Techniques</td>
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<td>CH 403</td>
<td>Systematic Inorganic Chemistry II</td>
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<td>CH 431</td>
<td>Physical Chemistry I (^1)</td>
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<td>MEA 323</td>
<td>Geochemistry of Natural Waters</td>
<td>3</td>
</tr>
<tr>
<td>MEA 473</td>
<td>Principles of Chemical Oceanography</td>
<td>3</td>
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</table>

Basic Math & Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science (^1)</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science (^1)</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory (^1)</td>
<td>1</td>
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</table>

No more than one D will be accepted in other basic math or science courses.
### Statistics Electives

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BUS 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
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<tr>
<td>EC 351</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
<td>4</td>
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<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming-SAS</td>
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</tr>
<tr>
<td>ST 308</td>
<td>Introduction to Statistical Programming-R</td>
<td>1</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ST 312</td>
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<td>3</td>
</tr>
<tr>
<td>ST 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
<td>3</td>
</tr>
<tr>
<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
<td>3</td>
</tr>
<tr>
<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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</table>

### Semester Sequence

This is a sample.

#### Course Title Hours

**First Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
</tr>
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<tbody>
<tr>
<td>CH 101 Chemistry - A Molecular Science (CP)</td>
</tr>
<tr>
<td>CH 102 General Chemistry Laboratory (CP)</td>
</tr>
<tr>
<td>COS 100 Science of Change</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
</tr>
<tr>
<td>MA 100 Earth System Science: Exploring the Connections</td>
</tr>
<tr>
<td>MA 141 Calculus I (CP)</td>
</tr>
<tr>
<td>Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 201 Chemistry - A Quantitative Science (CP)</td>
</tr>
<tr>
<td>CH 202 Quantitative Chemistry Laboratory (CP)</td>
</tr>
<tr>
<td>MA 241 Calculus II (CP)</td>
</tr>
<tr>
<td>ENG 101 Academic Writing and Research</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417)</td>
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<tr>
<td>Hours</td>
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</table>

**Second Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
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<tbody>
<tr>
<td>CH 221 Organic Chemistry I</td>
</tr>
<tr>
<td>CH 222 Organic Chemistry I Lab</td>
</tr>
<tr>
<td>MA 242 Calculus III</td>
</tr>
<tr>
<td>MEA 200 Introduction to Oceanography (CP)</td>
</tr>
<tr>
<td>MEA 210 Oceanography Lab</td>
</tr>
<tr>
<td>PY 205 Physics for Engineers and Scientists I (CP)</td>
</tr>
<tr>
<td>Hours</td>
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</table>

<table>
<thead>
<tr>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 315 Quantitative Analysis</td>
</tr>
<tr>
<td>CH 316 Quantitative Analysis Laboratory</td>
</tr>
<tr>
<td>CH 223 Organic Chemistry II</td>
</tr>
<tr>
<td>CH 224 Organic Chemistry II Lab</td>
</tr>
<tr>
<td>MEA 250 Introduction to Coastal Environments</td>
</tr>
<tr>
<td>PY 208 Physics for Engineers and Scientists II (CP)</td>
</tr>
<tr>
<td>PY 209 Physics for Engineers and Scientists II Laboratory</td>
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<tr>
<td>Hours</td>
</tr>
</tbody>
</table>

**Third Year**

<table>
<thead>
<tr>
<th>Fall Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 401 Systematic Inorganic Chemistry I</td>
</tr>
<tr>
<td>CH 442 Advanced Synthetic Techniques</td>
</tr>
<tr>
<td>CH 431 Physical Chemistry I</td>
</tr>
<tr>
<td>MA 341 Applied Differential Equations I</td>
</tr>
<tr>
<td>MEA 460 Principles of Physical Oceanography</td>
</tr>
<tr>
<td>Hours</td>
</tr>
</tbody>
</table>
who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

### Marine Sciences (BS): Geology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

The degree of Bachelor of Science in Natural Resources is available with a concentration in Marine and Coastal Resources.

Marine scientists explore all aspects of the seas and coastal regions, seeking to understand how the oceans, their biological communities, the solid earth and the atmosphere interact. As professionals with interdisciplinary training, marine scientists are needed to advise business, industry and governments on the potential impact of human activities and the wise use of marine resources. Marine scientists work for consulting firms; regulatory agencies; the mass media; business and industry; federal, state and local governments; academic laboratories; research and education organizations; and nonprofit environmental watchdog groups.

For more information about our marine science programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919-513-1093

### Plan Requirements

#### Marine Sciences (BS): Geology Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
<td>4</td>
</tr>
<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MEA 210</td>
<td>Oceanography Lab</td>
<td>1</td>
</tr>
</tbody>
</table>

### Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those
ME 250 Introduction to Coastal Environments 3
ME 459 Field Investigation of Coastal Processes 5
ME 460 Principles of Physical Oceanography 3
ME 462 Observational Methods and Data Analysis in Marine Physics 3
ME 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences 1

**Geology Concentration**

ME 101 Geology I: Physical 3
ME 110 Geology I Laboratory 1
ME 202 Geology II: Historical 3
ME 211 Geology II Laboratory 1
ME 251 Introduction to Coastal Environments Laboratory 1
ME 410 Introduction to Mineralogy and Petrology 4
ME 411 Marine Sediment Transport 3
ME 450 Introductory Sedimentology and Stratigraphy 4
ME 451 Structural Geology 4
ME 570 Geological Oceanography 3
ME 470 Introduction to Geophysics 3
or ME 471 Exploration and Engineering Geophysics

Advised Elective (p. 1378) 4
Select one of the following: 3

ME 449 Principles of Biological Oceanography
ME 467 Marine Meteorology
ME 473 Principles of Chemical Oceanography
ME 549 Principles of Biological Oceanography
ME 573 Principles of Chemical Oceanography

**Basic Math & Sciences**

CH 101 Chemistry - A Molecular Science 1 3
CH 102 General Chemistry Laboratory 1
CH 201 Chemistry - A Quantitative Science 1 3
CH 202 Quantitative Chemistry Laboratory 1
PY 205 Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory 1 4
PY 208 Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory 4
MA 141 Calculus I 1 4
MA 241 Calculus II 1 4
MA 242 Calculus III 4

Statistics Elective (p. 1379) 3
Select one of the following: 3

CSC 111 Introduction to Computing: Python
CSC 112 Introduction to Computing-FORTRAN
CSC 113 Introduction to Computing - MATLAB
CSC 116 Introduction to Computing - Java
GIS 280 Introduction to GIS
PY 251 Introduction to Scientific Computing

**College Requirements**

COS 100 Science of Change 2
ENG 101 Academic Writing and Research 1 4
Select one of the following: 3

ENG 331 Communication for Engineering and Technology
ENG 332 Communication for Business and Management
ENG 333 Communication for Science and Research

**GEP Courses**

GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 6
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

**Advised Elective**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>AEC 360</td>
<td>Ecology</td>
<td>4</td>
</tr>
<tr>
<td>AEC 380</td>
<td>Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>AEC 400</td>
<td>Applied Ecology</td>
<td>3</td>
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<tr>
<td>AEC 419</td>
<td>Freshwater Ecology</td>
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<tr>
<td>AEC 420</td>
<td>Introduction to Fisheries Science</td>
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<tr>
<td>AEC 423</td>
<td>Introduction to Fisheries Sciences Laboratory</td>
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<tr>
<td>AEC 424</td>
<td>Marine Fisheries Ecology</td>
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<tr>
<td>AEC 441</td>
<td>Biology of Fishes</td>
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<tr>
<td>AEC 442</td>
<td>Biology of Fishes Laboratory</td>
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<tr>
<td>AEC 460</td>
<td>Field Ecology and Methods</td>
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<tr>
<td>ANS 330</td>
<td>Laboratory Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ANS 415</td>
<td>Comparative Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>ANS 454/554</td>
<td>Lactation, Milk and Nutrition</td>
<td>3</td>
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<tr>
<td>ANT 371</td>
<td>Human Variation</td>
<td>3</td>
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<tr>
<td>BCH 351</td>
<td>General Biochemistry</td>
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<tr>
<td>BCH 452</td>
<td>Introductory Biochemistry Laboratory</td>
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<tr>
<td>BCH 453/553</td>
<td>Biochemistry of Gene Expression</td>
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<tr>
<td>BCH 454</td>
<td>Advanced Biochemistry Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BCH 455/555</td>
<td>Proteins and Molecular Mechanisms</td>
<td>3</td>
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<tr>
<td>BIO 315</td>
<td>General Parasitology</td>
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<tr>
<td>BIO 330</td>
<td>Evolutionary Biology</td>
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<tr>
<td>BIO 361</td>
<td>Developmental Biology</td>
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<td>BIO 370</td>
<td>Developmental Anatomy of the Vertebrates</td>
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<tr>
<td>BIO 405</td>
<td>Functional Histology</td>
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<tr>
<td>BIO 414</td>
<td>Cell Biology</td>
<td>3</td>
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<tr>
<td>BIO 424</td>
<td>Endocrinology</td>
<td>3</td>
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<tr>
<td>BIO 432</td>
<td>Evolutionary Medicine</td>
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<tr>
<td>BIO 434</td>
<td>Hormones and Behavior</td>
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<tr>
<td>BIO 440</td>
<td>The Human Animal: An Evolutionary Perspective</td>
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<tr>
<td>BIO 444</td>
<td>The Biology of Love and Sex</td>
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<tr>
<td>BIO 488/588</td>
<td>Neurobiology</td>
<td>3</td>
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<tr>
<td>BIT 410</td>
<td>Manipulation of Recombinant DNA</td>
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</table>
BIT 462  Gene Expression Analysis: Microarrays 2
BIT 462/562 Gene Expression Analysis: Microarrays 2
BIT 464  Protein Purification 2
BIT 465  Real-time PCR Techniques 2
BIT 466  Animal Cell Culture Techniques 2
BIT 467  PCR and DNA Fingerprinting 2
BIT 468  Genome Mapping 2
BIT 471  RNA Interference and Model Organisms 2
BIT 473  Protein Interactions 2
BIT 474/574  Plant Genetic Engineering 2
BIT 476  Applied Bioinformatics 2
BIT 481  Plant Tissue Culture and Transformation 2
BSC 478  Research Fundamentals in Biological Sciences 3
COM 436  Environmental Communication 3
CS 430  Advanced Agroecology 4
ENT 305  Introduction to Forensic Entomology 3
ENT 402  Forest Entomology 3
ENT 425  General Entomology 3
ES 300  Energy and Environment 3
ES 400  Analysis of Environmental Issues 3
FOR 402  Forest Entomology 3
FS 301  Introduction to Human Nutrition 3
FS 401/501  Advanced Nutrition and Metabolism 3
FS 405/505  Food Microbiology 3
FS 406/506  Food Microbiology Lab 1
FW 444/544  Mammalogy 3
FW 465/565  African Ecology and Conservation 4
GN 301  Genetics in Human Affairs 3
GN 311  Principles of Genetics 4
GN 312  Elementary Genetics Laboratory 1
GN 421/521  Molecular Genetics 3
GN 423  Population, Quantitative and Evolutionary Genetics 3
GN 425  Advanced Genetics Laboratory 2
GN 427  Introductory Bioinformatics 3
GN 434  Genes and Development 3
GN 441/541  Human and Biomedical Genetics 3
GN 451  Genome Science 3
GN 456  Epigenetics, Development, and Disease 3
GN 461  Advanced Bioinformatics 3
IDS 303  Humans and the Environment 3
MA 331  Differential Equations for the Life Sciences 3
MA 432  Mathematical Models in Life and Social Sciences 3
MB 351  General Microbiology 3
MB 352  General Microbiology Laboratory 1
MB 354  Inquiry-Guided Microbiology Lab 1
MB 405/505  Food Microbiology 3
MB 406/506  Food Microbiology Lab 1
MB 411  Medical Microbiology 3
MB 412  Medical Microbiology Laboratory 1
MB 414  Microbial Metabolic Regulation 3
MB 420/520  Fundamentals of Microbial Cell Biotransformations 2
MB 435/535  Bacterial Pathogenesis 3
MB 441  Immunology 3
MB 451  Microbial Diversity 3
MB 452  Microbial Diversity Lab 2
MB 455  Microbial Biotechnology 3
MB 461  Molecular Virology 3
MB 470  Emerging and Re-emerging Infectious Diseases 3
MEA 300  Environmental Geology 4
MEA 369  Life on Earth: Principles of Paleontology 3
NR 303  Humans and the Environment 3
NR 406  Conservation of Biological Diversity 3
NTR 301  Introduction to Human Nutrition 3
NTR 401/501  Advanced Nutrition and Metabolism 3
NTR 410/510  Maternal and Infant Nutrition 3
NTR 415/515  Comparative Nutrition 3
NTR 419  Human Nutrition and Chronic Disease 3
NTR 421/521  Life Cycle Nutrition 3
NTR 454  Lactation, Milk and Nutrition 3
PB 321  Introduction to Whole Plant Physiology 3
PB 360  Ecology 4
PB 403/503  Systematic Botany 4
PB 421  Plant Physiology 3
PB 480/580  Introduction to Plant Biotechnology 3
PB 481  Plant Tissue Culture and Transformation 2
PO 404/404  Avian Anatomy and Physiology 4
PO 415/515  Comparative Nutrition 3
PO 466/566  Animal Cell Culture Techniques 2
PP 315  Principles of Plant Pathology 4
SSC 332  Environmental Soil Microbiology 3
TOX 401/501  Principles of Toxicology 4
TOX 415  Environmental Toxicology and Chemistry 4
ZO 317  Primate Ecology and Evolution 3
ZO 333  Captive Animal Biology 3
ZO 350  Animal Phylogeny and Diversity 4
ZO 402  Invertebrate Biology 4
ZO 410  Introduction to Animal Behavior 3

Statistics Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BUS 350</td>
<td>Economics and Business Statistics</td>
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<tr>
<td>EC 351</td>
<td>Econometrics I</td>
<td>3</td>
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<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
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<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming - SAS</td>
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<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
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<tr>
<td>ST 311</td>
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<tr>
<td>ST 312</td>
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<td>3</td>
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</tbody>
</table>
Semester Sequence

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

This is a sample.

Course Title Hours
First Year Fall Semester
COS 100 Science of Change 2
MA 141 Calculus I (CP) 1 4
MEA 100 Earth System Science: Exploring the Connections 2 4
MEA 101 Geology I: Physical (CP) 2 3
MEA 110 Geology I Laboratory (CP) 2 1
Spring Semester
CH 101 Chemistry - A Molecular Science (CP) 1 3
CH 102 General Chemistry Laboratory 2 1
ENG 101 Academic Writing and Research 1 4
MA 241 Calculus II 1 4
MEA 202 Geology II: Historical 2 3
MEA 211 Geology II Laboratory 2 1

Second Year Fall Semester
CH 201 Chemistry - A Quantitative Science 1 3
CH 202 Quantitative Chemistry Laboratory 2 1
MA 242 Calculus III 3 4
MEA 200 Introduction to Oceanography (CP) 2 3
MEA 210 Oceanography Lab 2 1
MEA 410 Introduction to Mineralogy and Petrology 2 4
Spring Semester
MEA 250 Introduction to Coastal Environments 2 3
MEA 251 Introduction to Coastal Environments Laboratory 2 1
MEA 450 Introductory Sedimentology and Stratigraphy 2 4
PY 205 Physics for Engineers and Scientists I 1 3
PY 206 Physics for Engineers and Scientists I Laboratory 3 1

Third Year Fall Semester
MEA 460 Principles of Physical Oceanography 2 3
MEA 451 Structural Geology 2 4
GEP Health and Exercise Studies (p. 1422) 1
PY 208 Physics for Engineers and Scientists II 3 3
PY 209 Physics for Engineers and Scientists II Laboratory 3 1

Spring Semester
Advanced Writing Elective 3
Computer Science Option Elective 3
GEP Health and Exercise Studies (p. 1422) 1
MEA 462 Observational Methods and Data Analysis in Marine Physics 2 3
Statistical Science Option Elective 3 3
MEA 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences 1

Summer
MEA 459 Field Investigation of Coastal Processes 2 5

Fourth Year Fall Semester
GEP Social Sciences (p. 1430) 3

Hours
15
14
5
5
13
120

1 A grade of C- or higher is required.
2 No more than one D will be accepted in MEA core courses and concentration courses.
3 No more than one D will be accepted in other basic math or science courses.

Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

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MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

**Marine Sciences (BS): Meteorology Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/)) or contact:

Maggie Puyear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919-513-1093

**Plan Requirements**

**Marine Sciences (BS): Meteorology Concentration: 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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**Meteorology Concentration**

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**Meteorology Concentration Electives**

**Basic Math & Sciences**

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**College Requirements**

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**GEP Courses**

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### Semester Sequence

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### Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources
degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

## Marine Sciences (BS): Physics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/)! 

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

The degree of Bachelor of Science in Natural Resources is available with a concentration in Marine and Coastal Resources.

Marine scientists explore all aspects of the seas and coastal regions, seeking to understand how the oceans, their biological communities, the solid earth and the atmosphere interact. As professionals with interdisciplinary training, marine scientists are needed to advise business, industry and governments on the potential impact of human activities and the wise use of marine resources. Marine scientists work for consulting firms; regulatory agencies; the mass media; business and industry; federal, state and local governments; academic laboratories; research and education organizations; and nonprofit environmental watchdog groups.

For more information about our marine science programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu

### Plan Requirements

#### Marine Sciences (BS): Physics Concentration: 120 Total Units

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#### Physics Concentration

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#### Technical Elective

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#### College Requirements

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Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

This is a sample.

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**Total Hours** 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

**Semester Sequence**

**Third Year**

**Fall Semester**

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**Spring Semester**

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<td>MEA 467</td>
<td>Marine Meteorology ^2</td>
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**Fourth Year**

**Fall Semester**

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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>MEA 463</td>
<td>Fluid Physics ^2</td>
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**Spring Semester**

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1 A grade of C- or higher is required.
2 No more than one D will be accepted in MEA core courses and concentration courses.
3 No more than one D will be accepted in other basic math or science courses.

**Career Opportunities**

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving
as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

**Meteorology (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The degree of Bachelor of Science in Meteorology is offered in the Department of Marine, Earth and Atmospheric Sciences. A concentration in Marine Science may also be chosen.

Meteorologists study a diverse array of topics, including climate, air pollution, environmental impacts, weather analysis and forecasting, remote sensing, atmospheric physics and interactions between the atmosphere and other components of the earth system. Our undergraduate students pursue careers in air quality, weather forecasting, meteorological research, broadcast meteorology and positions with the armed forces. The proximity of the Environmental Protection Agency center in nearby Research Triangle Park, the NC Department of Air Quality, a strong working relation with the local media, and the presence of the State Climate Office and a NWS forecast office on the NC State campus all provide our students with a broad range of internship and employment possibilities.

For more information about our meteorology programs, visit our website ([https://meas.sciences.ncsu.edu/undergraduate/programs/atmospheric-science/](https://meas.sciences.ncsu.edu/undergraduate/programs/atmospheric-science/)) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs

Email: mwpollar@ncsu.edu
Phone: 919.513.1093

**Plan Requirements**

**Meteorology (BS): 120 Total Units**

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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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<td>MEA 312</td>
<td>Atmospheric Thermodynamics</td>
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<td>MEA 315</td>
<td>Mathematics Methods in Atmospheric Sciences</td>
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<td>MEA 321</td>
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<td>MEA 412</td>
<td>Atmospheric Physics</td>
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<td>Atmospheric Dynamics I</td>
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MEC Restricted Electives

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<td>MEA 473</td>
<td>Principles of Chemical Oceanography</td>
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<td>MEA 476</td>
<td>Worldwide River and Delta Systems: Their Evolution and Human Impacts</td>
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<td>MEA 479</td>
<td>Air Quality</td>
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<td>MEA 481</td>
<td>Geomorphology: Earth's Dynamic Surface</td>
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<td>MEA 485</td>
<td>Introduction to Hydrogeology</td>
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<td>MEA 488</td>
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Semester Sequence

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Approved Electives

Free Electives

Free Electives (12 Hr S/U Lmt)

Total Hours 120

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.
### Second Year

#### Fall Semester

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#### Spring Semester

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### Third Year

#### Fall Semester

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#### Spring Semester

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<td>Approved Elective 2</td>
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<tr>
<td>MEA 412</td>
<td>Atmospheric Physics 2</td>
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<td>Atmospheric Dynamics II 1</td>
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<td>MEA 495</td>
<td>Junior Seminar in the Marine, Earth, and Atmospheric Sciences</td>
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### Fourth Year

#### Fall Semester

<table>
<thead>
<tr>
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<tr>
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<tr>
<td>Restricted Elective 2</td>
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</table>

### Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.
MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

**Meteorology (BS): Marine Sciences Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The degree of Bachelor of Science in Meteorology is offered in the Department of Marine, Earth and Atmospheric Sciences. A concentration in Marine Science may also be chosen.

Meteorologists study a diverse array of topics, including climate, air pollution, environmental impacts, weather analysis and forecasting, remote sensing, atmospheric physics and interactions between the atmosphere and other components of the earth system. Our undergraduate students pursue careers in air quality, weather forecasting, meteorological research, broadcast meteorology and undergraduate students pursue careers in air quality, weather forecasting, meteorological research, broadcast meteorology and positions with the armed forces. The proximity of the Environmental Protection Agency center in nearby Research Triangle Park, the NC Department of Air Quality, a strong working relation with the local media, and the presence of the State Climate Office and a NWS forecast office on the NC State campus all provide our students with a broad range of internship and employment possibilities.

For more information about our meteorology programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/atmospheric-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919.513.1093

**Plan Requirements**

**Meteorology (BS): Marine Sciences Concentration:** 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
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<tr>
<td>MA 101</td>
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</tr>
<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
<td>4</td>
</tr>
<tr>
<td>MEA 210</td>
<td>Introduction to Oceanography</td>
<td>1</td>
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<tr>
<td>MEA 455</td>
<td>Micrometeorology</td>
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<tr>
<td>MEA 460</td>
<td>Principles of Physical Oceanography</td>
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</tr>
<tr>
<td>MEA 462</td>
<td>Observational Methods and Data Analysis in Marine Physics</td>
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<td>MEA 467</td>
<td>Marine Meteorology</td>
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**Math / Statistics** Select one of the following: 3

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<tr>
<td>CSC 113</td>
<td>Introduction to Computing - MATLAB</td>
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<tr>
<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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</tr>
<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
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**Chemistry / Physics**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science 1</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
<td>3</td>
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<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I Laboratoy 1</td>
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<td>PY 208</td>
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**Approved Electives**  5

**GEP Courses**

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<tr>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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<tr>
<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
<td></td>
<td></td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

<table>
<thead>
<tr>
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<th>Hours</th>
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<tbody>
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<td></td>
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</tbody>
</table>
Free Electives (12 Hr S/U Lmt) ²

Total Hours 120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Semester Sequence
Critical Path Courses - Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

This is a sample.

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<thead>
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<tr>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science (CP) ¹</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory³</td>
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<td>MA 141</td>
<td>Calculus I (CP) ¹</td>
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<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections (CP)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>CH 201</td>
<td>Chemistry - A Quantitative Science ³</td>
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<td>CH 202</td>
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<td>ENG 101</td>
<td>Academic Writing and Research (CP) ¹</td>
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<td>Calculus II (CP) ¹</td>
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<td>Introduction to Atmospheric Sciences (CP) ²</td>
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<td>Fundamentals of Air Quality and Climate Change ²</td>
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<td>Computing Option Elective ³</td>
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<td>Atmospheric Thermodynamics ²</td>
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<td>MEA 315</td>
<td>Mathematics Methods in Atmospheric Sciences ²</td>
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<td>Physics for Engineers and Scientists II ³</td>
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<td>Oceanography Lab ²</td>
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<tr>
<td>MEA 421</td>
<td>Atmospheric Dynamics I ¹</td>
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<td>Geophysical Science Elective ²,³</td>
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<td>ST 370</td>
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<td>MEA 412</td>
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<td>Atmospheric Dynamics II ¹</td>
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<td>MEA 460</td>
<td>Principles of Physical Oceanography ²</td>
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<td>MEA 455</td>
<td>Micrometeorology ²</td>
<td>3</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td>MEA 443</td>
<td>Synoptic Weather Analysis and Forecasting ²</td>
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<tr>
<td>Approved Elective ²</td>
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<tr>
<td>MEA 462</td>
<td>Observational Methods and Data Analysis in Marine Physics ²</td>
<td>3</td>
</tr>
<tr>
<td>MEA 467</td>
<td>Marine Meteorology ²</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
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</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
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<td><strong>Total Hours</strong></td>
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<td>120</td>
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</tbody>
</table>

¹ A grade of C- or higher is required.
² No more than one D will be accepted in MEA core courses and concentration courses.
³ No more than one D will be accepted in other basic math or science courses.

Career Opportunities
MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources
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MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

**Meteorology (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

The Department of Marine, Earth and Atmospheric Sciences offers a minor in Meteorology to majors in any field except meteorology. This program provides a means of recognition for students in related fields, especially Science and Engineering, who are interested in application of physical principles to the atmospheric environment.

**Admissions and Certification of Minor**

Students who plan to minor in Meteorology should contact the person listed below. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

**Contact Person**

Dr. Matt Parker  
Department of Marine, Earth and Atmospheric Sciences  
5149 Jordan Hall  
919.513.4367  
mdparker@ncsu.edu

**SIS Code: 17MYM**

**Plan Requirements**

- Grades of ‘C’ or better in MA 141 Calculus I and in PY 205 Physics for Engineers and Scientists I prior to admission to the minor.
- Successful completion of the program requires a ‘C’ or better in at least 15 credit hours to be taken as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MEA 215</td>
<td>Introduction to Atmospheric Sciences</td>
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</tr>
<tr>
<td>MEA 312</td>
<td>Atmospheric Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>MEA 421</td>
<td>Atmospheric Dynamics I</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Courses**

Select 4 credit hours from among MEA courses in Atmospheric Sciences at the 300-level or higher

| Total Hours | 15 |

**Natural Resources (BS): Marine and Coastal Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website [here](https://apps.oirp.ncsu.edu/pgas/)

The department offers curricula in each of the areas of marine, earth and atmospheric sciences. Each prepares students for employment at graduation or for further professional training. There is one Bachelor of Science (B.S.) curricula in atmospheric sciences: Meteorology. Students in that major can choose to concentrate in Marine Meteorology. Earth sciences house one curricula: the B.S. in Geology. In the marine sciences, students can choose between two degree programs: the B.S. in Marine Science or the B.S. in Natural Resources. Students in the marine science major choose one of five concentrations:

1. Biological Oceanography  
2. Chemistry  
3. Geology  
4. Meteorology  
5. Physics

Students in the B.S. in Natural Resources concentrate in Marine and Coastal Resources.

**Plan Requirements**

**Natural Resources (BS): Marine and Coastal Concentration:** 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
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<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
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</tr>
<tr>
<td>MEA 101</td>
<td>Geology I: Physical</td>
<td>3</td>
</tr>
<tr>
<td>MEA 110</td>
<td>Geology I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>MEA 130</td>
<td>Introduction to Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>MEA 135</td>
<td>Introduction to Weather and Climate Laboratory</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MEA 210</td>
<td>Oceanography Lab</td>
<td>1</td>
</tr>
<tr>
<td>MEA 220</td>
<td>Marine Biology</td>
<td>3</td>
</tr>
<tr>
<td>MEA 250</td>
<td>Introduction to Coastal Environments</td>
<td>3</td>
</tr>
</tbody>
</table>
### Math/Statistics/Orientation
- MA 131 Calculus for Life and Management Sciences A $^2$ 3
- MA 231 Calculus for Life and Management Sciences B 3
- ST 311 Introduction to Statistics 3
- COS 100 Science of Change 2

### Chemistry/Physics/Natural Sciences
- BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
- CH 101 Chemistry - A Molecular Science 3
- CH 102 General Chemistry Laboratory 1
- ZO 350 Animal Phylogeny and Diversity 4
- CH 201 Chemistry - A Quantitative Science 3
- CH 202 Quantitative Chemistry Laboratory 1
- MEA 100 Introduction to Fisheries Science 3
- or PB 360 Ecology 4

#### Select one of the following:

### Select one of the following:
- MEA 251 Introduction to Coastal Environments Laboratory 1
- MEA 459 Field Investigation of Coastal Processes 5
- MEA 469 Ecology of coastal Resources 3
- GIS 280 Introduction to GIS 3
- Advised Elective $^1$ 3

#### Select one of the following:
- MEA 323 Geochemistry of Natural Waters
- MEA 473 Principles of Chemical Oceanography
- MEA 573 Principles of Chemical Oceanography
- NR 400 Natural Resource Management 4

### Math/Statistics/Orientation
- MA 131 Calculus for Life and Management Sciences A $^2$ 3
- MA 231 Calculus for Life and Management Sciences B 3
- ST 311 Introduction to Statistics 3
- COS 100 Science of Change 2

### Science

#### Select one of the following:
- MEA 200 Introduction to Oceanography (CP) $^2$ 3
- PS 336 Global Environmental Politics 3

### Health & Exercise Science
- GEP Health and Exercise Studies (p. 1422) 2

### GEP Courses
- GEP Humanities (p. 1423) 6
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)

#### Total Hours 120

$^1$ Students should consult their academic advisors to determine which courses fill this requirement.

$^2$ A grade of C- or higher is required.

### Semester Sequence

Critical Path Courses - Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A (CP) $^1$</td>
<td>3</td>
</tr>
<tr>
<td>MA 100</td>
<td>Earth System Science: Exploring the Connections $^2$</td>
<td>4</td>
</tr>
<tr>
<td>MA 101</td>
<td>Geology I: Physical (CP) $^2$</td>
<td>3</td>
</tr>
<tr>
<td>MA 110</td>
<td>Geology I Laboratory (CP) $^2$</td>
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</tr>
<tr>
<td>COS 100</td>
<td>Science of Change</td>
<td>2</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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#### Hours 14

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<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (CP) $^1$</td>
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<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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#### Total Hours 14

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<td>Introduction to Weather and Climate (CP) $^2$</td>
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<tr>
<td>MEA 135</td>
<td>Introduction to Weather and Climate Laboratory $^2$</td>
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#### Hours 15

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<td>CH 102</td>
<td>General Chemistry Laboratory (CP) $^1$</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography (CP) $^2$</td>
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#### Total Hours 15

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<tr>
<td>MEA 251</td>
<td>Introduction to Coastal Environments Laboratory 1</td>
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<tr>
<td>MEA 459</td>
<td>Field Investigation of Coastal Processes 5</td>
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<tr>
<td>MEA 469</td>
<td>Ecology of coastal Resources 3</td>
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</tr>
<tr>
<td>GIS 280</td>
<td>Introduction to GIS 3</td>
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<tr>
<td>Advised Elective $^1$ 3</td>
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#### Select one of the following:
- MEA 323 Geochemistry of Natural Waters
- MEA 473 Principles of Chemical Oceanography
- MEA 573 Principles of Chemical Oceanography
- NR 400 Natural Resource Management 4

### Math/Statistics/Orientation
- MA 131 Calculus for Life and Management Sciences A $^2$ 3
- MA 231 Calculus for Life and Management Sciences B 3
- ST 311 Introduction to Statistics 3
- COS 100 Science of Change 2

### Science

#### Select one of the following:
- MEA 200 Introduction to Oceanography (CP) $^2$ 3
- PS 336 Global Environmental Politics 3

### Health & Exercise Science
- GEP Health and Exercise Studies (p. 1422) 2

### GEP Courses
- GEP Humanities (p. 1423) 6
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)

#### Total Hours 120

$^1$ Students should consult their academic advisors to determine which courses fill this requirement.

$^2$ A grade of C- or higher is required.
Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with aNatural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.

Department of Mathematics

For more information about this department, including contact information, visit the department (https://math.sciences.ncsu.edu).

In the NC State Department of Mathematics, excellent teaching and a supportive community combine with cutting-edge research across a broad spectrum of mathematics and its applications. Our department is committed to mentoring and to creating a supportive environment that helps all students succeed in math.

The NC State math faculty’s mission is to help students thrive. The quality of our teaching has been recognized by the university with the NC State University Provost Departmental Award for Teaching and Learning Excellence as well as the induction of 12 of our faculty into its Academy of Outstanding Teachers, and by prestigious awards from the American Mathematical Society (AMS). The department’s size — more than 60
faculty — means that each student has access to personal attention from faculty and to an unusual range of opportunities.

Research topics in our department range from fundamental questions in algebra and combinatorics to mathematical modeling of the eye and circulatory system. Ours is one of the leading U.S. math departments in offering opportunities for graduate students to work on practical problems with industrial collaborators. And our department is one of the most successful in the nation in securing research grants, with annual funding of more than $5 million, much of which supports graduate and undergraduate student researchers.

Department Highlights:

• Our students have won prestigious Goldwater, Churchill and Fulbright awards and have gone on to notable careers in business, government, research, and teaching.
• In 2011, the AMS honored our commitment to groups that are traditionally underrepresented in math with its 2011 Award for Mathematics Programs That Make a Difference.
• Our department awarded more than 12% of all doctoral degrees earned by African Americans in the nation’s top 100 mathematics departments between 2000 and 2010. And 45 percent of our department-supported Ph.D. students are female.
• Student organizations and seminars in the department are active. These opportunities include the Society for Undergraduate Mathematics, student chapters of the Society for Industrial and Applied Mathematics and the Association for Women in Mathematics, and graduate student groups in areas such as algebra and applied mathematics sponsor talks, panel discussions, and get-togethers.
• We reach into the community, cultivating the next generation of mathematicians through such programs as the Association for Women in Mathematics student chapter’s annual Sonia Kovalevsky Day for middle-school girls, public events like the annual Kwangil Koh Lecture on Mathematics in Our Time (a talk by a prominent mathematician), and participation in BugFest at the NC Museum of Natural Sciences.

For more information about our department, including contact information, visit our website (https://math.sciences.ncsu.edu/).
S.R. Lubkin
R.H. Martin
N. Medhin
K.C. Misra
M.S. Olufsen
N. Reading
J. Rodriguez
M. Shearer
J.W. Silverstein
R.C. Smith
E.L. Stitzinger
S. Sullivant
A. Szanto
T. Pang
H.T. Tran
S.V. Tsynkov
D. Zenkov

Adjunct professors
K. Berenhaut
J. Betts
S. Bhattacharya
W. Chen
P. Drineas
H. El-Marsri
J. Harlim
J. Hauenstein
M. Hoefer
D. Knoll
E. Mann-Peck
P. Schlosser

Emeriti
J.W. Bishir
R.E. Chandler
H.J. Charlton
E.N. Chukwu
L.O. Chung
H.L. Davison
J.C. Dunn
G.D. Faulkner
J.E. Franke
R.O. Fulp
D.E. Garoutte
J.R. Griggs
R.E. Hartwig
L. Helminck
J.R. Kolb
T. Lada
J.A. Marlin
M. McCollum
C.D. Meyer
L.B. Page
C.V. Pao
S.O. Paur
E.L. Peterson
M.S. Putcha
N.J. Rose
R. Savage
S. Schecter
J.S. Scroggs
J.F. Selgrade
C.E. Siewert
R. Silber
M. Singer
R. E. White

Associate professors
L. Bociu
M. Kang
L.K. Norris
Assisted Professor
A. Alexanderian
M.M. Farazmand
K.B. Flores
M. Gilman
T. Lidman
R.I. Liu
M. Medvinsky
R. Murray
T.K. Nguyen
D. Papp
A.K. Saibaba
R. Sazdanovic
C.L. Vinzant
Y. Kitapbayez

Teaching Professor
A.N. Duca
M.A. Fenn

Teaching Assistant Professor
B. Burns-Williams
B. Maultsby

Lecturers
E. Brown
E.J. Dempster
L.A. Kurtz

Plans
- Applied Mathematics (BS) (p. 1395)
- Applied Mathematics (BS): Financial Mathematics Concentration (p. 1398)
- Mathematics (BS) (p. 1400)
- Mathematics (Minor) (p. 1403)

Applied Mathematics (BS)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The bachelor of science in applied mathematics shares many basic features with the B.S. program in mathematics. The primary difference is that this program includes a strong interdisciplinary concentration in a related field. The applied concentration, which must be approved by a student’s adviser, should be structured to promote specific career or educational objectives.

Undergraduate research opportunities include:
- Society for Industrial and Applied Mathematics
- NC State Research Experiences for Undergraduates in Mathematics
- The Mathematical Biology Research Training Group
- Industrial Mathematical & Statistical Modeling (IMSM) Program by SAMSI
- Study abroad opportunities in applied mathematics
- SUM Club

For more information about this program visit: https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/applied-mathematics/

Department of Mathematics
North Carolina State University
Campus Box 8205
Raleigh, NC 27695

Dr. Alina Duca
Teaching Professor and Director of Undergraduate Programs in Mathematics
SAS Hall 2108B
Phone: 919.515.1875
Email: anduca@ncsu.edu

Plan Requirements
Applied Mathematics (BS): 120 Total Units

<table>
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<tr>
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<tr>
<td>COS 100</td>
<td>Science of Change</td>
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<tr>
<td>or E 115</td>
<td>Introduction to Computing Environments</td>
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Advanced Writing
Select one of the following: 3
- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research

ENG 101 Academic Writing and Research 1 4

Basic Mathematics
- MA 141 Calculus I 1 4
- MA 241 Calculus II 1 4
- MA 242 Calculus III 1 4
- MA 225 Foundations of Advanced Mathematics 1 3
- MA 341 Applied Differential Equations I 1 3

Basic Science
- CH 101 Chemistry - A Molecular Science 1 3
- CH 102 General Chemistry Laboratory 1 1

Select one of the following: 1 4
- PY 201 University Physics I
- PY 205 Physics for Engineers and Scientists I
& PY 206 and Physics for Engineers and Scientists I Laboratory
Basic Science Electives

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<tr>
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<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science &amp; Quantitative Chemistry Laboratory</td>
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<td>PY 202</td>
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<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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Statistics Electives

Statistics Electives (p. 1396) 6

Select one of the following: 1

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<td>CSC 112</td>
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<tr>
<td>CSC 113</td>
<td>Introduction to Computing - MATLAB</td>
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<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
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<td>MA 116</td>
<td>Introduction to Scientific Programming (Math)</td>
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<td>Introduction to Scientific Computing</td>
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Advanced Mathematics

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<tr>
<td>MA 402</td>
<td>Mathematics of Scientific Computing 1</td>
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<tr>
<td>MA 405</td>
<td>Introduction to Linear Algebra 1</td>
<td>3</td>
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<td>MA 407</td>
<td>Introduction to Modern Algebra for Mathematics Majors 1</td>
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<tr>
<td>MA 425</td>
<td>Mathematical Analysis I 1</td>
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Major Electives

Applied Electives 2 | 15

GEP Courses

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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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Free Electives

Free Electives (12 Hr S/U Lmt) 2 | 12

Total Hours 120-121

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

Statistics Electives

Statistics Elective Sequence 1

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<td>Introduction to Statistical Inference and Regression</td>
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Statistics Elective Sequence 2

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<td>ST 421</td>
<td>Introduction to Mathematical Statistics I</td>
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<td>&amp; ST 422</td>
<td>Introduction to Mathematical Statistics II</td>
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Statistics Elective Sequence 3

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<tr>
<td>MA 421</td>
<td>Introduction to Probability</td>
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<tr>
<td>&amp; ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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Statistics Elective Sequence 4

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<td>Probability and Statistics for Engineers</td>
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Statistics Elective Sequence 5

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<td>Introduction to Mathematical Statistics II</td>
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Methods of Applied Math Electives

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<tbody>
<tr>
<td>BMA 573</td>
<td>Mathematical Modeling of Physical and Biological Processes I</td>
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<td>Mathematical Modeling of Physical and Biological Processes II</td>
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<tr>
<td>E 531</td>
<td>Dynamic Systems and Multivariable Control I</td>
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<tr>
<td>MA 450</td>
<td>Methods of Applied Mathematics I</td>
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<td>MA 451</td>
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Math Electives

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<tr>
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<td>Symbolic Logic</td>
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<tr>
<td>MA 325</td>
<td>Introduction to Applied Mathematics</td>
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<tr>
<td>MA 335</td>
<td>Symbolic Logic</td>
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<tr>
<td>MA 351</td>
<td>Introduction to Discrete Mathematical Models</td>
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<td>Mathematical Modeling of Physical and Biological Processes I</td>
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<tr>
<td>BMA 574</td>
<td>Mathematical Modeling of Physical and Biological Processes II</td>
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<td>CSC 416</td>
<td>Introduction to Combinatorics</td>
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<td>CSC 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>CSC 428</td>
<td>Introduction to Numerical Analysis II</td>
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<td>CSC 565</td>
<td>Graph Theory</td>
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<td>CSC 580</td>
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<td>E 531</td>
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<td>ECG 528</td>
<td>Options and Derivatives Pricing</td>
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<tr>
<td>Course Code</td>
<td>Title</td>
<td>Hours</td>
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<tr>
<td>MA 555</td>
<td>Introduction to Manifold Theory</td>
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<td>MA 561</td>
<td>Set Theory and Foundations Of Mathematics</td>
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<td>MA 565</td>
<td>Graph Theory</td>
<td>3</td>
</tr>
<tr>
<td>MA 573</td>
<td>Mathematical Modeling of Physical and Biological Processes I</td>
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<tr>
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<td>Mathematical Modeling of Physical and Biological Processes II</td>
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<tr>
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<td>MA 583</td>
<td>Introduction to Parallel Computing</td>
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<td>MA 584</td>
<td>Numerical Solution of Partial Differential Equations--Finite Difference Methods</td>
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<td>MA 591</td>
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<tr>
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<td>Introduction to Mathematical Programming</td>
<td>3</td>
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<tr>
<td>OR 505</td>
<td>Linear Programming</td>
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<tr>
<td>OR 531</td>
<td>Dynamic Programming</td>
<td>3</td>
</tr>
<tr>
<td>OR 565</td>
<td>Graph Theory</td>
<td>3</td>
</tr>
<tr>
<td>ST 412</td>
<td>Long-Term Actuarial Models</td>
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<td>ST 413</td>
<td>Short-Term Actuarial Models</td>
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<tr>
<td>ST 546</td>
<td>Probability and Stochastic Processes I</td>
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## Semester Sequence

This is a sample.

### Course Title

<table>
<thead>
<tr>
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<th>Title</th>
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Applied Mathematics (BS): Financial Mathematics Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

A refinement of the applied mathematics degree. This program prepares students for careers in financial mathematics, actuarial science and portfolio management.

For more information about this program visit: https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/applied-mathematics-financial-concentration/

Department of Mathematics
North Carolina State University
Campus Box 8205
Raleigh, NC 27695

Dr. Alina Duca
Teaching Professor and Director of Undergraduate Programs in Mathematics
SAS Hall 2108B
Phone: 919.515.1875
Email: anduca@ncsu.edu

Plan Requirements

Applied Mathematics (BS): Financial Mathematics Concentration: 120 Total Units

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Basic Mathematics

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Basic Science

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1 A grade of C- or higher is required.
2 At most one grade below a C- is permitted in Advanced Mathematics courses and at most one grade below a C- is permitted in courses satisfying the Basic Science requirements. No grades below a C- are permitted in Basic Mathematics courses.
Basic Science Electives

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<td>Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory</td>
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<td>&amp; CH 202</td>
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Statistics Electives (p. 1399)<sup>1</sup> 6
Select one of the following:<sup>1</sup> 3

- CSC 111 Introduction to Computing: Python
- CSC 112 Introduction to Computing-FORTRAN
- CSC 113 Introduction to Computing - MATLAB
- CSC 116 Introduction to Computing - Java
- MA 116 Introduction to Scientific Programming (Math)
- ST 114 Statistical Programming

**Advanced Mathematics**

- MA 401 Applied Differential Equations II<sup>1</sup> 3
- MA 405 Introduction to Linear Algebra<sup>1</sup> 3
- MA 407 Introduction to Modern Algebra for Mathematics Majors<sup>1</sup> 3
- MA 425 Mathematical Analysis I<sup>1</sup> 3

**Financial Math Electives** (p. 1399)<sup>1</sup> 6
- MA 421 Introduction to Probability 3
- Math Electives (p. 1399)<sup>1</sup> 6

**Major Paper Co-Requirement (verify requirement) (p. 1399)<sup>2</sup>** 3

**Advised Electives**

**Advised Electives**<sup>2</sup> 12

**Concentration Requirements**

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<td>Fundamentals of Economics</td>
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<td>EC 301</td>
<td>Intermediate Microeconomics</td>
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<td>EC 302</td>
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**GEP Courses**

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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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**Free Electives**

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<td>Free Electives (12 Hr S/U Lmt)&lt;sup&gt;2&lt;/sup&gt;</td>
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Total Hours 120

<sup>1</sup> A grade of C- or higher is required.

<sup>2</sup> Students should consult their academic advisors to determine which courses fill this requirement.

### Basic Science Electives

**Code**

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**Statistics Electives**

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**Statistics Sequence 3**

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**Financial Math Electives**

**Code**

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<td>FIM 549</td>
<td>Financial Risk Analysis</td>
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<td>Long-Term Actuarial Models</td>
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<td>Uncertainty Quantification for Physical and Biological Models</td>
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**Math Electives**

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**Major Paper Co-Requirement**

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### Mathematics (BS)

The bachelor of science in mathematics is our most flexible curriculum. The mathematics and science requirements in the program along with the General Education Program in the humanities and social sciences ensure that graduates receive a broad education with a technical slant. At the same time, the large number of elective choices within the program makes it an appropriate curriculum for students with a variety of interests and career goals.

Undergraduate research opportunities include:

- Budapest Semester in Mathematics
- Society for Undergraduate Mathematics
- NC State Research Experiences for Undergraduates in Mathematics
- The Mathematical Biology Research Training Group
- SUM Club

### Semester Sequence

This is a sample.

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</table>

¹ A grade of C- or higher is required.
² At most one grade of D is permitted CH 101 Chemistry - A Molecular Science, CH 102 General Chemistry Laboratory, to PY 205 Physics for Engineers and Scientists I/PY 206 Physics for Engineers and Scientists I Laboratory, the course(s) satisfying basic science elective and the two courses satisfying the statistics requirement.

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!
Plan Requirements

Mathematics (BS): 120 Total Units

<table>
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<td>or E 115</td>
<td>Introduction to Computing Environments</td>
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**Advanced Writing**

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**Basic Mathematics**

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**Basic Sciences**

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Basic Science Elective (p. 1401)

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<td>CSC 113</td>
<td>Introduction to Computing - MATLAB</td>
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<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
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Math Electives (p. 1402)

Major Paper Co-Requirement (Verify Requirement) (p. 1402)

In-Dept Co-Requirement (Verify Requirement) 2

**Science/Engineering/Business/Statistics Electives**

The preferred statistics sequence is ST 380 with MA 421. Alternatives include ST 370 with MA 421, or STS 371 with STS 372, or ST 421 with ST 422, or MA 421 with ST 422. If ST 370 or ST 380 is taken, MA 421 will be an advanced mathematics elective. If ST 371/372 is taken, ST 371 will be a Science/Engineering/Bus/Stat. elective. If MA 421 is taken as any advanced math elective then ST 422 will satisfy the ST requirement.

The preferred statistics sequence is ST 380 with MA 421. Alternatives include ST 370 with MA 421, or STS 371 with STS 372, or ST 421 with ST 422, or MA 421 with ST 422. If ST 370 or ST 380 is taken, MA 421 will be an advanced mathematics elective. If ST 371/372 is taken, ST 371 will be a Science/Engineering/Bus/Stat. elective. If MA 421 is taken as any advanced math elective then ST 422 will satisfy the ST requirement.

Science/Engineering/Business/Statistics courses must be selected from the following: BIO/ZO 160, BIO 18*, BIO 200>, CE ***, CH ***, ECE ***, ECI 305, ECI 416, EMS 470, EMS 480, GN ***, ISE ***, MAE ***, MB ***, MEA ***, NE ***, NTR ***, OR ***, PY 300>, PB ***, ZO ***, ACC ***, EC ***, CSC ***, ST 300> (except not the courses CH 100, CH 111, CSC 100, CSC 200, ST 311, or ST 361) Note: Business courses are restricted to BUS majors/minor.

**GEP Courses**

GEP Humanities (p. 1423)

GEP Social Sciences (p. 1430)

GEP Health and Exercise Studies (p. 1422)

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)

GEP Interdisciplinary Perspectives (p. 1426)

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

Foreign Language Proficiency (p. 1417) (verify requirement)

**Free Electives**

Free Electives (12 Hr S/U Lmt)

Total Hours

1 A grade of C- or higher is required.

2 Students should consult their academic advisors to determine which courses fill this requirement.

**Basic Science Electives**

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<td>Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory</td>
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Math Electives

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<td>Symbolic Logic</td>
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<td>Applied Differential Equations I</td>
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<td>Introduction to Discrete Mathematical Models</td>
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<td>CSC 427</td>
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<td>OR 505</td>
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<td>OR 531</td>
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Major Paper Co-Requirement (Verify Requirement)

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### Semester Sequence

This is a sample.

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**Third Year**

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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>MA 425</td>
<td>Mathematical Analysis I $^2$</td>
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</tr>
<tr>
<td>MA 325</td>
<td>Introduction to Applied Mathematics $^2$</td>
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<td>Science/Engineering/ Business/Statistics Elective</td>
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<td>GEP Requirement (p. 1417)</td>
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**Fourth Year**

<table>
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<tr>
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<td><strong>Select one of the following:</strong> $^2$</td>
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<tr>
<td>MA 426</td>
<td>Mathematical Analysis II</td>
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<td>Advanced Mathematics Elective $^2$</td>
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<tr>
<td>Science/Engineering/ Business/Statistics Elective</td>
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<tr>
<td>Free Electives</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<tr>
<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<tr>
<td>Advanced Mathematics Elective1 $^2$</td>
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<td>Science/Engineering/ Business/Statistics Elective</td>
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<td>Free Electives</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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</table>

1. A grade of C- or higher is required.
2. At most one grade below a C- is permitted in Advanced Mathematics courses. No grades below a C- are permitted in Basic Mathematics courses.
3. At least one grade below a C- is permitted in CH 101 Chemistry - A Molecular Science, CH 102 General Chemistry Laboratory, the two courses satisfying the physics requirement, and the course satisfying the statistics requirement.

### Mathematics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Mathematics offers a minor in Mathematics to majors in any field except Mathematics. The minor program consists of the completion with a grade of C- or better of any fifteen hours selected from...
the Mathematics Department’s list of approved courses. The list includes all MA courses at the 300, 400, and 500 levels; however, MA 225 is acceptable but not required.

For more information about this program visit: https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/mathematics-minor/

Department of Mathematics
North Carolina State University
Campus Box 8205
Raleigh, NC 27695

Dr. Brenda Williams
Teaching Assistant Professor
SAS Hall 3242
Phone: 919.513.2214
Email: bdburns@ncsu.edu

Plan Requirements
Prerequisite to the Mathematics minor: Students must complete one (1) of the two (2) basic calculus sequences, as shown below, with a grade of ‘C’ or better in each course.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Sequence 1</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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</tr>
<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>Sequence 2</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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</table>

The minor program consists of the successful completion with a grade of ‘C-‘ or better in all 15 hours selected from the Mathematics Department’s list of approved courses. The list includes MA 225 Foundations of Advanced Mathematics as well as any MA courses at the 300, 400 and 500 levels.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>Required Courses</td>
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<td>Elective Courses</td>
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<tr>
<td>Select 15 credits of the following: $^2$</td>
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<tr>
<td>MA 225</td>
<td>Foundations of Advanced Mathematics</td>
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<tr>
<td>Any MA course at the 300, 400 and 500 levels</td>
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<tr>
<td>Total Hours</td>
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<td></td>
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</tbody>
</table>

$^1$ MA 225 Foundations of Advanced Mathematics is not required for the Minor.

$^2$ Students who earn credit for equivalent classes at the 300-level at other institutions may use the transfer credits to satisfy the 15-hours of math credits.

Department of Physics
North Carolina State University
Campus Box 8205
Raleigh, NC 27695

Dr. Paul Huffman
Professor and Department Head
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Raleigh, NC 27695-8202
Phone: 919.515.2521
Email: physicsdepartment@ncsu.edu

Faculty
Department Head
P. Huffman

Assistant Head
K. Warren
Named, Distinguished Professors
H. Ade, Goodnight Innovation Distinguished Professor
D.E. Aspnes, Distinguished University Professor
J. Bernholc, Drexel Professor
J. Krim, Distinguished University Professor
G. McLaughlin, Distinguished University Professors
L. Mitas, Distinguished University Professor
T. Schaefer, Wesley O. Doggett Distinguished Professor
J. E. Thomas, John S. Risley Distinguished Professor

Director of Undergraduate Programs
J.D. Brown

Director of Graduate Programs
D. E. Aspnes

Alumni Distinguished Undergraduate Professors
R.J. Beichner
J.M. Blondin
L.I. Clarke
S.P. Reynolds

Professors
H. Ade
D.E. Aspnes
R.J. Beichner
J. Bernholc
J.M. Blondin
J.D. Brown
L. Clarke
K. Daniels
W. Ditto
D. Dougherty
R. Golub
K. Gundogdu
H. Hallen
P.R. Huffman
C.R. Ji
J. Krim
G. McLaughlin
L. Mitas
S.P. Reynolds
R. Riehn
C.M. Roland
M.C. Sagui
T. Schaefer
J.E. Thomas
M. Unsal
K. Weninger
A.R. Young

Professor Emeriti
R. Chabay
K.T. Chung
J.W. Cook
S. Cotanch
W.R. Davis
D. Ellison
R.E. Fornes
C. R. Gould
D. Haase
G.L. Hall
C.E. Johnson
K.L. Johnston
G.H. Katzin
F. Lado, Jr.
G.E. Mitchell
M.A. Paesler
J.Y. Park
G. Parker
R.R. Patty
B. Sherwood
Physics provides the conceptual foundation for science and engineering. A physics degree is a mark of major intellectual achievement and a gateway to a thousand careers. The physics major at NC State combines the resources of a major research university with the ambience of a small college. Our ratio of physics majors to faculty of about 3 to 1 allows us to offer small classes, personal attention, and unparalleled opportunities for involvement in research.

Most physics majors are preparing for employment in a government or industrial laboratory, or with a company that provides STEM (science, technology, engineering and math) products or services. Other physics majors are preparing for graduate studies in physics or related sciences, or enrollment in professional schools (such as medicine or law). Some physics majors are preparing for a career as a high school teacher. The Bachelor of Arts (B.A.) curriculum has a flexible course of study if you desire an interdisciplinary program with an emphasis on physics.

For more information about this program, visit our website (https://physics.sciences.ncsu.edu/undergraduate/).

Department of Physics
NC State University
Campus Box 8202
Raleigh, NC 27695-8202

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Riddick Hall 319F, Box 8202
Raleigh, NC 27695-8202
Phone: 919.515.7471
Email: jbrown@ncsu.edu

Plan Requirements

**Physics (BA): 120 Total Units**

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tr>
<td><strong>Orientation</strong></td>
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<tr>
<td>COS 100</td>
<td>Science of Change (Verify Requirement)</td>
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<td><strong>Communication</strong></td>
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<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<td>ENG 101</td>
<td>Academic Writing and Research ᵃ</td>
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<tr>
<td><strong>Physics</strong></td>
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<tr>
<td>PY 201</td>
<td>University Physics I ᵃ</td>
<td>4</td>
</tr>
<tr>
<td>PY 202</td>
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<td>PY 203</td>
<td>University Physics III ᵃ</td>
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<tr>
<td>PY 252</td>
<td>Instrumental and Data Analysis for Physics ᵃ</td>
<td>2</td>
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<tr>
<td>PY 401</td>
<td>Quantum Physics I ᵃ</td>
<td>3</td>
</tr>
<tr>
<td>PY 411</td>
<td>Mechanics I ᵃ</td>
<td>3</td>
</tr>
<tr>
<td>PY 413</td>
<td>Thermal Physics ᵃ</td>
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</tr>
<tr>
<td>PY 414</td>
<td>Electromagnetism I ᵃ</td>
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<tr>
<td>PY 452</td>
<td>Advanced Physics Laboratory</td>
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<tr>
<td><strong>Math / Statistics / Computing</strong></td>
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</tr>
<tr>
<td>MA 141</td>
<td>Calculus I ᵃ</td>
<td>4</td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II ᵃ</td>
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* hath an initial
MA 242  Calculus III  4  
MA 341  Applied Differential Equations I  3  
MA 405  Introduction to Linear Algebra  3  
Statistics Elective (p. 1407)  1  
PY 251  Introduction to Scientific Computing  3  
Computing / Numerical Methods Elective (p. 1407)  1  

Science/Tech Electives
CH 101  Chemistry - A Molecular Science  3  
CH 102  General Chemistry Laboratory  1  
Basic Science Elective (p. 1407)  1  
Technical Electives  13  

Courses at the 300 level or above in science, mathematics, technology, engineering, and in math and science education.

GEP Courses
GEP Humanities (p. 1423)  6  
GEP Social Sciences (p. 1430)  6  
GEP Health and Exercise Studies (p. 1422)  2  
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3  
GEP Interdisciplinary Perspectives (p. 1426)  5  
GEP U.S. Diversity (p. 1431) (verify requirement)  
GEP Global Knowledge (p. 1419) (verify requirement)  
Foreign Language Proficiency (p. 1417) (verify requirement)  

Restricted Electives  6  
Select courses from the GEP Humanities (p. 1423) list, GEP Social Sciences (p. 1430) list, GEP Visual and Performing Arts list, and from courses at the 200 level or above in Education or Management.

Free Electives
Free Electives (12 Hr S/U Lmt)  2  9  

Total Hours  120

1 A grade of C- or higher is required.
2 Students should consult their academic advisors to determine which courses fill this requirement.

Statistics Electives
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<td>BUS 350</td>
<td>Economics and Business Statistics</td>
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<tr>
<td>EC 351</td>
<td>Econometrics I</td>
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<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
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<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming- SAS</td>
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<tr>
<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>ST 312</td>
<td>Introduction to Statistics II</td>
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</tr>
<tr>
<td>ST 350</td>
<td>Economics and Business Statistics</td>
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<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<tr>
<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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<tr>
<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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Computing / Numerical Methods Electives
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<td>Introduction to Numerical Methods</td>
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<td>CSC 427</td>
<td>Introduction to Numerical Analysis I</td>
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<tr>
<td>CSC 428</td>
<td>Introduction to Numerical Analysis II</td>
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<tr>
<td>MA 402</td>
<td>Mathematics of Scientific Computing</td>
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<tr>
<td>MA 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>MA 428</td>
<td>Introduction to Numerical Analysis II</td>
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<td>PY 525</td>
<td>Computational Physics</td>
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Basic Science Elective
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<td>BIO 165</td>
<td>Introduction to Environmental Research</td>
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<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>BME 203</td>
<td>Introduction to the Materials Science of Biomaterials</td>
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<tr>
<td>CE 225</td>
<td>Mechanics of Solids</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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<tr>
<td>CH 203</td>
<td>General Chemistry II for Students in Chemical Sciences</td>
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<td>CH 204</td>
<td>General Chemistry Laboratory II for Students in Chemical Sciences</td>
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<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>CH 222</td>
<td>Organic Chemistry Lab</td>
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<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>GN 301</td>
<td>Genetics in Human Affairs</td>
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<td>Solid Mechanics</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>MEA 110</td>
<td>Geology I Laboratory</td>
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<td>MEA 200</td>
<td>Introduction to Oceanography</td>
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<tr>
<td>MEA 215</td>
<td>Introduction to Atmospheric Sciences</td>
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<td>MEA 220</td>
<td>Marine Biology</td>
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<tr>
<td>MSE 200</td>
<td>Mechanical Properties of Structural Materials</td>
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<tr>
<td>MSE 201</td>
<td>Structure and Properties of Engineering Materials</td>
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</tr>
<tr>
<td>MSE 203</td>
<td>Introduction to the Materials Science of Biomaterials</td>
<td>3</td>
</tr>
<tr>
<td>NE 202</td>
<td>Radiation Sources, Interaction and Detection</td>
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<tr>
<td>TE 200</td>
<td>Introduction to Polymer Science and Engineering</td>
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</table>

Semester Sequence
This is a sample.

<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
</table>
| First Year Fall Semester
| PY 201   | University Physics I (CP)                       | 4     |
| MA 141   | Calculus I (CP)                                 | 4     |
| ENG 101  | Academic Writing and Research                   | 4     |

1 Students should consult their academic advisors to determine which courses fill this requirement.
GEP Health and Exercise Studies (p. 1422) | 1
COS 100 | Science of Change | 2

**Spring Semester**

<table>
<thead>
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<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PY 202</td>
<td>University Physics II (CP)</td>
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</tr>
<tr>
<td>MA 241</td>
<td>Calculus II (CP)</td>
<td>4</td>
</tr>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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**Second Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>PY 203</td>
<td>University Physics III (CP)</td>
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<tr>
<td>PY 251</td>
<td>Introduction to Scientific Computing</td>
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</tr>
<tr>
<td>MA 242</td>
<td>Calculus III (CP)</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

<table>
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<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PY 411</td>
<td>Mechanics I (CP)</td>
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<td>PY 252</td>
<td>Instrumental and Data Analysis for Physics</td>
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</tr>
<tr>
<td>MA 341</td>
<td>Applied Differential Equations</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
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**Third Year**

**Fall Semester**

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<tr>
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<td>Electromagnetism I</td>
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<tr>
<td>MA 405</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
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<tr>
<td>Advanced Writing Elective</td>
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<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY 401</td>
<td>Quantum Physics I</td>
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<td>GEP Humanities (p. 1423)</td>
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**Fourth Year**

**Fall Semester**

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<td>Technical Elective</td>
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**Spring Semester**

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<td>Thermal Physics I</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Restricted Elective</td>
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</table>

**Total Hours** | 120

1. At most one passing grade below C- is permitted in the Physics category.
2. At most one passing grade below C- is permitted in the Math/Statistics/Computing category.
3. At most one passing grade below C- is permitted in the Sciences/Technical Electives category.

---

### Plan Requirements

**Physics (BS): 120 Total Units**

<table>
<thead>
<tr>
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<tr>
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---

### Physics (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Physics provides the conceptual foundation for science and engineering. A physics degree is a mark of major intellectual achievement and a gateway to a thousand careers. The physics major at NC State combines the resources of a major research university with the ambience of a small college. Our ratio of physics majors to faculty of about 3 to 1 allows us to offer small classes, personal attention, and unparalleled opportunities for involvement in research.

Most physics majors are preparing for employment in a government or industrial laboratory, or with a company that provides STEM (science, technology, engineering and math) products or services. Other physics majors are preparing for graduate studies in physics or related sciences, or enrollment in professional schools (such as medicine or law). Some physics majors are preparing for a career as a high school teacher. The Bachelor of Science (B.S.) degree in physics is the appropriate choice if you’re planning for graduate study in physics.

For more information about this program, visit our website (https://physics.sciences.ncsu.edu/undergraduate/).

Department of Physics
NC State University
Campus Box 8202
Raleigh, NC 27695-8202

Dr. David Brown
Professor and Director of Undergraduate Programs
NC State University
Riddick Hall 319F, Box 8202
Raleigh, NC 27695-8202
Phone: 919.515.7471
Email: jbrown@ncsu.edu

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**Plan Requirements**

<table>
<thead>
<tr>
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<tr>
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### Communication
Select one of the following:

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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>Communication for Science and Research</td>
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<td>ENG 101</td>
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**Physics**

<table>
<thead>
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<th>Hours</th>
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<tr>
<td>PY 201</td>
<td>University Physics I</td>
<td>4</td>
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<td>PY 202</td>
<td>University Physics II</td>
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<td>PY 252</td>
<td>Instrumental and Data Analysis for Physics</td>
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<td>PY 401</td>
<td>Quantum Physics I</td>
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<td>PY 411</td>
<td>Mechanics I</td>
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<td>PY 412</td>
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<tr>
<td>PY 413</td>
<td>Thermal Physics</td>
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<tr>
<td>PY 414</td>
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**Math / Statistics / Computing**

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<thead>
<tr>
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<tbody>
<tr>
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<td>MA 242</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<tr>
<td>Statistics Elective (p. 1409)</td>
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<tr>
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**Science/Tech Electives**

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<th>Code</th>
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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>Basic Science Elective (p. 1409)</td>
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<td>Advanced Experimental Physics (p. 1410)</td>
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<td>Technical Electives</td>
<td>10</td>
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Technical Electives are courses at the 300 level or above in science, mathematics, technology, engineering, and in math and science education.

**GEP Courses**

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td>6</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td>2</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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**Free Electives**

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<thead>
<tr>
<th>Code</th>
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**Total Hours**

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1. A grade of C- or higher is required.
2. Students should consult their academic advisors to determine which courses fill this requirement.

**Statistics Electives**

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<tr>
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<tbody>
<tr>
<td>BUS 350</td>
<td>Economics and Business Statistics</td>
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<td>EC 351</td>
<td>Econometrics I</td>
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<td>ST 305</td>
<td>Statistical Methods</td>
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<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming- SAS</td>
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<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
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<td>ST 311</td>
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<td>ST 312</td>
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<tr>
<td>ST 350</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
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<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
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**Computing / Numerical Methods Electives**

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<td>CSC 302</td>
<td>Introduction to Numerical Methods</td>
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<tr>
<td>CSC 427</td>
<td>Introduction to Numerical Analysis I</td>
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<td>CSC 428</td>
<td>Introduction to Numerical Analysis II</td>
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<tr>
<td>MA 402</td>
<td>Mathematics of Scientific Computing</td>
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<td>Introduction to Numerical Analysis I</td>
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<td>PY 525</td>
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**Basic Science Elective**

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<tr>
<td>BIO 165</td>
<td>Introduction to Environmental Research</td>
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<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity</td>
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<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology</td>
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<td>Introduction to the Materials Science of Biomaterials</td>
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<td>Mechanics of Solids</td>
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<td>Chemistry - A Quantitative Science</td>
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<td>Quantitative Chemistry Laboratory</td>
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<td>General Chemistry II for Students in Chemical Sciences</td>
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<tr>
<td>CH 204</td>
<td>General Chemistry Laboratory II for Students in Chemical Sciences</td>
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<tr>
<td>CH 220</td>
<td>Introductory Organic Chemistry</td>
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<td>CH 222</td>
<td>Organic Chemistry I Lab</td>
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<td>CHE 205</td>
<td>Chemical Process Principles</td>
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<td>GN 301</td>
<td>Genetics in Human Affairs</td>
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<tr>
<td>MAE 214</td>
<td>Solid Mechanics</td>
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<td>MEA 101</td>
<td>Geology I: Physical</td>
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<td>Geology I Laboratory</td>
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MEA 200  Introduction to Oceanography  3
MEA 210  Oceanography Lab  1
MEA 215  Introduction to Atmospheric Sciences  4
MEA 220  Marine Biology  3
MSE 200  Mechanical Properties of Structural Materials  3
MSE 201  Structure and Properties of Engineering Materials  3
MSE 203  Introduction to the Materials Science of Biomaterials  3
NE 202  Radiation Sources, Interaction and Detection  4
TE 200  Introduction to Polymer Science and Engineering  3

Advanced Experimental Physics

Code  Title  Hours
PY 452  Advanced Physics Laboratory  3
PY 456  3

Semester Sequence

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

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<thead>
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<td>PY 201</td>
<td>University Physics I (CP) ¹</td>
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<td>MA 141</td>
<td>Calculus I (CP) ²</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>MA 241</td>
<td>Calculus II (CP) ²</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science ³</td>
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<td>Hours</td>
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<td>University Physics III (CP) ¹, ³</td>
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<td>PY 252</td>
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<td>MA 242</td>
<td>Calculus III (CP) ²</td>
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<td>PY 413</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations I ²</td>
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<td>Basic Sciences ³</td>
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<td>Hours</td>
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Third Year

| Fall Semester           |                                                  |       |
| PY 412                  | Mechanics II ¹                                   | 3     |
| PY 414                  | Electromagnetism I ¹                             | 3     |
| MA 401                  | Applied Differential Equations II ²              | 3     |
| Statistics Elective ²   |                                                  | 3     |
| Advanced Writing Elective  |                                              | 3     |
|                         | Hours                                            | 15    |
| Spring Semester         |                                                  |       |
| PY 401                  | Quantum Physics I ¹                              | 3     |
| PY 415                  | Electromagnetism II ¹                            | 3     |
| MA 405                  | Introduction to Linear Algebra ²                 | 3     |
| Computing/Numerical Methods Elective ² |                              | 3     |
| Technical Elective ³    |                                                  | 1     |
| GEP Health and Exercise Studies (p. 1422) |                        | 1     |
|                         | Hours                                            | 15    |

Fourth Year

| Fall Semester           |                                                  |       |
| PY 402                  | Quantum Physics II ¹                             | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) |                               | 3     |
| Technical Elective ³    |                                                  | 3     |
| Technical Elective ³    |                                                  | 3     |
| Free Elective           |                                                  | 3     |
|                         | Hours                                            | 15    |
| Spring Semester         |                                                  |       |
| Advanced Experimental Physics ¹ |                                             | 3     |
| GEP Social Sciences (p. 1430) |                               | 3     |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | | 3 |
| Technical Elective ³    |                                                  | 3     |
| Technical Elective ³    |                                                  | 3     |
| Free Elective           |                                                  | 3     |
|                         | Hours                                            | 15    |
| Total Hours             |                                                  | 120   |

1  At most one passing grade below C- is permitted in the Physics category.
2  At most one passing grade below C- is permitted in the Math/Statistics/Computing category.
3  At most one passing grade below C- is permitted in the Sciences/Technical Electives category.

Physics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Physics Department offers a minor in physics to majors in any field except physics. This minor gives students a broad exposure to the basic disciplines of physics and provides an opportunity for learning how these disciplines are applied in some of the frontier fields of physics research.

For more information about this program, visit our website (https://physics.sciences.ncsu.edu/undergraduate/resources-for-minors/).

Department of Physics
NC State University
Plan Requirements

- Completion of 17 hours of coursework in Physics
- A grade of ‘C’ or better in all courses used for the minor.

<table>
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<tr>
<td>or PY 201</td>
<td>University Physics I</td>
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<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
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<td>or PY 202</td>
<td>University Physics II</td>
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<td>PY 407</td>
<td>Introduction to Modern Physics</td>
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<tr>
<td>or PY 203</td>
<td>University Physics III</td>
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**Elective Courses**

Select two of the following: 1

- PY 328 Stellar and Galactic Astrophysics 6
- PY 413 Thermal Physics
- PY 341 Relativity, Gravitation and Cosmology

Total Hours 15

1 Some upper level physics courses (PY 401 Quantum Physics I and PY 402 Quantum Physics II, PY 411 Mechanics I and PY 412 Mechanics II, PY 414 Electromagnetism I and PY 415 Electromagnetism II, and the PY 500 level courses) may be substituted for the courses in this group. Students must have prior written approval from the minor advisor listed below in order to exercise this option.

Department of Statistics

Statistics is a field of limitless opportunities to solve real-world problems. We’re one of the largest and top-rated statistics departments (https://www.usnews.com/best-graduate-schools/top-science-schools/statistics-rankings/) in the nation, and the diverse research interests (https://statistics.sciences.ncsu.edu/research/) of our faculty mean students can explore a wide range of specializations and find the one or ones that pique their interest.

We offer a dynamic environment for teaching, research, and interdisciplinary collaboration and training. Biostatistics, data science, business analytics, environmental statistics, statistical genetics, sports analytics, and theoretical statistics are just a few of the subject areas in which our faculty excel. Our students are highly involved in experiential learning opportunities including research, internships, and consulting. US News recently ranked Statistician as its #1 Best Business Job (https://money.usnews.com/careers/best-jobs/statistician/), and our graduates choose from high-paying jobs in exciting fields including computing, precision medicine, sports analytics, manufacturing, biostatistics, national security, and academia.

Department Highlights:

- Student organizations of interest to Statistics majors include the Statistics Club (https://www.facebook.com/groups/464002833712482/), Actuarial Club (https://www.facebook.com/groups/1646853775608262/), and Sports Analytics Club (http://shiny.stat.ncsu.edu/sportstat/).
- Statistics students have many study abroad opportunities, with recent destinations including Antarctica, Ghana, Australia, China, and the United Kingdom.
- Students in our program develop valuable statistical computing skills in the classroom and lab, and then apply those in our real-world practicum courses and at local and regional DataFests.
- Students find exciting summer experiences that include internships in nearby Research Triangle Park, in undergraduate research programs across the nation, and in our own Summer Institute in Biostatistics (SIBS) program.
- About a quarter of our students continue their education with graduate studies. Including frequent placement in NC State’s prestigious Institute for Advanced Analytics (https://analytics.ncsu.edu/?page_id=1799/). For more information about our department, including contact information, visit our website (https://statistics.sciences.ncsu.edu/).

Dr. Len Stefanski
R. A. Fisher Distinguished Professor and Department Head
Department of Statistics
NC State University Campus Box 8203
5109 SAS Hall
Raleigh, NC 27695-8203
Email: len_stefanski@ncsu.edu

Faculty

Head
L. Stefanski

Associate Head
D. Boos

Director of Biomathematics Graduate Program
A. Lloyd

Director of Bioinformatics Graduate Program
S. Muse

Director of Bioinformatics Research Center
F. Wright
Director of Undergraduate Programs in Statistics
S. Muse

R.A. Fisher Distinguished Professor of Statistics
L. Stefanski

J. Stuart Hunter Distinguished Professor
M. Davidian

Cox Distinguished Professor of Statistics
B. Reich

Goodnight Distinguished Professor of Statistics
E. Laber

Alumni Distinguished Graduate Professors
M. Davidian
A. Wilson

Alumni Distinguished Undergraduate Professors
J.M. Hughes-Oliver
T. Reiland

Goodnight Innovation Distinguished Professor
F. Wright

University Distinguished Professor
S. Ghosal

Professors
D.D. Boos
M. Davidian
S. Ghosal
S.K. Ghosh
K. Gross
M. Gumpertz
J. Hughes-Oliver
E. Laber
W. Lu
S. Muse
J. Osborne
B. Reich
L.A. Stefanski
J. Thorne
J. Tzeng
A. Wilson
F. Wright
D. Zhang

Associate Professors
J. Jeng
A. Maity
D. Martin
R. Martin
T.W. Reiland
C.E. Smith
R. Song
A. Staicu

Assistant Professors
E. Chi
J. Stallrich
M. Tang
J. Williams
L. Xiao
S. Yang

Teaching Associate Professors
H. McGowan
P. Savariappan

Teaching Assistant Professors
J. Duggins
The undergraduate Bachelor of Science in Statistics curriculum provides basic training for a career in statistics, while also preparing students for graduate study in statistics or related fields. In addition to statistics, the curriculum includes coursework in mathematics, computer science, and the biological/physical sciences. Our program’s emphasis on statistical computing is unique, and prepares our graduates for careers in the rapidly evolving Data Science sector. Each statistics major also works with their advisor to formulate an individualized plan for 12 credits of “Advised Electives”. This plan might lead to a minor or distribute their study across disciplines exploring the application of statistics in other fields such as agriculture and life sciences, computer science, economics and business, industrial engineering, or the social sciences.

For more information, see the website (https://statistics.sciences.ncsu.edu/undergraduate/) for our major.

Dr. Spencer Muse
Professor and Director of Undergraduate Programs
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Email: muse@ncsu.edu

## Plan Requirements

### Statistics (BS): 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>COS 100</td>
<td>Science of Change (verify requirement)</td>
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<tr>
<td></td>
<td><strong>Communication &amp; Advanced Writing</strong></td>
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<tr>
<td></td>
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<td>COM 112 Interpersonal Communication</td>
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<td>COM 211 Argumentation and Advocacy</td>
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<tr>
<td></td>
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<td>ENG 333 Communication for Science and Research</td>
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<td></td>
<td>ENG 101 Academic Writing and Research</td>
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<tr>
<td></td>
<td><strong>Mathematics &amp; Sciences</strong></td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<td>MA 225</td>
<td>Foundations of Advanced Mathematics</td>
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<tr>
<td>MA 305</td>
<td>Introductory Linear Algebra and Matrices</td>
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<tr>
<td></td>
<td>or MA 405 Introduction to Linear Algebra</td>
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<td></td>
<td><strong>GEP Natural Sciences (p. 1429)</strong></td>
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<td><strong>Natural Science Elective</strong></td>
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<td>Choose from the GEP Natural Sciences (p. 1429) Lab list</td>
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<tr>
<td></td>
<td><strong>Computer Science/Statistical Computing</strong></td>
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<tr>
<td>ST 114</td>
<td>Statistical Programming</td>
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<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming - SAS</td>
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<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
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<tr>
<td>ST 445</td>
<td>Introduction to Statistical Computing and Data Management</td>
<td>3</td>
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<td>Select one of the following:</td>
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<tr>
<td></td>
<td>CSC 442 Introduction to Data Science</td>
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<tr>
<td>ST 440</td>
<td>Applied Bayesian Analysis</td>
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<tr>
<td>ST 442</td>
<td>Introduction to Data Science</td>
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<tr>
<td>ST 446</td>
<td>Intermediate SAS Programming with Applications</td>
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<tr>
<td>ST 540</td>
<td>Applied Bayesian Analysis</td>
<td></td>
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<tr>
<td></td>
<td><strong>Statistics</strong></td>
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<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
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<tr>
<td>ST 312</td>
<td>Introduction to Statistics II</td>
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### ST Electives 400 Level

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<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ST 421</td>
<td>Introduction to Mathematical Statistics I (^1)</td>
<td>3</td>
</tr>
<tr>
<td>ST 422</td>
<td>Introduction to Mathematical Statistics II (^1)</td>
<td>3</td>
</tr>
<tr>
<td>ST 430</td>
<td>Introduction to Regression Analysis (^1)</td>
<td>3</td>
</tr>
<tr>
<td>ST 431</td>
<td>Introduction to Experimental Design (^1)</td>
<td>3</td>
</tr>
<tr>
<td>ST 432</td>
<td>Introduction to Survey Sampling (^3)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ST Electives 400 Level (p. 1414) (^1)</td>
<td>6</td>
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</table>

#### Advised Electives

Advised Electives \(^{1,2}\) 12

#### GEP Courses

- GEP Humanities (p. 1423) 6
- GEP Social Sciences (p. 1430) 6
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

#### Free Electives

Free Electives (12 Hr S/U Lmt) \(^2\) 9

Total Hours 120

\(^1\) A grade of C- or higher is required.

\(^2\) Students should consult their academic advisors to determine which courses fill this requirement.

### Semester Sequence

This is a sample.

#### Course Title Hours

##### First Year

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COS 100</td>
<td>Science of Change or Introduction to Computing Environments</td>
<td>2</td>
</tr>
<tr>
<td>or E 115</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics (^1)</td>
<td>3</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I (CP) (^1)</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following: (^1)</td>
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<td></td>
</tr>
<tr>
<td>ST 114</td>
<td>Statistical Programming (CP)</td>
<td>3</td>
</tr>
<tr>
<td>CSC 111</td>
<td>Introduction to Computing: Python</td>
<td></td>
</tr>
<tr>
<td>CSC 116</td>
<td>Introduction to Computing - Java</td>
<td></td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422) (^1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Spring Semester**

Select one of the following: 3

- COM 110  Public Speaking  3
- COM 112  Interpersonal Communication  3
- COM 211  Argumentation and Advocacy  3
- MA 241  Calculus II (CP) \(^1\)  4
- ENG 101  Academic Writing and Research  4
- ST 312  Introduction to Statistics II (CP) \(^1\)  3
- ST 307  Introduction to Statistical Programming-SAS (CP) \(^1\)  1

**Second Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA 242</td>
<td>Calculus III (CP) (^1)</td>
<td>4</td>
</tr>
<tr>
<td>MA 225</td>
<td>Foundations of Advanced Mathematics (CP) (^1)</td>
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</tr>
<tr>
<td>ST 445</td>
<td>Introduction to Statistical Computing and Data Management</td>
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<tr>
<td>GEP Elective</td>
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<td>3</td>
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</table>
NC State University

GEP Health and Exercise Studies (p. 1422) 1

Spring Semester

ST 308 Introduction to Statistical Programming - R 1

GEP Elective 3

ST 431 Introduction to Experimental Design 1 3

MA 305 or MA 405 Introductory Linear Algebra and Matrices (CP) 1 or Introduction to Linear Algebra 3

Advised Elective 1 3

Free Elective 3

Hours 14

Third Year

Fall Semester

ST 421 Introduction to Mathematical Statistics I (CP) 1 3

ST 430 Introduction to Regression Analysis (CP) 1 3

GEP Elective 3

Advised Elective 1 3

Free Elective 3

Hours 16

Spring Semester

ST 422 Introduction to Mathematical Statistics II (CP) 3

GEP Elective 3

Computational Statistics Elective 1 3

Natural Sciences Elective 4

Statistical Elective 1 3

Hours 15

Fourth Year

Fall Semester

Select one of the following: 3

ENG 331 Communication for Engineering and Technology

ENG 332 Communication for Business and Management

ENG 333 Communication for Science and Research

GEP Elective 3

Advised Elective 1 3

Statistics Elective 1 3

Natural Sciences Elective 3

Hours 16

Spring Semester

ST 432 Introduction to Survey Sampling 1 3

Natural Sciences Elective 4

Advised Elective 1 3

Free Electives 3

GEP Elective 3

Hours 16

Total Hours 120

1 At most one D level grade is permitted in Advised Electives, Statistics Electives, or required MAT, ST, or CSC courses. C- or better is required in ST 307 Introduction to Statistical Programming: SAS, ST 311 Introduction to Statistics, ST 312 Introduction to Statistics II and ST 421 Introduction to Mathematical Statistics I.

Career Opportunities

The importance of sound statistical thinking in the design and analysis of quantitative studies is reflected in the abundance of job opportunities for statisticians. Industry relies on statistical methods to control the quality of goods in the process of manufacturing and to determine the acceptability of goods produced. Statistical procedures based on scientific sampling have become basic tools in such diverse fields as weather forecasting, environmental monitoring, opinion polling, crop and livestock estimation, market research, and business trends prediction. The development and testing of new drugs and therapies requires statistical expertise, and advances in genomic science provide tremendous opportunities for statistical work. Because one can improve the efficiency and use of increasingly complex and expensive experiment and survey data, the statistician is in demand wherever quantitative studies are conducted. Statistics is at the core of Data Science and Analytics, and our department provides an outstanding environment to prepare for careers in these areas.

Statistics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

A minor in statistics is an excellent complement to majors in a wide range of fields. The minor program helps students learn to use statistical methods to summarize information and solve real-world problems. Flexible academic plans offer almost all students at NC State access to this valuable minor.

For more information, see the website (https://statistics.sciences.ncsu.edu/undergraduate/minor/) for our minor.

Dr. Spencer Muse
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Email: muse@ncsu.edu

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
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<tr>
<td>ST 312</td>
<td>Introduction to Statistics II</td>
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</tr>
<tr>
<td>ST 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

Part A: Introductory Statistics

Select one of the following options: 4-6

Option 1:

ST 305 Statistical Methods

Option 2:

ST 312 Introduction to Statistics II

And select one of the following:

ST 311 Introduction to Statistics

ST 350 Economics and Business Statistics

ST 370 Probability and Statistics for Engineers

ST 380 Probability and Statistics for the Physical Sciences
The Environmental and Molecular Toxicology program has established an undergraduate minor in Environmental Toxicology that is available to all baccalaureate degree students at North Carolina State University. The new minor was approved in February of 2003.

Given the importance and high level of interest in protecting human and environmental health, environmental toxicology is a contemporary field of study that will be of great interest to many undergraduate students. This program also will provide undergraduates with exposure to two of the University’s major academic thrusts: Genomic Sciences and Environmental Sciences. The interdisciplinary and applied nature of environmental toxicology interfaces with virtually all academic programs within the College of Science (COS) (http://www.cals.ncsu.edu/).

### Plans

- Environmental Toxicology (Minor) (p. 1416)

### Environmental Toxicology (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Environmental and Molecular Toxicology program offers an undergraduate minor in Environmental Toxicology that is available to all baccalaureate degree students at North Carolina State University. The minor is intended to provide undergraduate students with an understanding of how chemicals and physical agents can adversely affect biological systems and the environment, including the mechanisms of chemically induced toxicity, the fate and effects of chemicals in the environment, and the evaluation of chemical hazards and risks. The minor is especially appropriate for (but not limited to) students majoring in the biological or agricultural sciences, physical sciences or science education.

### Admissions and Certification of Minor

The minor will be administrated by Dr. Seth Kullman, the Undergraduate Coordinator. NC State undergraduate students may be admitted to the minor after successfully completing 60 credit hours. Students should contact the minor coordinator and complete a minor application form/work plan. This form will be forwarded to the student’s advisor.

### Contact Person

Dr. Elizabeth Ellen Thompson
2202 Toxicology Bldg
919.515.9774
eethomp2@ncsu.edu

**SIS code:** 17ETM

### Plan Requirements

- Completion of 15 credit hours.
- 9 credit hours will be required courses and 6 credit hours will be elective courses.
- A grade of ‘C’ or better is required for all courses taken to fulfill the minor requirements.

### Life Sciences First Year Program

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Life Sciences First Year (LSFY) program at NC State University was developed with the goal of helping students find the right fit in a degree program at NC State. LSFY is a joint program between the College of Agriculture and Life Sciences (p. 1416) and the College of Sciences. Designed for students who enter NC State with an interest in any aspect of the life sciences, the LSFY curriculum allows students to begin laying the foundation for further studies in any of the life science degree programs at NC State. At the same time, the advising program and specially designed courses encourage and provide the means for students to explore their academic interests to settle on the academic home that is best for them, while understanding what they need to do to achieve their professional goals. After learning more about degree requirements and exploring their own interests and aptitudes (both in and out of class), LSFY students apply by the end of their first year to transfer into a degree program.

The LSFY program includes all incoming first-year students who express interest in earning a degree in one of the following majors: Biochemistry, Biological Sciences, Genetics, Microbiology, Nutrition Science, Plant Biology, or Zoology. There is no need to fill out a special application for the program.

To learn more about the LSFY program, visit the website (https://departments.sciences.ncsu.edu/lsfy/).

### Life Sciences First Year Program

Bostian Hall
2721 Pillsbury Circle
Campus Box 7611
Raleigh, NC 27695-7611
Email: LifeSciencesFY@ncsu.edu

Dr. Erica Kosal
Director, LSFY Program
Email: efkosal@ncsu.edu

### Toxicology Program

The Environmental and Molecular Toxicology program has established an undergraduate minor in Environmental Toxicology that is available to all baccalaureate degree students at North Carolina State University. The new minor was approved in February of 2003.

Given the importance and high level of interest in protecting human and environmental health, environmental toxicology is a contemporary field of study that will be of great interest to many undergraduate students. This program also will provide undergraduates with exposure to two of the University’s major academic thrusts: Genomic Sciences and Environmental Sciences. The interdisciplinary and applied nature of environmental toxicology interfaces with virtually all academic programs within the College of Science (COS) (http://www.cals.ncsu.edu/).

### Plans

- Environmental Toxicology (Minor) (p. 1416)
Core Courses

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<tr>
<td>TOX 401</td>
<td>Principles of Toxicology</td>
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<td>TOX 415</td>
<td>Environmental Toxicology and Chemistry</td>
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<tr>
<td>TOX 490</td>
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Elective Courses

Select six credits of the following:

- TOX 495
- TOX 499
- BCH 451 Principles of Biochemistry
- BO/ZO 360
- CE 280
- CH 315 Quantitative Analysis
- CH/MEA 323
- ES 100 Introduction to Environmental Sciences
- ET 201 Environmental Technology Laboratory I
- ET 202 Environmental Technology Laboratory II
- ET 301 Environmental Technology Laboratory III
- ET 302 Environmental Technology Laboratory IV
- ET 401 Environmental Technology Laboratory V
- ET 310 Environmental Monitoring and Analysis
- ET/MEA 320 Fundamentals of Air Pollution
- ET 450
- FS/MB 405 Food Microbiology
- FW/ZO 353 Wildlife Management
- GN 311 Principles of Genetics
- NTR/ANS 419 Human Nutrition and Chronic Disease
- ST 311 Introduction to Statistics
- TC/TAM 401
- ZO 421
- ALS 498 Honors Research or Teaching I
- ALS 499 Honors Research or Teaching II

Total Hours: 15

Other courses may qualify if they contain significant content related to toxicology; consent of the Toxicology Undergraduate Teaching Coordinator is required.

GEP Category Requirements

- Foreign Language Proficiency (p. 1417)
- GEP Global Knowledge (p. 1419)
- GEP Health and Exercise Studies (p. 1422)
- GEP Humanities (p. 1423)
- GEP Interdisciplinary Perspectives (p. 1426)
- GEP Mathematical Sciences (p. 1428)
- GEP Natural Sciences (p. 1429)
- GEP Social Sciences (p. 1430)
- GEP U.S. Diversity (p. 1431)
- GEP Visual and Performing Arts (p. 1432)

Foreign Language Proficiency

Rationale

In a sense, languages are keys to the world. The continuous expansion of international relations makes the knowledge of foreign languages increasingly significant. In learning a foreign language and studying its literature and cultures, students acquire a body of knowledge about how humans think, view the world, express themselves, and communicate with one another. Language learning also expands one’s ability to create and discover new meaning in one’s own language and culture. Knowledge of the linguistic structures of a second language helps students to understand their own language and culture. Likewise, an awareness of contrasting cultural concepts sensitizes students to the differences between their own culture and others. Such awareness has become increasingly important as the communities of the world have become more interconnected and interdependent. The needs of our global society require that more citizens have access to other languages and cultures in order to cooperate in the process of improving the quality of human life.

Foreign Language Proficiency Requirement

To fulfill the GEP Foreign language requirement, the student must have proficiency at the FL* 102 level. This can be demonstrated by completing two years of high school study of the same language with a grade better than a C- in each of the two years, or a passing grade at the FL* 102 level, or by placement into the FL* 201 by examination. Additional Foreign Language requirements above the FL proficiency requirement (FL*102) have been established by some Colleges and programs.

American Sign Language (ASL) is accepted in satisfying the foreign language proficiency requirement with two years of ASL in high school with a grade “C” or better in each year.

The Cherokee language is an accepted language for satisfying the foreign language proficiency requirement.

GEP High School For Language

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<td>Elementary Chinese II</td>
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<td>FLF 102</td>
<td>Elementary French II</td>
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<td>FLF 110</td>
<td>Accelerated Elementary French</td>
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<td>FLG 102</td>
<td>Elementary German II</td>
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<td>FLI 102</td>
<td>Elementary Italian II</td>
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</tr>
<tr>
<td>FLJ 102</td>
<td>Elementary Japanese II</td>
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<tr>
<td>FLN 102</td>
<td>Elementary Hindi-Urdu II</td>
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<tr>
<td>FLP 102</td>
<td>Elementary Portuguese II</td>
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<td>FLR 102</td>
<td>Elementary Russian II</td>
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</tr>
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<td>Elementary Spanish II</td>
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**Intermediate For Language**

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HON 310  The Creative Process in Science: Realities, Comparisons, and Culture Perceptions  3
HON 352  Self, Schooling, and the Social Order: A Critical Examination  3
HON 398  Honors Special Topics  1-6
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HSS 392  International and Crosscultural Communication  3
HUMU 295  Humanities and U.S. Diversity Special Topics  3
IDS 210  Introduction to American Studies  3
IDS 220  The Science and Art of Happiness  3
IPUS 295  Interdisciplinary Perspectives and U.S. Diversity Special Topics  2-3
IS 250  Globalizing North Carolina  3
LPS 302  Diversity and Leadership in the Public Sector  3
M 100  Personal and Professional Identity Development  1
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MUS 210  Introduction to Popular Music: 1950s-1970s  3
MUS 211  Introduction to Popular Music: 1980s-Present  3
MUS 230  Introduction to African-American Music  3
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NTR 210  Introduction to Community Food Security  3
PHI 319  Africana Political Philosophy  3
PHI 320  Philosophy of Race  3
PRT 238  Diversity and Inclusion in Recreation and Sport  3
PS 303  Race in U.S. Politics  3
PS 306  Gender and Politics in the United States  3
PS 309  Equality and Justice in United States Law  3
PS 313  Criminal Justice Policy  3
PS 418  Gender Law and Policies  3
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PSY 406  Psychology of Gender  3
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REL 323  Religious Cults, Sects, and Minority Faiths in America  3
REL 343  African American Religions  3
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SOC 203  Current Social Problems  3
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SOC 204  Sociology of Family  3
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SOC 304  Gender and Society  3
SOC 305  Racial and Ethnic Relations  3
SSC 428  Service-Learning in Urban Agriculture Systems  1
SSUS 295  Social Sciences and U.S. Diversity Special Topics  3
STS 210  Women and Gender in Science and Technology  3
SW 201  Introduction to Social Work  4
SW 260  Introduction to Gerontology: An Interdisciplinary Field of Practice  3
SW 290  The Development of Social Welfare and Social Work in the U.S.  3
SW 312  Multicultural Social Work  3
SW 425  Hunger and Homelessness  3
SW 525  Hunger and Homelessness  3
THE 340  African American Theatre  3
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USC 101  Introduction to University Education I  1
USC 110  Freshman Advancement Seminar  1
USC 240  Leadership and Coalition Building in Diverse Communities  3
USD 295  U.S. Diversity Special Topics  1-3
VPUS 295  Visual and Performing Arts and U.S. Diversity Special Topics  3
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WGS 204  Sociology of Family  3
WGS 210  Women and Gender in Science and Technology  3
WGS 220  Men and Masculinity  3
WGS 304  Gender and Society  3
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WGS 406  Psychology of Gender  3
WGS 410  Studies in Gender and Genre  3
WGS 418  Gender Law and Policies  3
WGS 447  Women in America: From Contact to the Civil War  3
WGS 448  American Women in the Twentieth Century  3
WGS 492  Theoretical Issues in Women’s and Gender Studies  3
WGS 547  Women in America: From Contact to the Civil War  3
WGS 548  American Women in the Twentieth Century  3

GEP Visual and Performing Arts

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### Poole College of Management

For more information about this college, including contact information, visit the college [here](https://poole.ncsu.edu/undergraduate/).

2150 Nelson Hall  
Box 8614  
Raleigh, NC 27695-8614  
Phone: (919) 515-5565  
fax: (919) 515-5564  
E-mail: poole_undergrad@ncsu.edu

Please visit the Poole College of Management's website [here](https://poole.ncsu.edu/undergraduate/) for additional information about our programs.

The Poole College of Management’s curricula provide students with the knowledge and skills required to launch successful careers in today’s dynamic global business community. Poole graduates are prepared to pursue positions with large corporations, small firms, and start-ups, nonprofits, government agencies, or even to start their own businesses. Many choose to pursue advanced studies in professional accounting, economics, law and business administration either upon graduation or after acquiring a few years of professional experience.

The college’s academic programs provide a wide range of options that enable students to build on their existing interests and strengths, as well as to explore new directions. Students may study accounting, information technology, financial management, supply chain management, marketing, economic analysis, human resource management, entrepreneurship, and more. Communication skills, data analysis skills, and computer literacy are integrated into the curriculum, along with project-based, hands-on learning that provides valuable real-world experience.

Students acquire a strong liberal arts background through general education courses and electives that they choose from the many options available through NC State’s historically strong academic programs in science, technology, engineering, humanities and social science. Dual degree and interdisciplinary programs are also available, and students are encouraged to participate in study abroad, internships, and campus leadership opportunities during their time in the college. The Poole College presents an environment in which students can develop an inclusive mindset and the skills necessary to facilitate positive
intercultural communication and interaction, especially in the context of today’s global business world.

NC State University is accredited by AACSB International—the Association to Advance Collegiate Schools of Business. Accreditation affirms the Poole College of Management’s positioning among the best business and management schools in the world.

Poole College of Management faculty bring years of professional experience along with solid academic training to our classrooms. Many are active in corporate consulting and serve on the boards of directors of major corporations. A large number of the college’s faculty are members of NC State University’s Academy of Outstanding Teachers, and many others have been honored for their teaching, research, and service. The faculty is organized into four academic departments:

- Accounting
- Business Management
- Economics
- Management, Innovation, and Entrepreneurship

**Dual Degree/Double Major International Programs**

The Poole College of Management is committed to offering a variety of international opportunities for our students. From specialized Poole-sponsored summer international programs to semester and full-year study abroad programs, to unique dual-degree options, Poole students are offered a world of choice in international study.

Hamilton Scholars (http://poole.ncsu.edu/undergraduate/global/alexander-hamilton-scholars/) is a double major program offered collaboratively by the Poole College of Management and the College of Humanities and Social Sciences (CHASS). In four years, students can complete two degrees: one from the Poole College of Management in either Accounting, Business Administration or Economics and the second from CHASS in International Studies. The Hamilton Scholars program includes extracurricular activities and requires at least one study abroad experience. Graduates of the program are prepared to function successfully in cross-cultural corporate settings.

The International Business Dual Degree (IBDD) Program (https://poole.ncsu.edu/undergraduate/global/international-business-dual-degree-program-ibdd/) provides an even richer opportunity for international immersion and study. In this program, students spend their first two years studying at NC State University, then the next two years studying at one of our partner universities in China, France, Germany, Italy or Spain. Students complete two internships: one in each country. In addition, students take most of the courses at the partner University in the native language. Upon completion of the four-year program, students earn a Bachelor of Science in Business Administration from NC State University and a bachelor’s degree in International Business/Management from the partner institution. Graduates of the IBDD Program are bi-lingual; have at least 9 months work experience; have lived, studied, and worked in two countries and are highly sought after for international positions, both domestic and abroad.

**Student Organizations**

Numerous student organizations are housed in the Poole College to provide undergraduate students a wide range of exposure to business in practice. Students are encouraged to become active in the clubs and organizations aligned with their chosen major and/or concentration in order to develop networking skills and professional contacts. Poole College’s student organizations (https://poole.ncsu.edu/undergraduate/about/our-students/student-organizations/) are also a valuable source of service and professional development experiences and provide undergraduates a wide range of leadership development opportunities.

**Student Services**

The Poole College of Management is committed to providing the support services to enable our students to succeed. Our team of full-time professional advisors provides comprehensive academic advising services to undergraduate students from freshman through senior year; our global programs staff supports student exploration of appropriate international experiences during their academic career; our career development staff is dedicated to helping students pursue internships during their academic program and career positions upon graduation.

**Diversity and Inclusion**

The Poole College of Management seeks to facilitate an environment of inclusivity and positive intercultural communication and interaction for our students. Understanding how diversity and differences impact individuals and our society, especially in the context of today’s global business world, is a focus for the college. The Office of Undergraduate Programs and our diversity and inclusion staff sponsor multiple initiatives, programs and events throughout the year to foster this learning and work with students, staff, and faculty in these areas.

**Scholarships**

Through the generous support of alumni, friends and corporate partners, the Poole College of Management offers a limited number of highly competitive scholarships to our current and incoming students, in addition to any available university-wide awards. Please visit the Poole College of Management’s website (https://poole.ncsu.edu/undergraduate/) for additional information and a list of additional resources for possible financial support. Students are encouraged to contact the University’s Office of Scholarships and Financial Aid for more information and assistance in planning the financing of their college costs.

**Faculty**

**Dean**

Frank Buckless, Stephen P. Zelnak Chair

**Associate Dean, Undergraduate Programs**

Tamah Morant

**Associate Dean, Graduate Programs and Research**

Steve Allen

**Interim Associate Dean, Faculty and Academic Affairs**

Richard Warr
Minors

- Accounting (Minor) (p. 1452)
- Business Administration (Minor) (p. 1474)
- Business Entrepreneurship (Minor) (p. 1474)
- Economics (Minor) (p. 1485)

Certificates

- Essentials of Business (Certificate) (p. 1485)

Undergraduate Honors Program in Business Analytics

The Data Analytics Honors Program is designed for Poole College of Management students seeking to extend their accounting, business administration, or economics degree into the area of data analysis and analytics. Courses in this honors program are designed to build an expertise in understanding data, data structures and data analysis as used by businesses. The program has a focus on real world applications through practicum and project-based courses. For program requirements, see: https://oucc.dasa.ncsu.edu/undergraduate-honors-program-in-business-analytics/

Questions about the Data Analytics Honors Program should be directed to data_analytics_honors@ncsu.edu

Department of Accounting

The accounting program provides education and training to individuals who plan to pursue careers as professional accountants in consulting, business, government, and industry. The Department of Accounting offers Bachelor of Science and Master of Accounting degrees. The Bachelor of Science degree provides a general business foundation including courses in business statistics, statistical programming and business analytics with a depth of specialization in accounting issues and skills. Students develop interpersonal, teamwork and problem-solving skills, and learn how to apply technology in the accounting field. The curriculum includes financial and managerial accounting, taxation, business law and ethics, auditing and accounting information systems. Five additional focus areas are offered: financial analysis, information systems, managerial accounting, internal auditing, and government/ non-profit accounting. High achieving students completing the Bachelor of Science in Accounting program may choose to apply directly to the Master of Accounting (MAC) program, earning the graduate degree with just one additional year of coursework. Successful completion of the graduate program qualifies students to sit for the Certified Public Accounting (CPA) exam. High performing students with a B.S. degree in other majors are also eligible to apply to the MAC program by completing online prerequisites.

The Master of Accounting (MAC) degree program produces professionals with a more specialized knowledge of accounting skills and satisfies the American Institute of Certified Public Accountants mandated 150-hour education requirement for certification.

A minor in accounting is also offered to students interested in gaining a basic knowledge of accounting to supplement another degree, or to prepare for a graduate program in Accounting.

Opportunities
The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

Curriculum and Degree Requirements

The accounting major requires that students complete 120 credits towards the degree. Additionally, accounting majors are subject to the university and college's residency requirements. In addition to completing 30 credit hours of their major course requirements for the accounting degree at NC State University, students must take ACC 450 and three of the following four courses at NC State: ACC 310, ACC 311, ACC 330 and ACC 340.

Accounting Department
Poole College of Management
3102 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/accounting

Kathy Krawczyk (https://poole.ncsu.edu/people/krawczyk/)
Interim Department Head
Dixon Hughes Goodman Professor of Accounting

Faculty

Interim Department Head
Kathy Krawczyk

Plans

- Accounting (BS) (p. 1436)
- Accounting (BS): Financial Analysis Concentration (p. 1438)
- Accounting (BS): Government/Nonprofit Concentration (p. 1441)
- Accounting (BS): Information Systems Concentration (p. 1444)
- Accounting (BS): Internal Auditing Concentration (p. 1447)
- Accounting (BS): Managerial Concentration (p. 1449)
- Accounting (Minor) (p. 1452)

Accounting (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Bachelor of Science in Accounting degree provides a general business foundation including courses in business statistics, statistical programming and business analytics with a depth of specialization in accounting issues and skills. Students develop interpersonal, teamwork and problem-solving skills, and learn how to apply technology in the accounting field. The curriculum includes financial and managerial accounting, taxation, business law and ethics, auditing and accounting information systems.

High achieving students completing the Bachelor of Science in Accounting program may choose to apply directly to the Master of Accounting (MAC) program, earning the graduate degree with just one additional year of coursework. Successful completion of the graduate program qualifies students to sit for the Certified Public Accounting (CPA) exam.

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Plan Requirements

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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>HI 214 History and Archaeology of Ancient Latin America</td>
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<td>PHI 221 Contemporary Moral Issues</td>
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<td>PHI 313 Ethical Problems in the Law</td>
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<td>MA 141 Calculus I</td>
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<td>MA 114 Introduction to Finite Mathematics with Applications</td>
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<td></td>
<td>or MA 242 Calculus III</td>
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### Interdisciplinary Perspectives
- **GEP Interdisciplinary Perspectives (p. 1426)**: 2

### Physical Education
- **GEP Health and Exercise Studies (p. 1422)**: 2

### Corequisites
- **GEP U.S. Diversity (p. 1431)** (verify requirement)
- **GEP Global Knowledge (p. 1419)** (verify requirement)

### Major Requirements (Non-Acc)
- **M 100 Personal and Professional Identity Development**: 1
- **MIE 201 Introduction to Business Processes**: 3
- **BUS 320 Financial Management**: 3
- **MIE 330 Human Resource Management**: 3
- **BUS 340 Information Systems Management**: 3
- **BUS 360 Marketing Methods**: 3
- **BUS 370 Operations and Supply Chain Management**: 3
- **MIE 305 Legal and Regulatory Environment**: 3
- **MIE 480 Business Policy and Strategy**: 3

### Major Requirements (Acc)
- **ACC 210 Concepts of Financial Reporting**: 2
- **ACC 220 Introduction to Managerial Accounting**: 1
- **ACC 310 Intermediate Financial Accounting I**: 1
- **ACC 311 Intermediate Financial Accounting II**: 1
- **ACC 330 An Introduction To Income Taxation**: 1
- **ACC 340 Accounting Information Systems**: 1
- **ACC 450 Auditing and Assurance Services**: 3

### Concentration
Choose concentration

### Free Electives
- **Free Electives**: 10

**Total Hours**: 120

1. C- or better
2. C+ or better
3. Students should consult their academic advisors to determine how to complete this requirement.

### Foreign Language 201
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<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<td>FLF 201</td>
<td>Intermediate French I</td>
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<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
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<td>FLG 201</td>
<td>Intermediate German I</td>
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<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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<td>FLI 201</td>
<td>Intermediate Italian I</td>
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<td>FLJ 201</td>
<td>Intermediate Japanese I</td>
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<td>Intermediate Hindi-Urdu I</td>
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<td>FLP 201</td>
<td>Intermediate Portuguese I</td>
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<td>FLR 201</td>
<td>Intermediate Russian I</td>
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<td>FLS 201</td>
<td>Intermediate Spanish I</td>
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<td>GRK 201</td>
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<td>LAT 201</td>
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<td>PER 201</td>
<td>Intermediate Persian I</td>
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### Semester Sequence
This is a sample.

#### First Year

**Fall Semester**
- **M 100 Personal and Professional Identity Development**: 1
- **ENG 101 Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)**: 4

Select one of the following:
- **MA 121 Elements of Calculus**: 3
- **MA 131 Calculus for Life and Management Sciences A**: 3
- **MA 141 Calculus I**: 3
- **FLx 201** or **MA 242 Introduction to Finite Mathematics with Applications or Calculus III**: 3
- **Communications or Humanities (p. 1436)**: 3
- **ENG 101 Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)**: 4
- **EC 201 Principles of Microeconomics or Introduction to Agricultural & Resource Economics**: 3
- **ACC 210 Concepts of Financial Reporting**: 1

**Total Hours**: 15

**Spring Semester**
- **MA 114 Introduction to Finite Mathematics with or MA 242 Applications or Calculus III**: 3
- **Communications or Humanities (p. 1436)**: 3
- **ENG 101 Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)**: 4
- **EC 201 Principles of Microeconomics or Introduction to Agricultural & Resource Economics**: 3
- **ACC 210 Concepts of Financial Reporting**: 1

**Total Hours**: 16

### Acad Writing Research

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<td>FLE 101</td>
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### Transfer Sequence
- **ENG 202 Disciplinary Perspectives in Writing**: 3
- **ENG 1GEP 100 Level English Composition**: 3
### Second Year
#### Fall Semester
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<td>BUS 340</td>
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<td>BUS/ST 350</td>
<td>Economics and Business Statistics</td>
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<td>Principles of Macroeconomics</td>
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<td>BUS 351</td>
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<td>BUS 370</td>
<td>Operations and Supply Chain Management</td>
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<td>MIE 305</td>
<td>Legal and Regulatory Environment</td>
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<td>MIE 330</td>
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<td>PSY 200</td>
<td>Introduction to Psychology</td>
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<td>BUS 320</td>
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1 A grade of C- or better is required.

2 Students must also take one course from the Poole College of Management Ethics list – MIE 306 Managing Ethics in Organizations, PHI 214 Issues in Business Ethics, PHI 221 Contemporary Moral Issues, PHI 313 Ethical Problems in the Law, PHI 375 Ethics (no credit hour requirement). If a student takes a PHI course to satisfy the Ethics requirement, it may double-count as the second humanities course provided the first course was not also a PHI course.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

### GPA Graduation Requirements
- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all ACC courses attempted at NC State must be 2.0 or higher

### Career Opportunities
The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

### Accounting (BS): Financial Analysis Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Financial analysis deals with the body of rules and procedures governing the preparation and analysis of general-purpose financial statements (e.g., balance sheet, income statement, statement of cash flows). These financial statements are designed to provide readers with information that will be useful in making decisions relevant to operating their businesses, managing their investments, and evaluating the performance of employees, managers, and executives.
Curriculum Overview:

Students in the financial analysis concentration develop skills in the areas of financial accounting, financial statement analysis, and traditional topics in finance (e.g., investments, portfolio analysis, and capital budgeting). This skill set provides a foundation for graduate-level study in accounting or finance and prepares students for careers in public accounting, corporate accounting, and governmental or not-for-profit organizations.

The Financial Analysis concentration is designed to prepare students in the following areas:

- Reasoning/problem solving capabilities
- Thorough understanding of generally accepted accounting principles (GAAP)
- Preparation and analysis of data and information
- Use of financial management decision tools
- Ability to “get behind the numbers” and understand financial reports
- Personal financial planning and management insight

Accounting Department:

Poole College of Management,
3102 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565

Kathy Krawczyk
Interim Department Head
Dixon Hughes Goodman Professor of Accounting

Plan Requirements

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<td>Argumentation and Advocacy</td>
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1. C- or better
2. C+ or better
3. Students should consult their academic advisors to determine how to complete this requirement.

### Acad Writing Research

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### Spring Semester

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### Hours

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### Second Year

#### Fall Semester

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### Hours

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### Spring Semester

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### Semester Sequence

This is a sample.

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### GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all ACC courses attempted at NC State must be 2.0 or higher

### Career Opportunities

The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

### Accounting (BS): Government/Nonprofit Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The field of accounting for government agencies and nonprofit organizations focuses on careers in public service and provides students with the elemental tools necessary for understanding organizations not motivated by profit-seeking. Emphasis is placed on understanding the role of accounting in nonprofit and government agencies and the accounting procedures and devices necessary to provide accountability to the public.

### Curriculum Overview:

The government/nonprofit concentration is designed for students interested in general or financial management of nonprofit organizations and government organizations. All levels of government – local, state, and federal – provide opportunities in the areas of auditing, financial management, and budgeting. In addition, students versed in government and nonprofit accounting have opportunities in public accounting since most local governments and nonprofits are audited not by government auditors but by public accounting firms.

The government/nonprofit concentration is designed to prepare students in the following areas:

- The ability to make insightful contributions to the strategic planning process
- The knowledge to design measures that focus and motivate the organization’s employees and activities
- Understanding of budgeting, audit and financial analysis issues unique to government and nonprofit entities

### Concentration

- Auditing and Assurance Services
- Concentration
- GEP Interdisciplinary Perspectives (p. 1426)
- Free Elective
- GEP Humanities (p. 1423)

### Hours

15

### Spring Semester

- Concentration
- MIE 480 Business Policy and Strategy
- Free Electives

### Hours

12

### Total Hours

120

---

1 A grade of C- or better is required.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).
## Plan Requirements

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### Major Requirements (Non-Acc)

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### Major Requirements (Acc)

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<td>ACC 310</td>
<td>Intermediate Financial Accounting I</td>
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<td>ACC 311</td>
<td>Intermediate Financial Accounting II</td>
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<td>ACC 330</td>
<td>An Introduction To Income Taxation</td>
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<td>ACC 340</td>
<td>Accounting Information Systems</td>
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<td>ACC 450</td>
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### Concentration

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<tr>
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<td>Governmental and Nonprofit Accounting</td>
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<td>COM 466</td>
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<tr>
<td>HI 380</td>
<td>History of Nonprofits, Philanthropy, and Social Change</td>
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<td>PS 202</td>
<td>State and Local Government</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<td>PS 312</td>
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### Free Electives

Free Electives | 3 | 13 | 

**Total Hours** | 120

---

1. C- or better
2. C+ or better
3. Students should consult their academic advisors to determine how to complete this requirement.

### Acad Writing Research

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### Transfer Sequence

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### Foreign Language 201

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<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<td>FLF 201</td>
<td>Intermediate French I</td>
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### Semester Sequence

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<td>MA 141</td>
<td>Calculus I</td>
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<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications or Calculus III</td>
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<td>Interpersonal Communication</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
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<td>Principles of Microeconomics or Introduction to Agricultural &amp; Resource Economics</td>
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<td>ACC 460</td>
<td>Governmental and Nonprofit Accounting</td>
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### Accounting (BS): Information Systems Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The field of accounting information systems focuses on the flow of accounting information within a company and between a company and its external trading partners. Accounting is at the heart of a company's information system, supporting critical business processes. Organizations use information systems and technology to process and analyze data, streamline activities, and manage resources and assets.

**Curriculum Overview:**
The information systems concentration, in accounting, is designed to build an understanding of key business processes, the components of an effective entity-wide internal control structure, the process by which efficient database design can be used to improve accounting information, and contemporary issues involved in providing assurance services for systems and database reliability. Topics of study include information systems-related internal controls, business processes, systems security and privacy, database management, e-commerce and enterprise resource planning systems theory.

The information systems concentration is designed to prepare students in the following areas:

- Proficiency in accounting software
- Knowledge and use of enterprise resource planning software
- Database modeling and development
- Understanding of business processes and information systems controls
- Conceptual orientation of information for managerial and financial decisions

### Plan Requirements

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<tr>
<td>COM 110</td>
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<td>Principles of Macroeconomics</td>
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<td>Contemporary Moral Issues</td>
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<td>Probability and Statistics for Engineers</td>
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<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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<td>Predictive Analytics for Business</td>
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<td>M 100</td>
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NC State University 1445
### Semester Sequence

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#### First Year

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<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
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<td>MA 141</td>
<td>Calculus I</td>
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<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
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<td>EC 201</td>
<td>Principles of Microeconomics or Introduction to Agricultural &amp; Resource Economics</td>
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<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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<td>Interpersonal Communication (GEP Humanities (p. 1423))</td>
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<td>Argumentation and Advocacy (GEP Humanities (p. 1423))</td>
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<td>BUS/ST 350</td>
<td>Economics and Business Statistics</td>
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<td>BUS 360</td>
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<td>MIE 330</td>
<td>Human Resource Management</td>
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<td>Introduction to Psychology</td>
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#### Spring Semester

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<td>Marketing Methods</td>
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<td>Legal and Regulatory Environment</td>
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### Spring Semester

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1 A grade of C- or better is required.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

### GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all ACC courses attempted at NC State must be 2.0 or higher

### Career Opportunities

The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

### Accounting (BS): Internal Auditing Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organization’s operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate, monitor and improve the effectiveness of risk management, control, and governance processes (IPPF, Institute of Internal Auditors, 2009).

**Curriculum Overview:**
Students in the internal audit concentration learn practical knowledge of the role and the best practices of internal auditing in governance, risk management and control. Students develop skills in planning and conducting internal audit assurance engagements. The internal auditing concentration gives students an understanding of fraud risk management and computerized auditing techniques.

**Accounting Department:**
Poole College of Management  
3102 Nelson Hall  
Raleigh, NC 27695  
Phone: (919) 515-5565  
https://poole.ncsu.edu/accounting

Kathy Krawczyk  
Interim Department Head  
Dixon Hughes Goodman Professor of Accounting

### Plan Requirements

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<td>MA 131 Calculus for Life and Management Sciences A</td>
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<td>ST 372 Introduction to Statistical Inference and Regression</td>
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<td>BUS 351 Predictive Analytics for Business</td>
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GEP Global Knowledge (p. 1419) (verify requirement)

**Major Requirements (Non-Acc)**

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**Major Requirements (Acc)**

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<td>An Introduction To Income Taxation</td>
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**Concentration**

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**Free Electives**

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Total Hours: 120

1. C- or better
2. C+ or better
3. Students should consult their academic advisors to determine how to complete this requirement.

**Acad Writing Research**

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**Transfer Sequence**

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<td>Disciplinary Perspectives in Writing</td>
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**Foreign Language 201**

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**Concentration Electives**

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**Semester Sequence**

This is a sample.

**First Year**

**Fall Semester**

| Course   | Title                                                                 | Hours |
|----------|                                                                      |-------|
| M 100    | Personal and Professional Identity Development                        | 1     |
| ENG 101  | Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab) | 4     |
| MA 121   | Elements of Calculus                                                 | 3     |
| MA 131   | Calculus for Life and Management Sciences A                           | 3     |
| MA 141   | Calculus I                                                            | 3     |
| FLN 201  | Intermediate Hindi-Urdu I                                             | 3     |
| MIE 201  | Introduction to Business Processes                                   | 3     |
| GEP Health and Exercise Studies (p. 1422) | | 1 |

**Spring Semester**

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Students should consult their academic advisors to determine how to complete this requirement.

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**Transfer Sequence**

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## Second Year
### Fall Semester
- ACC 220 Introduction to Managerial Accounting 3
- COM 110 Public Speaking (GEP Humanities (p. 1423)) 3
- COM 112 Interpersonal Communication (GEP Humanities (p. 1423))
- COM 211 Argumentation and Advocacy (GEP Humanities (p. 1423))
- GEP Humanities (p. 1423) 3
- BUS/ST 350 Economics and Business Statistics 3
- GEP Natural Sciences (p. 1429) 3
- EC 202 Principles of Macroeconomics 3

### Spring Semester
- ACC 310 Intermediate Financial Accounting I 3
- BUS 340 Information Systems Management 3
- BUS 320 Financial Management 3
- BUS 360 Marketing Methods 3
- BUS 370 Operations and Supply Chain Management 3
- MIE 305 Legal and Regulatory Environment 3
- MIE 330 Human Resource Management 3
- PSY 200 Introduction to Psychology 3
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- ST 307 Introduction to Statistical Programming-SAS 1

### Hours
- Spring Semester: 15
- Total Hours: 30

## Third Year
### Fall Semester
- ACC 311 Intermediate Financial Accounting II 3
- ACC 340 Accounting Information Systems 3
- BUS 320 Financial Management 3
- BUS 360 Marketing Methods 3
- BUS 370 Operations and Supply Chain Management 3
- MIE 305 Legal and Regulatory Environment 3
- MIE 330 Human Resource Management 3
- ENG 331 Communication for Engineering and Technology 3
- ENG 332 Communication for Business and Management 3
- ENG 333 Communication for Science and Research 3
- GEP Health and Exercise Studies (p. 1422) 1

### Hours
- Third Year: 16
- Total Hours: 46

## Spring Semester
- ACC 330 An Introduction To Income Taxation 3
- BUS 320 Financial Management 3
- BUS 360 Marketing Methods 3

## Fourth Year
### Fall Semester
- ACC 450 Auditing and Assurance Services 3
- MIE 480 Business Policy and Strategy 3
- BUS 320 Financial Management 3
- BUS 360 Marketing Methods 3
- BUS 370 Operations and Supply Chain Management 3
- MIE 305 Legal and Regulatory Environment 3
- MIE 330 Human Resource Management 3
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- ST 307 Introduction to Statistical Programming-SAS 1

### Hours
- Fourth Year: 15
- Total Hours: 60

1 A grade of C- or better is required.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

### GPA Graduation Requirements
- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all ACC courses attempted at NC State must be 2.0 or higher

### Career Opportunities
The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

### Accounting (BS): Managerial Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Managerial accounting is more than simply compiling and delivering financial data. Managerial accounting focuses on the implications of financial data in the broad context of managing an organization and how financial information impacts every aspect of the business. Important aspects of managerial accounting include analyzing numbers to evaluate the supply chain and evaluating business processes and cost.

### Curriculum Overview:
The managerial accounting concentration is designed for students who are interested in careers within business, government, or not-for-profit organizations. The concentration allows students to combine interests in both accounting and business. The coursework is designed to prepare students for the events that are shaping the future of the accounting and finance profession and to equip them with the skills and competencies crucial for career success.

The Managerial concentration is designed to prepare students in the following areas:

- The ability to make insightful contributions to the strategic planning process
- The knowledge to design measures that focus and motivate the organization’s employees and activities
- The skills to develop information and analyses that provide insight into how value is being created and how progress is being matched to strategic initiatives
- An integrated view of how accounting and finance interact with other business functions

**Accounting Department**
Poole College of Management
3102 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/accounting/

Kathy Krawczyk (https://poole.ncsu.edu/people/krawczyk/)
Interim Department Head
Dixon Hughes Goodman Professor of Accounting

**Plan Requirements**

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### Acad Writing Research

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<td>FLG 201</td>
<td>Intermediate German I</td>
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<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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<tr>
<td>FLI 201</td>
<td>Intermediate Italian I</td>
<td>3</td>
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<td>FLJ 201</td>
<td>Intermediate Japanese I</td>
<td>3</td>
</tr>
<tr>
<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<td>FLR 201</td>
<td>Intermediate Russian I</td>
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<tr>
<td>FLS 201</td>
<td>Intermediate Spanish I</td>
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</tr>
<tr>
<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture</td>
<td>3</td>
</tr>
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<td>GRK 201</td>
<td>Intermediate Greek I</td>
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<tr>
<td>LAT 201</td>
<td>Intermediate Latin I</td>
<td>3</td>
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<tr>
<td>PER 201</td>
<td>Intermediate Persian I</td>
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### Concentration Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BUS 470</td>
<td>Operations Modeling and Analysis</td>
<td>3</td>
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<tr>
<td>BUS 472</td>
<td>Operations Planning and Control Systems</td>
<td>3</td>
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<tr>
<td>BUS 473</td>
<td>Supply Chain Strategy</td>
<td>3</td>
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<tr>
<td>BUS 475</td>
<td>Purchasing and Supply Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS 479</td>
<td>Supply Chain Management Undergraduate Practicum</td>
<td>3</td>
</tr>
<tr>
<td>MIE 335</td>
<td>Organizational Behavior</td>
<td>3</td>
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</table>

### Semester Sequence

This is a sample.

#### First Year

##### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>M 100</td>
<td>Personal and Professional Identity Development</td>
<td>1</td>
</tr>
</tbody>
</table>
### GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all ACC courses attempted at NC State must be 2.0 or higher

### Career Opportunities

The field of accounting deals with identifying, measuring and communicating information to assist individuals and companies in making informed economic decisions. Accounting provides students with excellent career opportunities. Individuals graduating with an accounting degree can expect to be exposed to all aspects of an organization from a broad top-down perspective.

### Accounting (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Accounting Minor helps students:

- Gain familiarity with financial accounting, managerial accounting, and other accounting topics.
- Understand that accounting is an information system for measuring, processing, and communicating financial information about economic entities.
- Understand how accounting information allows users to make reasoned choices among alternative uses of scarce resources in the conduct of business and economic activities.

### Declaring the Minor

Students should complete the declaration form available at https://goo.gl/forms/whNchXFKPWr9Auz1 (https://goo.gl/forms/whNchXFKPWr9Auz1/) before starting classes for the minor to allow greater access to classes.

### Certification

The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. If transfer credits contribute to the completion of the minor, students need to ensure that official transcripts are sent and processed at NC State.

### Plan Requirements

- A grade of 'C-' or better in all courses used to satisfy the minor.
- An overall GPA of 2.0 or better for all ACC minor courses in the program of study
- Courses credited to the minor may not be taken for credit only (pass/fail).
- Students may transfer in up to 9 credits (6 max at the 300/400 level) towards the minor.

---

1 A grade of C- or better is required.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).
All transfer credits must be approved by the Poole College of Management Office of Undergraduate Programs in Nelson 2150.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses
Select nine credit hours of any 300 or 400 level accounting course 9

Total Hours 15

Students should make sure that they have met all required prerequisites for 300- and 400-level courses

Department of Business Management

The Bachelor of Science degree in Business Administration is offered jointly by faculty in the Department of Business Management and the Department of Management, Innovation and Entrepreneurship.

The Business Administration degree program prepares students for careers in business, consulting, government, or nonprofit organizations as well as for graduate study in business, law, and related fields. The curriculum focuses on strategic integration of the core business functions. All students take foundation courses in finance, marketing, human resource management, entrepreneurship, business law, supply chain/operations management, information systems and strategic management, and select a concentration for more in-depth study. The curriculum emphasizes analytical thinking skills and an entrepreneurial mindset and provides students with skills in information technology and its application, problem solving and ethical thinking for decision making, and data analytics and the use of data for decision making in a global strategic context.

Concentration areas are listed below:

- Entrepreneurship
- Finance
- Human Resource Management
- Information Technology
- Marketing
- Operations and Supply Chain Management

Two minors are also offered - Business Administration for students interested in gaining a basic knowledge of business practice to supplement another degree, and Business Entrepreneurship for students interested in the process of identifying, evaluating, and implementing business opportunities that focus on value creation.

A certificate in the Essentials of Business is also offered to NC State undergraduate students and to Non-Degree Seeking (NDS) students. This 12-credit certificate gives students an introductory perspective on business functions and the way businesses operate.

Opportunities

Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Curriculum and Degree Requirements

The business administration major requires that students complete 120 credits towards the degree. Additionally, business administration majors are subject to the university and college's residency requirements. In addition to completing at least 30 credit hours while officially enrolled as a degree candidate in either the Business Administration or Accounting program, students must complete at least 30 credit hours of the major course requirements for the degree at NC State University.

Business Management
Poole College of Management
2300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/business-management/

Sebastian Heese
Interim Department Head
Owens Distinguished Professorship of Supply Chain Management

Management, Innovation, and Entrepreneurship
Poole College of Management
1300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/mie/

Bradley Kirkman
Department Head
Professor of Management

Faculty

Department Head

H. Sebastian Heese-Business Management (Interim)

Brad Kirkman-Management, Innovation & Entrepreneurship

Plans

- Business Administration (BS) (p. 1454)
- Business Administration (BS): Entrepreneurship Concentration (p. 1456)
- Business Administration (BS): Finance Concentration (p. 1458)
- Business Administration (BS): Human Resources Concentration (p. 1461)
- Business Administration (BS): Information Technology Concentration (p. 1464)
- Business Administration (BS): Marketing Concentration (p. 1466)
- Business Administration (BS): Operations/Supply Chain Management (p. 1469)
- Business Administration (BS): Undeclared (p. 1472)
- Business Administration (Minor) (p. 1474)
- Business Entrepreneurship (Minor) (p. 1474)
Business Analytics Honors Program

The Business Analytics Honors Program (https://oucc.dasa.ncsu.edu/undergraduate-honors-program-in-business-analytics/) offers eligible Poole College undergraduate students additional preparation for careers in the high-demand field of business analytics. The Business Analytics Honors Program combines challenging analytics coursework with a practicum course that engages students with local employers working on real world business analytics projects. Admission to this program is competitive and based on prior academic achievement.

Business Administration (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td><strong>Humanities and Social Sciences</strong></td>
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<tr>
<td>Acad Writing Research (p. 1454)</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Foreign Language 201 (p. 1454)</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>COM 110</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>PSY 200</td>
<td>Introduction to Psychology</td>
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<td>Select one of the following:</td>
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<td>ARE 201</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>ARE 201A</td>
<td>Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>EC 202</td>
<td>Principles of Macroeconomics</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences)</td>
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<td>MIE 306</td>
<td>Managing Ethics in Organizations</td>
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<td>PHI 214</td>
<td>Issues in Business Ethics</td>
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<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<td>PHI 313</td>
<td>Ethical Problems in the Law</td>
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<td>PHI 375</td>
<td>Ethics</td>
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<td>Select one of the following:</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td></td>
</tr>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<tr>
<td>or MA 242</td>
<td>Calculus III</td>
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<td>BUS 350</td>
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<td>ST 350</td>
<td>Economics and Business Statistics</td>
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<tr>
<td>ST 312</td>
<td>Introduction to Statistics II</td>
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<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<tr>
<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
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<tr>
<td>BUS 351</td>
<td>Predictive Analytics for Business</td>
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<td>ST 307</td>
<td>Introduction to Statistical Programming- SAS</td>
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<td><strong>Interdisciplinary Perspectives</strong></td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td><strong>Corequisites</strong></td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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<td>M 100</td>
<td>Personal and Professional Identity Development</td>
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<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td>3</td>
</tr>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<td>BUS 320</td>
<td>Financial Management</td>
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<td>MIE 330</td>
<td>Human Resource Management</td>
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<td>BUS 340</td>
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<td>BUS 360</td>
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<td>BUS 370</td>
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<td>MIE 305</td>
<td>Legal and Regulatory Environment</td>
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<td>MIE 480</td>
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<td>Select 12 credit hours</td>
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<td><strong>Free Electives</strong></td>
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<td><strong>Total Hours</strong></td>
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1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>FLE 101</td>
<td>Academic Writing and Research</td>
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Transfer Sequence

<table>
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<tr>
<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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Foreign Language 201

<table>
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<tr>
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<tbody>
<tr>
<td>FLA 201</td>
<td>Intermediate Arabic I</td>
<td>3</td>
</tr>
<tr>
<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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</tr>
<tr>
<td>FLF 201</td>
<td>Intermediate French I</td>
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</tr>
<tr>
<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
<td>3</td>
</tr>
<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
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### Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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<td>FLI 201</td>
<td>Intermediate Italian I</td>
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<td>FLJ 201</td>
<td>Intermediate Japanese I</td>
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<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<td>Intermediate Portuguese I</td>
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<td>FLR 201</td>
<td>Intermediate Russian I</td>
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<tr>
<td>FLS 201</td>
<td>Intermediate Spanish I</td>
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</tr>
<tr>
<td>FLS 212</td>
<td>Spanish: Language, Technology, Culture</td>
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<td>GRK 201</td>
<td>Intermediate Greek I</td>
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<td>LAT 201</td>
<td>Intermediate Latin I</td>
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</tr>
<tr>
<td>PER 201</td>
<td>Intermediate Persian I</td>
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**First Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 100</td>
<td>Personal and Professional Identity Development</td>
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</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
<td>4</td>
</tr>
<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
<td>1</td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
<td>1</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>1</td>
</tr>
<tr>
<td>FLx 201</td>
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</tr>
<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications or Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>COM 110</td>
<td>Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
</tr>
<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
<td>4</td>
</tr>
<tr>
<td>EC 201</td>
<td>Principles of Microeconomics or Introduction to Agricultural &amp; Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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</table>

**Hours**

15

**Second Year**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<tr>
<td>BUS 340</td>
<td>Information Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>BUS/ST 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>EC 202</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BUS 351</td>
<td>Predictive Analytics for Business</td>
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<tr>
<td>Select two of the following:</td>
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<tr>
<td>BUS 320</td>
<td>Financial Management</td>
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<tr>
<td>BUS 360</td>
<td>Marketing Methods</td>
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<tr>
<td>MIE 305</td>
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<tr>
<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
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**Hours**

16

**Third Year**

**Fall Semester**

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<td>MIE 305</td>
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<td>Introduction to Entrepreneurship</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>Free Electives</td>
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**Hours**

15

**Spring Semester**

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**Hours**

15
Fourth Year
Fall Semester
Select two Concentration courses
GEP Interdisciplinary Perspectives (p. 1426)
GEP Humanities (p. 1423)
Free Elective
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Spring Semester
MIE 480 Business Policy and Strategy
Concentration course
Free Electives
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Total Hours 120

1 Must be completed with “C-” or better.

Students must also complete as a part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

GPA Graduation Requirements

• Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
• Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

Career Opportunities

Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Business Administration (BS): Entrepreneurship Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Entrepreneurship is the general description given to the process of identifying business opportunities, developing implementation plans to capitalize on those opportunities, and building and growing new ventures. A new venture can describe a variety of business applications including new businesses, new opportunities for established businesses, new nonprofits, as well as many other possibilities.

Curriculum Overview

The entrepreneurship concentration is cross-disciplinary, focusing on the challenges of establishing and managing new and growing ventures. The business environment and management skills required for success in new ventures are significantly different from those in established, mature organizations. The entrepreneurship concentration is relevant to students preparing to work in a variety of entrepreneurial environments.

The entrepreneurship concentration is designed to prepare students in the following areas:

• Integration of business concepts as they relate to an entrepreneurial venture
• Building and growing a new venture Understanding the investment communities for new ventures
• Identification and analysis of opportunities
• Researching, writing and presenting a business plan
• Idea generation

Management, Innovation, and Entrepreneurship
Poole College of Management
1300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/mie/

Bradley Kirkman
Department Head
Professor of Management

Plan Requirements

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<tr>
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<td>Introduction to Psychology</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>PHI 214</td>
<td>Issues in Business Ethics</td>
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<td>PHI 221</td>
<td>Contemporary Moral Issues</td>
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<tr>
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<td>Introduction to Finite Mathematics with Applications</td>
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or MA 242 Calculus III
Select one of the following: 1
BUS 350 Economics and Business Statistics
ST 350 Economics and Business Statistics
ST 312 Introduction to Statistics II
ST 370 Probability and Statistics for Engineers
ST 372 Introduction to Statistical Inference and Regression
BUS 351 Predictive Analytics for Business
ST 307 Introduction to Statistical Programming- SAS

Interdisciplinary Perspectives
GEP Interdisciplinary Perspectives (p. 1426) 2

Physical Education
GEP Health and Exercise Studies (p. 1422) 2

Corequisites
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

Major Requirements
M 100 Personal and Professional Identity Development 1
MIE 201 Introduction to Business Processes 3
ACC 210 Concepts of Financial Reporting 1
ACC 220 Introduction to Managerial Accounting 1 3
MIE 310 Introduction to Entrepreneurship 3
BUS 320 Financial Management 3
MIE 330 Human Resource Management 3
BUS 340 Information Systems Management 3
BUS 360 Marketing Methods 3
BUS 370 Operations and Supply Chain Management 3
MIE 305 Legal and Regulatory Environment 3
MIE 480 Business Policy and Strategy 3

Concentration
MIE 410 Business Opportunity Analysis 3
MIE 412 Finance and Accounting for Entrepreneurs 3
MIE 413 New Venture Planning 3
Select one of the following: 3
MIE 412 Finance and Accounting for Entrepreneurs
MIE 416 The Legal Dynamics of Entrepreneurship
MIE 418 Social Entrepreneurship Practicum
MIE 419 Entrepreneurship Practicum

Free Electives
Free Electives (12 Hr S/U Lmt) 2 19

Total Hours 120

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

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Foreign Language 201

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<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<td>FLF 201</td>
<td>Intermediate French I</td>
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<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
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<td>FLG 201</td>
<td>Intermediate German I</td>
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<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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<td>FLN 201</td>
<td>Intermediate Hindi-Urdu I</td>
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<td>FLP 201</td>
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<td>LAT 201</td>
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<td>PER 201</td>
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Semester Sequence

This is a sample.

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Select one of the following: 1
MA 121 | Elements of Calculus                                                    | 3     |
MA 131 | Calculus for Life and Management Sciences A                           |       |
MA 141 | Calculus I                                                             |       |
FLx 201 | Introduction to Business Processes                                     | 3     |
MIE 201 | Introduction to Business Processes                                     | 3     |
GEP Health and Exercise Studies (p. 1422) | | 1 |

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Spring Semester

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Select one of the following: 3
COM 110 | Public Speaking                                                        |       |
COM 112 | Interpersonal Communication                                            |       |
COM 211 | Argumentation and Advocacy                                             |       |
GEP Humanities (p. 1423) | | 2 |
| ENG 101 | Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab) | 4     |

Acad Writing Research

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Transfer Sequence

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<td>Disciplinary Perspectives in Writing</td>
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BUS 320  Financial Management
BUS 340  Information Systems Management
BUS 360  Marketing Methods
BUS 370  Operations and Supply Chain Management
MIE 305  Legal and Regulatory Environment
MIE 310  Introduction to Entrepreneurship
MIE 330  Human Resource Management

Concentration course 3
Free Elective 6

Hours 15

Fourth Year
Fall Semester
Select two Concentration courses 6
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP Humanities (p. 1423) 2 3
Free Elective 4

Hours 15

Spring Semester
MIE 480  Business Policy and Strategy 3
Concentration course 3
Free Electives 6

Hours 12
Total Hours 120

1  Must be completed with “C-” or better.
2  If a student takes a PHI course to satisfy the Ethics requirement, it may double-count as the second humanities course provided the first course was not also a PHI course.

Students must also complete as a part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

GPA Graduation Requirements
• Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
• Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

Career Opportunities
Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Business Administration (BS): Finance Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)! All businesses, large and small, must make financial decisions. Such decisions include the raising of funds necessary to operate, the cost of
these funds, and a careful analysis of the use of these funds. In addition, individuals must make financial decisions throughout their lives in terms of building assets to meet their financial goals. Finance involves the study of all of these issues, whether for businesses or individuals, and the application of the tools needed to successfully make the crucial financial decisions that must be made on an ongoing basis.

Curriculum Overview
Students in the finance concentration focus on financial markets, the allocation of financial resources by individuals, corporations and other groups, and the tools financial managers use to make business decisions. Topics of study include financial analysis and management, investment analysis and portfolio management, financial markets, business valuation, risk management, personal finance, and international finance.

The finance concentration is designed to prepare students in the following areas:

- Financial and decision-making skills for a wide range of applications
- The integration of finance across functional areas of an organization
- Expertise to exercise sound judgment in professional and personal financial decisions

Business Management
Poole College of Management
2300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/business-management/

Sebastian Heese
Interim Department Head
Owens Distinguished Professorship of Supply Chain Management

Plan Requirements

<table>
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<tr>
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<td>Select one of the following: (verify requirement)</td>
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MIE 306 | Managing Ethics in Organizations |
PHI 214 | Issues in Business Ethics |
PHI 221 | Contemporary Moral Issues |
PHI 313 | Ethical Problems in the Law |
PHI 375 | Ethics |

Mathematical and Natural Sciences

GEP Natural Sciences (p. 1429) 7
Select one of the following: 3
MA 121 | Elements of Calculus |
MA 131 | Calculus for Life and Management Sciences A |
MA 141 | Calculus I |
MA 114 | Introduction to Finite Mathematics with Applications or MA 242 | 3 |
| Calculus III | |
| Select one of the following: | 3 |
| BUS 350 | Economics and Business Statistics |
| ST 350 | Economics and Business Statistics |
| ST 312 | Introduction to Statistics II |
| ST 370 | Probability and Statistics for Engineers |
| ST 372 | Introduction to Statistical Inference and Regression |
| BUS 351 | Predictive Analytics for Business |
| ST 307 | Introduction to Statistical Programming- SAS |

Interdisciplinary Perspectives

GEP Interdisciplinary Perspectives (p. 1426) 2

Physical Education

GEP Health and Exercise Studies (p. 1422) 2

Corequisites

GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

Major Requirements

M 100 | Personal and Professional Identity Development |
MIE 201 | Introduction to Business Processes |
ACC 210 | Concepts of Financial Reporting |
ACC 220 | Introduction to Managerial Accounting |
MIE 310 | Introduction to Entrepreneurship |
BUS 320 | Financial Management |
MIE 330 | Human Resource Management |
BUS 340 | Information Systems Management |
BUS 360 | Marketing Methods |
BUS 370 | Operations and Supply Chain Management |
MIE 305 | Legal and Regulatory Environment |
MIE 480 | Business Policy and Strategy |

Concentration

BUS 420 | Financial Management of Corporations |
BUS 422 | Investments and Portfolio Management |
Select two of the following: 6
| BUS 425 | Advanced Personal Financial Management |
| BUS 426 | International Financial Management |
| BUS 428 | Financial Analytics |
| BUS 429 | Financial Modeling |

Free Electives
Free Electives (12 Hr S/U Lmt) ²

Total Hours 120

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<td>FLE 101</td>
<td>Academic Writing and Research</td>
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Transfer Sequence

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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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Foreign Language 201

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<td>PER 201</td>
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Semester Sequence

This is a sample.

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| First Year Fall Semester
| M 100    | Personal and Professional Identity Development | 1     |
| ENG 101  | Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab) ¹ | 4     |

Select one of the following: ¹

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>MA 121</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>MA 141</td>
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<tr>
<td>FLx 201</td>
<td>Introduction to Business Processes</td>
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</tbody>
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| Second Year Fall Semester
| ACC 220 | Introduction to Managerial Accounting ¹ | 3     |

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>COM 112</td>
<td>Interpersonal Communication</td>
<td>3</td>
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<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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| Second Year Spring Semester
| ST 307 | Introduction to Statistical Programming-SAS | 1     |

| Second Year Spring Semester
| Select three of the following:
| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |
| MIE 305 | Legal and Regulatory Environment   | 3     |
| MIE 310 | Introduction to Entrepreneurship   | 3     |
| MIE 330 | Human Resource Management          | 3     |
| PSY 200 | Introduction to Psychology         | 3     |

| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
| Select three of the following:
| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |

| Third Year Fall Semester
| Select two of the following:
| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |

GEP Health and Exercise Studies (p. 1422) 1

Spring Semester

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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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GEP Humanities (p. 1423) ²

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<th>Hours</th>
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<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)¹</td>
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<td>EC 201</td>
<td>Principles of Microeconomics ¹</td>
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<tr>
<td>or ARE 201</td>
<td>or Introduction to Agricultural &amp; Resource Economics</td>
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ACC 210 | Concepts of Financial Reporting ¹ | 3     |

Second Year Fall Semester

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<td>Introduction to Managerial Accounting ¹</td>
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Select one of the following:

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<th>Title</th>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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| GEP Humanities (p. 1423) ²
| Select three of the following:
| BUS/ST 350 | Economics and Business Statistics ¹ | 3     |
| GEP Natural Sciences (p. 1429) | 3 |
| EC 202 | Principles of Macroeconomics ³ | 3     |

GEP Health and Exercise Studies (p. 1422) 1

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<thead>
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<tr>
<td>PSY 200</td>
<td>Introduction to Psychology</td>
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</table>
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
| Select three of the following:
| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |

| MIE 305 | Legal and Regulatory Environment   | 3     |
| MIE 310 | Introduction to Entrepreneurship   | 3     |
| MIE 330 | Human Resource Management          | 3     |
| PSY 200 | Introduction to Psychology         | 3     |

| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
| Select three of the following:
| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |

| MIE 305 | Legal and Regulatory Environment   | 3     |
| MIE 310 | Introduction to Entrepreneurship   | 3     |
| MIE 330 | Human Resource Management          | 3     |
| PSY 200 | Introduction to Psychology         | 3     |

| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
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| BUS 320 | Financial Management               | 3     |
| BUS 340 | Information Systems Management     | 3     |
| BUS 360 | Marketing Methods                  | 3     |
| BUS 370 | Operations and Supply Chain Management | 3     |

| MIE 305 | Legal and Regulatory Environment   | 3     |
| MIE 310 | Introduction to Entrepreneurship   | 3     |
| MIE 330 | Human Resource Management          | 3     |
| PSY 200 | Introduction to Psychology         | 3     |
Career Opportunities

Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Business Administration (BS): Human Resources Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The world economy is clearly changing. The majority of organizations today are in the business of providing services. The list is endless: information technology, communication, financial, medical, education, communication, food and entertainment, consulting... Today more than ever, the viability and true value of a business is determined less by its investment in facilities, equipment, and inventory, but by the value-added of its employees. Companies that employ better workers, and manage them better, are more successful. That means that the effective management of human resources is more critical than it has ever been. The field of human resource management focuses on just that – effectively developing and managing the organization’s most valuable asset – its people.

Curriculum Overview

Students in the human resource management concentration learn how to design and implement programs to more effectively manage the organization’s employees. This includes staffing (planning, recruitment, and selection of employees); training and development; performance management; leadership; compensation and benefits administration; employee relations; and employee health, safety, and security.

The human resource management concentration is designed to prepare students in the following areas:

- Core human resource management knowledge
- Employment and workplace law Integration of human resource management with other operational and business functions
- Critical thinking and analysis
- Professional networking and presentations

Management, Innovation, and Entrepreneurship
Poole College of Management
1300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/mie/

Bradley Kirkman
Department Head
Professor of Management

Plan Requirements

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<tr>
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<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
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<td>MIE 330</td>
<td>Human Resource Management</td>
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<td>ENG 332</td>
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<td>ENG 333</td>
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Spring Semester

Select two of the following: 6

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<td>MIE 305</td>
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<td>MIE 310</td>
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<td>Hours</td>
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Fourth Year

Fall Semester

Select two Concentration courses 6

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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>GEP Humanities (p. 1423)</td>
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Spring Semester

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Total Hours 120

GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.
Foreign Language 201 (p. 1462) 3
Select one of the following:
   COM 110  Public Speaking
   COM 112  Interpersonal Communication
   COM 211  Argumentation and Advocacy
PSY 200  Introduction to Psychology 3
Select one of the following: 1 3
   ARE 201  Introduction to Agricultural & Resource Economics
   ARE 201A Introduction to Agricultural & Resource Economics
EC 201  Principles of Microeconomics
EC 202  Principles of Macroeconomics 3
Select one of the following: 3
   ENG 331  Communication for Engineering and Technology
   ENG 332  Communication for Business and Management
   ENG 333  Communication for Science and Research
   GEP Humanities (p. 1423) 6
   GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts) 3
Select one of the following: (verify requirement) 3
   MIE 306  Managing Ethics in Organizations
   PHI 214  Issues in Business Ethics
   PHI 221  Contemporary Moral Issues
   PHI 313  Ethical Problems in the Law
   PHI 375  Ethics

Mathematical and Natural Sciences
GEP Natural Sciences (p. 1429) 7
Select one of the following: 1 3
   MA 121  Elements of Calculus
   MA 131  Calculus for Life and Management Sciences A
   MA 141  Calculus I
   MA 114  Introduction to Finite Mathematics with Applications
or MA 242  Calculus III
Select one of the following: 1 3
   BUS 350  Economics and Business Statistics
   ST 350  Economics and Business Statistics
   ST 370  Probability and Statistics for Engineers
   ST 372  Introduction to Statistical Inference and Regression
   BUS 351  Predictive Analytics for Business 3
   ST 307  Introduction to Statistical Programming- SAS 1

Interdisciplinary Perspectives
GEP Interdisciplinary Perspectives (p. 1426) 2

Physical Education
GEP Health and Exercise Studies (p. 1422) 2

Corequisites
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)

Major Requirements
M 100  Personal and Professional Identity Development 1
MIE 201 Introduction to Business Processes 3
ACC 210  Concepts of Financial Reporting 1 3
ACC 220  Introduction to Managerial Accounting 1 3
MIE 310  Introduction to Entrepreneurship 3
BUS 320  Financial Management 3
MIE 330  Human Resource Management 3
BUS 340  Information Systems Management 3
BUS 360  Marketing Methods 3
BUS 370  Operations and Supply Chain Management 3
MIE 305  Legal and Regulatory Environment 3
MIE 480  Business Policy and Strategy 3

Concentration
MIE 434  Compensation Systems 3
MIE 437  Human Resources Analytics 3
MIE 438  Staffing 3
Select one of the following: 3
   MIE 432  Labor and Employee Relations
   MIE 435  Leadership and Management
   MIE 436  Training and Development
   MIE 439  Human Resources Practicum

Free Electives
Free Electives (12 Hr S/U Lmt) 2 19
Total Hours 120

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

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**Semester Sequence**

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<tr>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
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<tr>
<td>Select one of the following: 1</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<td>COM 112</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>ACC 210</td>
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<td>BUS 370</td>
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<td>MIE 305</td>
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<td>MIE 310</td>
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Free Electives 6

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Total Hours 120

1 Must be completed with “C-” or better.

Students must also complete a part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

Career Opportunities

Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Business Administration (BS): Information Technology Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

Information Technology students specialize in the support of business processes through the use of IT. Concentration students are business oriented but work with various technologies and systems to support business needs. In contrast with computer science programs, the IT concentration focuses on how to use information technology to support business needs rather than how to program and create new software. Our students focus on using technology to organize, represent and manipulate data to support business decision making. These students also gain experience with a variety of computing technologies. The IT concentration is valuable by itself, but it can provide other concentration students with a competitive advantage if they add IT as a second concentration.

Curriculum Overview

Students in the information technology concentration learn the basics of computer hardware, software and networking, and more importantly, how to apply that technical knowledge to business functions such as finance, marketing and product management.

The information technology concentration is designed to prepare students in the following areas:

- Software use and development
- Database development and management
- Basic computer networking and telecommunications
- Information security and privacy
- Knowledge management

Business Management

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Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/business-management/

Sebastian Heese
Interim Department
Head Owens Distinguished Professorship of Supply Chain Management

Plan Requirements

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Mathematical and Natural Sciences

GEP Natural Sciences (p. 1429) 7

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**Interdisciplinary Perspectives**

GEP Interdisciplinary Perspectives (p. 1426) 2

**Physical Education**

GEP Health and Exercise Studies (p. 1422) 2

**Corequisites**

GEP U.S. Diversity (p. 1431) (verify requirement)

GEP Global Knowledge (p. 1419) (verify requirement)

**Major Requirements**

- M 100 Personal and Professional Identity Development 1
- MIE 201 Introduction to Business Processes 3
- ACC 210 Concepts of Financial Reporting 1 3
- ACC 220 Introduction to Managerial Accounting 1 3
- MIE 310 Introduction to Entrepreneurship 3
- BUS 320 Financial Management 3
- MIE 330 Human Resource Management 3
- BUS 340 Information Systems Management 3
- BUS 360 Marketing Methods 3
- BUS 370 Operations and Supply Chain Management 3
- MIE 305 Legal and Regulatory Environment 3
- MIE 480 Business Policy and Strategy 3

**Concentration**

Select two of the following: 6
- BUS 440 Database Management
- BUS 441 Business Data Communications and Networking
- BUS 442 Information Systems Development

Select two of the following: 6
- BUS 440 Database Management
- BUS 441 Business Data Communications and Networking
- BUS 442 Information Systems Development

- BUS 443 Web Development for Business Applications
- BUS 444 Systems Analysis and Design
- BUS 449 Information Technology Capstone

**Free Electives**

Free Electives (12 Hr S/U Lmt) 2 19

**Total Hours** 120

1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

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## Acad Writing Research

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## Foreign Language 201

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<td>FLF 201</td>
<td>Intermediate French I</td>
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<td>FLF 212</td>
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<td>FLG 201</td>
<td>Intermediate German I</td>
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<td>FLG 212</td>
<td>German Language, Culture, Science, and Technology</td>
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<td>Intermediate Hindi-Urdu I</td>
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<td>PER 201</td>
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## Semester Sequence

This is a sample.

**Course**  
**Title**  
**Hours**

### First Year

#### Fall Semester

- M 100 Personal and Professional Identity Development 1
- ENG 101 Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab) 1 4
- Select one of the following: 1 3
- MA 121 Elements of Calculus
- MA 131 Calculus for Life and Management Sciences A
- MA 141 Calculus I
- FLx 201 3
- MIE 201 Introduction to Business Processes 3
- GEP Health and Exercise Studies (p. 1422) 1

**Total Hours** 15

#### Spring Semester

- MA 114 Introduction to Finite Mathematics with Applications or Calculus III 3
- Select one of the following: 3
- COM 110 Public Speaking
- COM 112 Interpersonal Communication
- COM 211 Argumentation and Advocacy
- GEP Humanities (p. 1423)
- ENG 101 Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab) 1 4
### Second Year
**Fall Semester**
- ACC 220 Introduction to Managerial Accounting \(^1\) 3

Select one of the following:
- COM 110 Public Speaking 3
- COM 112 Interpersonal Communication
- COM 211 Argumentation and Advocacy
- GEP Humanities (p. 1423)
- BUS/ST 350 Economics and Business Statistics \(^1\) 3
- GEP Natural Sciences (p. 1429) 3
- EC 202 Principles of Macroeconomics 3
- GEP Health and Exercise Studies (p. 1422) 3

**Hours** 16

**Spring Semester**
Select three of the following: 9
- BUS 320 Financial Management
- BUS 340 Information Systems Management
- BUS 360 Marketing Methods
- BUS 370 Operations and Supply Chain Management
- MIE 305 Legal and Regulatory Environment
- MIE 310 Introduction to Entrepreneurship
- MIE 330 Human Resource Management
- PSY 200 Introduction to Psychology 3
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- ST 307 Introduction to Statistical Programming-SAS 1

**Hours** 16

### Third Year
**Fall Semester**
Select two of the following: 6
- BUS 320 Financial Management
- BUS 340 Information Systems Management
- BUS 360 Marketing Methods
- BUS 370 Operations and Supply Chain Management
- MIE 305 Legal and Regulatory Environment
- MIE 310 Introduction to Entrepreneurship
- MIE 330 Human Resource Management

Select one of the following: 3
- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research

**Free Electives** 6

**Hours** 15

**Spring Semester**
Select two of the following: 6
- BUS 320 Financial Management
- BUS 340 Information Systems Management
- BUS 360 Marketing Methods
- BUS 370 Operations and Supply Chain Management
- MIE 305 Legal and Regulatory Environment
- MIE 310 Introduction to Entrepreneurship
- MIE 330 Human Resource Management

**Free Electives** 6

**Hours** 15

### Fourth Year
**Fall Semester**
Select two Concentration courses 6
- GEP Interdisciplinary Perspectives (p. 1426) 2
- GEP Humanities (p. 1423) 3
- **Free Elective** 4

**Hours** 15

**Spring Semester**
MIE 480 Business Policy and Strategy 3
- Concentration course 3
- **Free Electives** 6

**Hours** 12

**Total Hours** 120

\(^1\) Must be completed with “C-” or better.

Students must also complete as part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

### GPA Graduation Requirements
- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

### Career Opportunities
Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

### Business Administration (BS): Marketing Concentration
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, products and services to create exchanges that satisfy both individuals and organizations. Marketing professionals are interested in the buying behavior of consumers and organizations, and its relationship to the selling process.
The marketing field includes new product development and innovation, pricing, market and competitor analysis, customer segmentation, marketing research, business development, advertising and public relations, retailing and sales, and marketing strategy.

**Curriculum Overview**

The marketing concentration provides students with the skills necessary to lead in environments where products, markets, and technology are rapidly changing. Sustainable competitive advantage comes from three key activities: value identification, value creation and value delivery.

The marketing concentration is designed to prepare students in the following areas:

- Identification of customers and opportunities
- Design of solutions and delivery of value
- Development of goods and taking them to market
- Communication with customers to ensure satisfaction and loyalty

Core courses deliver fundamental foundation skills, knowledge, and experience while the elective courses allow students to focus their learning in areas that are most pertinent to their career interests.

**Business Management**

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Phone: (919) 515-5565  
https://poole.ncsu.edu/business-management/

Sebastian Heese  
Interim Department Head  
Owens Distinguished Professorship of Supply Chain Management

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**Plan Requirements**

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<td>EC 201 Principles of Microeconomics</td>
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1. C- or better
2. Students should consult their academic advisors to determine which courses fill this requirement.
### Acad Writing Research

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### Transfer Sequence

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<td>Intermediate Chinese I</td>
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<td>German Language, Culture, Science, and Technology</td>
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<td>Intermediate Italian I</td>
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### Concentration Electives

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<td>Channel and Retail Marketing</td>
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<td>International Marketing</td>
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<td>Traditional and Digital Brand Promotion</td>
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<td>Product and Brand Management</td>
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### Semester Sequence

This is a sample.

#### First Year

##### Fall Semester

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Select one of the following:  

- MA 131  Calculus for Life and Management Sciences A  
- MA 141  Calculus I  
- FLE 201  Calculus I  
- MIE 201  Introduction to Business Processes  
- GEP Health and Exercise Studies (p. 1422)  

Hours  

15

##### Spring Semester

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Select one of the following:  

- COM 110  Public Speaking  
- COM 112  Interpersonal Communication  
- COM 211  Argumentation and Advocacy  
- GEP Humanities (p. 1423)  

#### Second Year

##### Fall Semester

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<td>Introduction to Managerial Accounting</td>
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Select one of the following:  

- COM 110  Public Speaking  
- COM 112  Interpersonal Communication  
- COM 211  Argumentation and Advocacy  
- GEP Humanities (p. 1423)  

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<td>EC 202</td>
<td>Principles of Macroeconomics or Introduction to Agricultural &amp; Resource Economics</td>
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Hours  

16

##### Spring Semester

Select three of the following:  

- BUS 320  Financial Management  
- BUS 340  Information Systems Management  
- BUS 360  Marketing Methods  
- BUS 370  Operations and Supply Chain Management  
- MIE 305  Legal and Regulatory Environment  
- MIE 310  Introduction to Entrepreneurship  
- MIE 330  Human Resource Management  
- PSY 200  Introduction to Psychology | 3 |
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |

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<td>ST 307</td>
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Hours  

16
Third Year
Fall Semester
Select two of the following: 6
- BUS 320 Financial Management
- BUS 340 Information Systems Management
- BUS 360 Marketing Methods
- BUS 370 Operations and Supply Chain Management
- MIE 305 Legal and Regulatory Environment
- MIE 310 Introduction to Entrepreneurship
- MIE 330 Human Resource Management

Select one of the following: 3
- ENG 331 Communication for Engineering and Technology
- ENG 332 Communication for Business and Management
- ENG 333 Communication for Science and Research

Free Electives 6

Hours 15

Spring Semester
Select two of the following: 6
- BUS 320 Financial Management
- BUS 340 Information Systems Management
- BUS 360 Marketing Methods
- BUS 370 Operations and Supply Chain Management
- MIE 305 Legal and Regulatory Environment
- MIE 310 Introduction to Entrepreneurship
- MIE 330 Human Resource Management

Concentration course 3

Free Electives 6

Hours 15

Fourth Year
Fall Semester
Select two Concentration courses 6
- GEP Interdisciplinary Perspectives (p. 1426)
- GEP Humanities (p. 1423)
- Free Elective 4

Hours 15

Spring Semester
MIE 480 Business Policy and Strategy 3

Concentration course 3

Free Electives 6

Hours 12

Total Hours 120

1 Must be completed with “C-” or better.

Students must also complete as a part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

GPA Graduation Requirements
- Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

Career Opportunities
Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

Business Administration (BS): Operations/Supply Chain Management

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The field of operations and supply chain management focuses on creating efficiencies in an organization’s global “supply chain” – the network of interconnected businesses and activities involved in getting the organization’s products or services to the end users. Supply chain management spans the sourcing of raw materials and components, their movements and storage, work-in-process inventory, and finished goods/services from point-of-origin to point-of-consumption. The focus is improving the way the organization coordinates and integrates these “flows” within and among organizations.

Curriculum Overview
Students concentrating in operations and supply chain learn how to develop and evaluate business processes, perform strategic and tactical supply chain planning, and manage the activities and resources that transform inputs into finished goods and services.

The operations and supply chain concentration is designed to prepare students in the following areas:
- Knowledge of how goods, services, finances and information flow through the supply chain
- Analysis and resolution of customer and supplier business problems
- Analysis and improvement of business processes to improve customer satisfaction and business performance
- Understanding of how to link suppliers, internal customers, and external customers to create value
- Resolution of real-world supply chain problems through project work with partner companies in the Supply Chain Resource Cooperative (https://scm.ncsu.edu/)

Business Management
Poole College of Management
2300 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/business-management/

Sebastian Heese
Interim Department Head
Owens Distinguished Professorship of Supply Chain Management
Plan Requirements

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GEP Global Knowledge (p. 1419) (verify requirement)

**Major Requirements**

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<td>BUS 320</td>
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**Concentration**

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**Free Electives**

Free Electives (12 Hr S/U Lmt) ² 19

Total Hours 120

¹ C- or better
² Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

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<tr>
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Transfer Sequence

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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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Foreign Language 201

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<td>FLF 201</td>
<td>Intermediate French I</td>
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<tr>
<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
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<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
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# Semester Sequence

This is a sample.

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<tr>
<th>Course</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>M 100</td>
<td>Personal and Professional Identity</td>
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<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<td>FLx 201</td>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>MA 114</td>
<td>Introduction to Finite Mathematics with Applications or Calculus III</td>
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<td>COM 110</td>
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<td>COM 112</td>
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<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<td>Principles of Microeconomics or Introduction to Agricultural &amp; Resource Economics</td>
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<td>Concepts of Financial Reporting</td>
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<tr>
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<td>Information Systems Management</td>
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<td>BUS 370</td>
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<td>Legal and Regulatory Environment</td>
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<td>Introduction to Entrepreneurship</td>
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**Fourth Year**

**Fall Semester**

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**Spring Semester**

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1 Must be completed with “C-“ or better.

Students must also complete as a part of their degree requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

**GPA Graduation Requirements**

- Overall GPA for all courses attempted at NC State must be 2.0 or higher;
- Overall GPA for all BUS, MIE, and M courses attempted at NC State must be 2.0 or higher.

**Career Opportunities**

Graduates in business administration are prepared for a variety of careers in business or industry including new product development, marketing, manufacturing, human resources, IT management, business analysis, banking and finance, consulting, and business development. They have the knowledge and tools to launch new business ideas and succeed in management positions.

**Business Administration (BS): Undeclared**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

**Plan Requirements**

<table>
<thead>
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<th>Code</th>
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<tr>
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<td>COM 112 Interpersonal Communication</td>
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<td></td>
<td>COM 211 Argumentation and Advocacy</td>
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<td>PSY 200 Introduction to Psychology</td>
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<td>ARE 201A Introduction to Agricultural &amp; Resource Economics</td>
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<td>EC 201 Principles of Microeconomics</td>
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**Mathematical and Natural Sciences**

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<td>MA 131 Calculus for Life and Management Sciences A</td>
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<tr>
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<td>MA 141 Calculus I</td>
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<tr>
<td></td>
<td>MA 114 Introduction to Finite Mathematics with</td>
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<td></td>
<td>Applications</td>
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<tr>
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<td>or MA 242 Calculus III</td>
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<td>ST 312 Introduction to Statistics II</td>
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<td>ST 370 Probability and Statistics for Engineers</td>
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<td>ST 372 Introduction to Statistical Inference and</td>
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<td></td>
<td>Regression</td>
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**Interdisciplinary Perspectives**

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**Physical Education**

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**Corequisites**

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<td>GEP Global Knowledge (p. 1419) (verify requirement)</td>
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**Major Requirements**

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<td>M 100</td>
<td>Personal and Professional Identity Development</td>
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<td>Introduction to Business Processes</td>
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<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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<td>ACC 220</td>
<td>Introduction to Managerial Accounting</td>
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<td>Introduction to Entrepreneurship</td>
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<td>Human Resource Management</td>
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<td>BUS 340</td>
<td>Information Systems Management</td>
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<td>BUS 360</td>
<td>Marketing Methods</td>
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<td>BUS 370</td>
<td>Operations and Supply Chain Management</td>
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<td>Legal and Regulatory Environment</td>
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<td>Business Policy and Strategy</td>
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**Concentration**
Select Concentration ²

Free Electives
Free Electives (12 Hr S/U Lmt) ²

Total Hours

1 C- or better

2 Students should consult their academic advisors to determine which courses fill this requirement.

Acad Writing Research

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>FLE 101</td>
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Transfer Sequence

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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<tr>
<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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Foreign Language 201

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>FLA 201</td>
<td>Intermediate Arabic I</td>
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<td>Intermediate Chinese I</td>
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<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
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<td>FLG 201</td>
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<td>FLI 201</td>
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<td>FLN 201</td>
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<td>Intermediate Portuguese I</td>
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Semester Sequence

This is a sample.

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<td>Natural Sciences (p. 1429) with Lab ¹</td>
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Select one of the following: ¹

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<td>Calculus for Life and Management Sciences A</td>
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Spring Semester

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<td>or ARE 201</td>
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ACC 210 | Concepts of Financial Reporting ¹ | 3 |

Second Year

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<td>BUS/ST 350</td>
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Spring Semester

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<td>BUS 370</td>
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<tr>
<td>MIE 305</td>
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<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
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Third Year

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Hours | 15

Notes:

- ¹ Select one of the following.
- ² Students should consult their academic advisors to determine which courses fill this requirement.
Business Administration (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/]

Students who fulfill the requirements for the undergraduate Minor in Business Administration will gain an understanding of the language and basic concepts of business, fundamentals of economics, and core concepts of financial accounting. Building on that core foundation, students will pursue additional coursework in several areas of business. The Minor in Business Administration requires 18 hours of coursework with a 2.0 GPA in minor coursework.

Contact
Poole College of Management
Undergraduate Programs Office
Box 8614
2150 Nelson Hall
919.515.5565
poole_minors@ncsu.edu

Plan Requirements

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<td>Human Resource Management</td>
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Total Hours 18

1 C- or better

Business Entrepreneurship (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website [https://apps.oirp.ncsu.edu/pgas/]

Students who fulfill the requirements for the undergraduate Minor in Business Entrepreneurship will gain an understanding of the language and basic concepts of business, fundamentals of economics, and core concepts of financial accounting. Building on that core foundation, students will pursue additional coursework in several areas of business. The Minor in Business Entrepreneurship requires 18 hours of coursework with a 2.0 GPA in minor coursework.

Contact
Poole College of Management
Undergraduate Programs Office
Box 8614
2150 Nelson Hall
919.515.5565
poole_minors@ncsu.edu

Plan Requirements

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<td>BUS 320</td>
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Total Hours 18

1 C- or better
The purpose of the Minor in Entrepreneurship is to engage students in the process of identifying, evaluating, and implementing business opportunities that focus on value creation. This process includes the creation of new ventures, as well as adding value within existing companies through innovation applications. The Minor focuses on embedding students in the entrepreneurship ecosystem in Raleigh and beyond.

As a result, students who fulfill the requirements for the undergraduate Minor in Entrepreneurship will develop an entrepreneurial mindset through experiential learning and through their embeddedness in the entrepreneurship ecosystem. The Minor in Entrepreneurship requires 18 hours of coursework with a 2.0 GPA in minor coursework.

**Contact**
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Box 8614
2150 Nelson Hall
919.515.5565
poole_minors@ncsu.edu

**Plan Requirements**

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Total Hours: 18

1. C- or better

**Department of Economics**

The Department of Economics provides a broad-based education with a specialization in economic theory and applications. Students can select the Bachelor of Arts in Economics degree, with a focus on liberal arts courses, or the Bachelor of Science in Economics, with a focus on courses in business, mathematics, statistics, and science. The economics programs are flexible, and, with thoughtful advance planning, students can easily pursue an economics degree along with a minor, or even a second major, in another academic area.

Economics students can develop their understanding of economic issues in a variety of areas including: econometrics, game theory, health economics, industrial organization, international economics, labor economics, money and financial institutions, public finance, resource and environmental economics.

A degree in economics provides rigorous analytical training with a broad understanding of the workings of the global economic system. Its flexibility allows students to tailor their education to specific interests and career goals. The undergraduate programs in economics prepare a student for careers in business and government as well as for many graduate and professional degree programs.

The Department of Economics also offers an **Honors Program in Economics**, designed for academically talented and motivated students who desire a richer educational experience than offered in regular courses. The primary goal of this program is to help students develop the ability to apply economic analysis to a variety of issues at the individual, corporate, and government level.

Students enrolled in the University Scholars program, or who have completed 30 hours at NC State with an overall GPA of 3.25 or better, may enroll in economics honors courses. To be certified as a graduate of the economics honors program, students must have at least a 3.25 major GPA in all economics courses attempted at NC State and an overall GPA of 3.25 or higher. In addition, students must complete specific course requirements.

A minor in Economics is available to undergraduate students and is an excellent complement to many majors within the university, including international studies, political science, statistics, business administration, accounting, and engineering.

**Opportunities**

An undergraduate degree in economics has long served as the foundation for advanced professional degrees in law and business, graduate study in economics, as well as jobs in business, industry and government.

**Curricula and Degree Requirements**

The Bachelor of Arts in Economics (B.A.) is a broad and flexible program of study. The major course work for the B.A. in Economics includes courses in economic theory, mathematics and statistics as well as courses in advanced, applied economics. The program provides for substantial flexibility, so students may tailor their studies to their particular interests and long-term goals.

Both economics degrees require that students complete 120 credits towards the degree. All Economics majors are subject to the university and college’s residency requirements. Additionally, students in the Economics majors (B.A. or B.S.) must earn at least 1/2 of their required economics (EC) credits while enrolled in the curriculum, and students must complete at least one-half of the required economics credit hours (EC courses) at NC State University.

**Economics Department**
Poole College of Management
4102 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/economics/
Economics (BA)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Bachelor of Arts in Economics (B.A.) is a broad and flexible program of study. The major course work for the B.A. in Economics includes courses in economic theory, mathematics and statistics as well as courses in advanced, applied economics. The program provides for substantial flexibility, so students may tailor their studies to their particular interests and long-term goals.

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Economics Department
Poole College of Management
4102 Nelson Hall
Raleigh, NC 27695
Phone: (919) 515-5565
https://poole.ncsu.edu/economics/

Lee Craig
Department Head
Alumni Distinguished Professor

Plan Requirements

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<th>Hours</th>
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<tr>
<td>ECG 512</td>
<td>Law and Economics</td>
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<tr>
<td>ECG 515</td>
<td>Environmental and Resource Policy</td>
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<tr>
<td>ECG 528</td>
<td>Options and Derivatives Pricing</td>
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<td>ECG 530</td>
<td>Topics in Labor Economics</td>
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<tr>
<td>ECG 537</td>
<td>Health Economics</td>
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<tr>
<td>ECG 540</td>
<td>Economic Development</td>
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<tr>
<td>ECG 548</td>
<td>International Economics</td>
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<tr>
<td>ECG 561</td>
<td>Applied Econometrics I</td>
<td>3</td>
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<tr>
<td>ECG 562</td>
<td>Applied Econometrics II</td>
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<td>ECG 563</td>
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### Econ Electives II

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<td>ECG 506</td>
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<td>ECG 512</td>
<td>Law and Economics</td>
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<td>Economic Development</td>
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<td>ECG 548</td>
<td>International Economics</td>
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<td>ECG 561</td>
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<td>3</td>
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<td>ECG 562</td>
<td>Applied Econometrics II</td>
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### Econ Electives II A

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<td>EC 410</td>
<td>Public Finance</td>
<td>3</td>
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<td>EC 413</td>
<td>Industrial Organization</td>
<td>3</td>
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<td>EC 431</td>
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<td>EC 437</td>
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<tr>
<td>EC 468</td>
<td>Game Theory</td>
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<tr>
<td>EC 474</td>
<td>Economics of Financial Institutions and Markets</td>
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</tr>
<tr>
<td>EC 480</td>
<td>Introduction to Economic Research</td>
<td>3</td>
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<tr>
<td>EC 490</td>
<td>Research Seminar in Economics</td>
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<tr>
<td>EC 495</td>
<td>Special Topics in Economics</td>
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<tr>
<td>EC 498</td>
<td>Independent Study in Economics</td>
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### Acad Writing and Research

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### Transfer Sequence

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<tr>
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<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
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### Foreign Language 201

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<tbody>
<tr>
<td>FLA 201</td>
<td>Intermediate Arabic I</td>
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<td>FLC 201</td>
<td>Intermediate Chinese I</td>
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<td>FLF 201</td>
<td>Intermediate French I</td>
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<tr>
<td>FLF 212</td>
<td>French: Language, Culture, and Technology</td>
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<tr>
<td>FLG 201</td>
<td>Intermediate German I</td>
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## Semester Sequence

This is a sample.

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<tr>
<th>Course</th>
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<tr>
<td><strong>First Year</strong>&lt;br&gt;<strong>Fall Semester</strong>&lt;br&gt;M 100</td>
<td>Personal and Professional Identity</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with Lab)</td>
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<tr>
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<td>Select one of the following:</td>
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<tr>
<td>MA 121</td>
<td>Elements of Calculus</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>MA 141</td>
<td>Calculus I</td>
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<td>FLx 201</td>
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<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
<td><strong>Spring Semester</strong>&lt;br&gt;MA 114 or MA 242</td>
<td>Introduction to Finite Mathematics with Applications or Calculus III</td>
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<tr>
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<tr>
<td>COM 110</td>
<td>Public Speaking</td>
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<tr>
<td>COM 112</td>
<td>Interpersonal Communication</td>
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<tr>
<td>COM 211</td>
<td>Argumentation and Advocacy</td>
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<tr>
<td>GEP Humanities (p. 1423)</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research (or GEP Natural Sciences (p. 1429) with lab)</td>
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<tr>
<td>EC 201 or EC 205 or ARE 201</td>
<td>Principles of Microeconomics or Fundamentals of Economics or Introduction to Agricultural &amp; Resource Economics</td>
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<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
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<td><strong>Second Year</strong>&lt;br&gt;<strong>Fall Semester</strong>&lt;br&gt;EC 301</td>
<td>Intermediate Microeconomics</td>
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<tr>
<td>BUS 350 or ST 350</td>
<td>Economics and Business Statistics or Economics and Business Statistics</td>
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<td><strong>Spring Semester</strong>&lt;br&gt;EC 302</td>
<td>Intermediate Macroeconomics</td>
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<td>Select one of the following:</td>
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<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
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<td>ENG 332</td>
<td>Communication for Business and Management</td>
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<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
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<tr>
<td><strong>Third Year</strong>&lt;br&gt;<strong>Fall Semester</strong>&lt;br&gt;EC 480 or EC 351</td>
<td>Introduction to Economic Research or Econometrics I</td>
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<td>Economics Elective</td>
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<td>Select one of the following:</td>
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<td>Select two Advised Electives</td>
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<td>Free Electives</td>
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<tr>
<td><strong>Spring Semester</strong>&lt;br&gt;</td>
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<td>Economics Elective</td>
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<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
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<td>Free Electives</td>
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<tr>
<td><strong>Fourth Year</strong>&lt;br&gt;<strong>Fall Semester</strong>&lt;br&gt;Select two Economics Electives</td>
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<tr>
<td>Free Elective</td>
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<tr>
<td><strong>Spring Semester</strong>&lt;br&gt;EC 490</td>
<td>Research Seminar in Economics</td>
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<td>Economics Elective</td>
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<tr>
<td>Advised Elective</td>
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<tr>
<td>Free Electives</td>
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<td><strong>Total Hours</strong></td>
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1. Must be completed with “C-” or better.
Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

**GPA Graduation Requirements**

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all EC and ECG courses attempted at NC State must be 2.0 or higher

**Career Opportunities**

An undergraduate degree in economics has long served as the foundation for advanced professional degrees in law and business, graduate study in economics, as well as jobs in business, industry and government.

**Economics (BS)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

Economics students can develop their understanding of economic issues in a variety of areas including: econometrics, game theory, health economics, industrial organization, international economics, labor economics, money and financial institutions, public finance, resource and environmental economics.

A degree in economics provides rigorous analytical training with a broad understanding of the workings of the global economic system. Its flexibility allows students to tailor their education to specific interests and career goals. The undergraduate programs in economics prepare a student for careers in business and government as well as for many graduate and professional degree programs.

Both economics degrees require that students complete 120 credits towards the degree. All Economics majors are subject to the university and college’s residency requirements. Additionally, students in the Economics majors (B.A. or B.S.) must earn at least 1/2 of their required economics (EC) credits while enrolled in the curriculum, and students must complete at least one-half of the required economics credit hours (EC courses) at NC State University.

**Economics Department**

Poole College of Management  
4102 Nelson Hall  
Raleigh, NC 27695  
Phone: (919) 515-5565  
https://poole.ncsu.edu/economics/

Lee Craig  
Department Head  
Alumni Distinguished Professor

**Plan Requirements**

<table>
<thead>
<tr>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>Econometrics I</td>
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<td>EC 451</td>
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<tr>
<td>EC 490</td>
<td>Research Seminar in Economics</td>
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**Economics Electives**

- 400/500 Level Econ Electives (p. 1480) 6
- 300/400/500 Level EC Electives (p. 1480) 6

**Humanities and Social Sciences**

- Acad Writing and Research (p. 1480) 1 4
- GEP Social Sciences (p. 1430) 3
- Select one of the following: 3
  - ENG 331 Communication for Engineering and Technology
  - ENG 332 Communication for Business and Management
  - ENG 333 Communication for Science and Research
- GEP Humanities (p. 1423) 6
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

**Mathematical and Natural Sciences**

- Natural Sciences Sequence (p. 1480) 8
- Select one of the following: 3
  - BUS 350 Economics and Business Statistics
  - ST 350 Economics and Business Statistics
  - ST 312 Introduction to Statistics II
  - ST 370 Probability and Statistics for Engineers
  - ST 372 Introduction to Statistical Inference and Regression
- Natural Sciences Electives (p. 1481) 7
- MA 131 Calculus for Life and Management Sciences A 3
  - or MA 141 Calculus I
- MA 231 Calculus for Life and Management Sciences B 3
  - or MA 241 Calculus II
- MA 114 Introduction to Finite Mathematics with Applications 3
  - or MA 242 Calculus III
- Quantitative Elective (p. 1482) 3
- ST 307 Introduction to Statistical Programming- SAS 1

**Interdisciplinary Perspectives**

- GEP Interdisciplinary Perspectives (p. 1426) 5

**Physical Education**

- GEP Health and Exercise Studies (p. 1422) 2

**Corequisites**

- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

**Advised Electives**

- Advised Electives 2 15

**Free Electives**

- Free Electives (12 Hr S/U Lmt) 2 18

Total Hours 120
1 C- or better
2 Students should consult their academic advisors to determine which courses fill this requirement.

### 400/500 Level Econ Electives

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<td>Applied Microeconomic Analysis</td>
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<td>ECG 506</td>
<td>Applied Macroeconomic Analysis</td>
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<td>ECG 512</td>
<td>Law and Economics</td>
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<td>ECG 515</td>
<td>Environmental and Resource Policy</td>
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<td>ECG 528</td>
<td>Options and Derivatives Pricing</td>
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<td>ECG 537</td>
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<td>ECG 561</td>
<td>Applied Econometrics I</td>
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<td>ECG 580</td>
<td>Writing in Economics</td>
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<td>ECG 590</td>
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### Econ Electives II A

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<tr>
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<tbody>
<tr>
<td>EC 404</td>
<td>Money, Financial Markets, and the Economy</td>
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<td>EC 410</td>
<td>Public Finance</td>
<td>3</td>
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<td>Industrial Organization</td>
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<td>EC 437</td>
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<tr>
<td>EC 468</td>
<td>Game Theory</td>
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<td>EC 474</td>
<td>Economics of Financial Institutions and Markets</td>
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<td>EC 480</td>
<td>Introduction to Economic Research</td>
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<td>EC 490</td>
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<td>Independent Study in Economics</td>
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### Acad Writing and Research

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### Transfer Sequence

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<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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### Natural Science Sequence

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<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
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<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science</td>
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<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
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### Geology Sequence
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<td>Geology I: Physical</td>
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<td>MEA 110</td>
<td>Geology I Laboratory</td>
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**GEP Natural Sci Non Lab Courses**

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MA 426  Mathematical Analysis II  3
MA 427  Introduction to Numerical Analysis I  3
MA 428  Introduction to Numerical Analysis II  3
MA 430  Mathematical Models in the Physical Sciences  3
MA 432  Mathematical Models in Life and Social Sciences  3
MA 437  Applications of Algebra  3
MA 440  Game Theory  3
MA 444  Problem Solving Strategies for Competitions  1
MA 450  Methods of Applied Mathematics I  3
MA 451  Methods of Applied Mathematics II  3
MA 491  Reading in Honors Mathematics  1-6
MA 493  Special Topics in Mathematics  1-6
MA 494  Major Paper in Math  1
MA 499  Independent Research in Mathematics  1-6
MA 501  Advanced Mathematics for Engineers and Scientists I  3
MA 502  Advanced Mathematics for Engineers and Scientists II  3
MA 504  Introduction to Mathematical Programming  3
MA 505  Linear Programming  3
MA 507  Survey of Real Analysis  3
MA 508  Geometry For Secondary Teachers  3
MA 509  Survey of Abstract Algebra  3
MA 510  Selected Topics In Mathematics For Secondary Teachers  1-6
MA 511  Advanced Calculus I  3
MA 512  Advanced Calculus II  3
MA 513  Introduction To Complex Variables  3
MA 515  Analysis I  3
MA 518  Geometry of Curves and Surfaces  3
MA 520  Linear Algebra  3
MA 521  Abstract Algebra I  3
MA 522  Computer Algebra  3
MA 523  Linear Transformations and Matrix Theory  3
MA 524  Combinatorics I  3
MA 526  Algebraic Geometry  3
MA 528  Options and Derivatives Pricing  3
MA 531  Dynamic Systems and Multivariable Control I  3
MA 532  Ordinary Differential Equations I  3
MA 534  Introduction To Partial Differential Equations  3
MA 537  Nonlinear Dynamics and Chaos  3
MA 540  Uncertainty Quantification for Physical and Biological Models  3
MA 544  Computer Experiments In Mathematical Probability  3
MA 546  Probability and Stochastic Processes I  3
MA 547  Financial Mathematics  3
MA 548  Monte Carlo Methods for Financial Math  3
MA 549  Financial Risk Analysis  3
MA 551  Introduction to Topology  3
MA 555  Introduction to Manifold Theory  3
MA 561  Set Theory and Foundations Of Mathematics  3
MA 565  Graph Theory  3
MA 573  Mathematical Modeling of Physical and Biological Processes I  3
MA 574  Mathematical Modeling of Physical and Biological Processes II  3
MA 580  Numerical Analysis I  3
MA 583  Introduction to Parallel Computing  3
MA 584  Numerical Solution of Partial Differential Equations--Finite Difference Methods  3
MA 587  Numerical Solution of Partial Differential Equations--Finite Element Method  3
MA 591  Special Topics  1-6
MBA 528  Options and Derivatives Pricing  3
MEA 315  Mathematics Methods in Atmospheric Sciences  4
OR 504  Introduction to Mathematical Programming  3
OR 505  Linear Programming  3
OR 531  Dynamic Systems and Multivariable Control I  3
OR 565  Graph Theory  3
ST 401  Experiences in Data Analysis  4
ST 404  Epidemiology and Statistics in Global Public Health  3
ST 405  Applied Nonparametric Statistics  3
ST 412  Long-Term Actuarial Models  3
ST 413  Short-Term Actuarial Models  3
ST 421  Introduction to Mathematical Statistics I  3
ST 422  Introduction to Mathematical Statistics II  3
ST 430  Introduction to Regression Analysis  3
ST 431  Introduction to Experimental Design  3
ST 432  Introduction to Survey Sampling  3
ST 433  Applied Spatial Statistics  3
ST 434  Applied Time Series  3
ST 435  Statistical Methods for Quality and Productivity Improvement  3
ST 437  Applied Multivariate and Longitudinal Data Analysis  3
ST 440  Applied Bayesian Analysis  3
ST 442  Introduction to Data Science  3
ST 445  Introduction to Statistical Computing and Data Management  3
ST 446  Intermediate SAS Programming with Applications  3
ST 491  Statistics in Practice  3
ST 495  Special Topics in Statistics  1-6
ST 497  Professional Experience in Statistics  1-3
ST 498  Independent Study In Statistics  1-6
ST 499  Research Experience in Statistics  1-3
ST 501  Fundamentals of Statistical Inference I  3
ST 502  Fundamentals of Statistical Inference II  3
ST 503  Fundamentals of Linear Models and Regression  3
ST 505  Applied Nonparametric Statistics  3
Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MA 131 or MA 141</td>
<td>Calculus for Life and Management Sciences A or Calculus I</td>
<td>3</td>
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<tr>
<td>GEP Natural Sciences (p. 1429) (Sequence)</td>
<td></td>
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</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
<td>3</td>
</tr>
<tr>
<td>GEP Natural Sciences (p. 1429) (Sequence)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MA 231 or MA 241</td>
<td>Calculus for Life and Management Sciences B or Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<td></td>
</tr>
<tr>
<td>EC 301</td>
<td>Intermediate Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>MA 114 or MA 242</td>
<td>Introduction to Finite Mathematics with Applications or Calculus III</td>
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</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
<td></td>
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<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td></td>
<td>3</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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</tr>
<tr>
<td><strong>Hours</strong></td>
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<td>16</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST/BUS 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>EC 302</td>
<td>Intermediate Macroeconomics</td>
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</tr>
<tr>
<td>GEP Natural Sciences (p. 1429)</td>
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</tr>
<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/ Visual and Performing Arts)</td>
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<tr>
<td>Free Electives</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>16</td>
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<tr>
<td><strong>Third Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
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<tr>
<td>EC 351</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Elective</td>
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<td>3</td>
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<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ENG 331</td>
<td>Communication for Engineering and Technology</td>
<td></td>
</tr>
<tr>
<td>ENG 332</td>
<td>Communication for Business and Management</td>
<td></td>
</tr>
<tr>
<td>ENG 333</td>
<td>Communication for Science and Research</td>
<td></td>
</tr>
<tr>
<td>Economics Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming-SAS</td>
<td>1</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC 451</td>
<td>Econometrics II</td>
<td>3</td>
</tr>
<tr>
<td>Economics Elective</td>
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<td>3</td>
</tr>
<tr>
<td>Advised Electives</td>
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</tr>
<tr>
<td>Free Electives</td>
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<td>6</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Fourth Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select two Economics Electives</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Select two Advised Electives</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Free Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC 490</td>
<td>Research Seminar in Economics</td>
<td>3</td>
</tr>
<tr>
<td>Select two Advised Electives</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
Free Electives 5

<table>
<thead>
<tr>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
</tr>
</tbody>
</table>

Total Hours 120

1 Must be completed with “C-” or better.

Students must also complete as a part of their general education requirements one course from the GEP U.S. Diversity list (no credit hour requirement) and one course from the GEP Global Knowledge list (no credit hour requirement).

GPA Graduation Requirements

- Overall GPA for all courses attempted at NC State must be 2.0 or higher; and
- Overall GPA for all EC and ECG courses attempted at NC State must be 2.0 or higher

Career Opportunities

An undergraduate degree in economics has long served as the foundation for advanced professional degrees in law and business, graduate study in economics, as well as jobs in business, industry and government.

Economics (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Economics offers an undergraduate Minor in Economics to all undergraduate majors outside the Department of Economics. The Minor in Economics is designed to help students develop a basic understanding of the principles and applications of economics. By pursuing this minor the student will: develop an understanding of microeconomic and macroeconomic theory and the role of markets: understand the effects of government regulation and policy on economic behavior; learn to apply economics to contemporary social and market issues; and develop analytical skills.

Contact

Poole College of Management
Undergraduate Programs Office
Box 8614
2150 Nelson Hall
919.515.5565
poole_minors@ncsu.edu

Plan Requirements

- A GPA of 2.0 or greater is required in all economics courses (EC, ECG, and ARE) attempted at NC State.
- Courses for the minor may not be taken for credit only (pass/fail).
- Students may transfer in up to six credits towards the minor.
- All transfer credits must be approved by the Poole College of Management Office of Undergraduate Programs in Nelson 2150.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
<td>3</td>
</tr>
<tr>
<td>or EC/ARE 201</td>
<td>Principles of Microeconomics</td>
<td></td>
</tr>
</tbody>
</table>

Elective Courses

Select two courses from any 300, 400, and/or 500 level EC/ECG 6

Economic courses

Total Hours 15

Essentials of Business (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

This Certificate is designed for the non-business undergraduate student who realizes that an understanding of business is essential for success in the workplace. It recognizes that the student’s regular academic program often does not accommodate additional courses during the Fall or Spring semesters. There are two required 3 unit courses covering business essentials and financial/managerial accounting. The student then selects two 3 unit courses from the following:

- Human Resource Management Marketing Methods
- Operations Management
- Personal Finance
- Uses of Accounting Information

Courses are offered in an online format during Summer sessions. This is to avoid conflict with a possible summer job or other activities. Courses may also be taken during a Fall or Spring semester if space is available.

Program Coordinators

Jason DeRousie
Director of Curriculum and Academic Programs
Poole College of Management
Nelson Hall 2150
business_essentials@ncsu.edu
919-515-5565

Admissions Requirements

Current NC State undergraduate students must have a minimum of a 2.0 grade point average to be accepted into this program. Non-NC State students must be registered with the university as non-degree seeking (NDS) students – see https://registrar.ncsu.edu/nds/ for more information. NDS students will have up to 6 years from the date of the first course taken to complete the certificate program.

The application deadline is 60 days prior to the date of the first course the student wishes to take. Please go to the program website – go.ncsu.edu/business_essentials (http://go.ncsu.edu/business_essentials/) to apply.

Plan of Study

Contact the Program Coordinators.

Registration Information

Contact: business_essentials@ncsu.edu
Academic Structure

Term Effective: 2191
Plan Code: 20BECTU
CIP Code: 52.0201

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIE 201</td>
<td>Introduction to Business Processes</td>
<td>3</td>
</tr>
<tr>
<td>ACC 280</td>
<td>Survey of Financial and Managerial Accounting</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select two of the following:</td>
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<tr>
<td>MIE 330</td>
<td>Human Resource Management</td>
<td></td>
</tr>
<tr>
<td>BUS 360</td>
<td>Marketing Methods</td>
<td></td>
</tr>
<tr>
<td>BUS 370</td>
<td>Operations and Supply Chain Management</td>
<td></td>
</tr>
<tr>
<td>BUS 225</td>
<td>Personal Finance</td>
<td></td>
</tr>
<tr>
<td>ACC 230</td>
<td>Individual Income Taxation</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 12

- There are no other required examinations, presentations, or external learning experiences.
- A total of 12 semester hours is required; all courses must be taken at NC State.
- Satisfactory completion of the certificate program requires:
  - completion of the coursework noted above
  - a grade of D-or better in all courses used to satisfy the certificate requirements
  - an overall GPA of 2.0 or better for all courses used to satisfy the certificate requirements

University College

University College is home to programs that can enrich your experience at NC State. From honors and scholars to undergraduate research and fellowships, we serve the entire university by providing outlets for students to express their Think and Do mentality.

Student success is our number one priority. We challenge you to think bigger, to find innovative solutions to real-world problems. Our rigorous coursework and on-campus resources provide you with the tools you need to excel.

Learn more about us on our website (https://universitycollege.dasa.ncsu.edu/)

Departments

- Department of Health and Exercise Studies (p. 1486)
- Department of Military Science (Army ROTC) (p. 1490)
- Department of Music (p. 1493)
- Department of Naval Science (Naval ROTC) (p. 1496)
- Honors and Scholars Programs (p. 1500)
- Military Sciences (Air Force ROTC) (p. 1504)

Minors

- Arts Entrepreneurship (Minor) (p. 1494)
- Coaching Education (Minor) (p. 1487)
- Dance (Minor) (p. 1497)
- Global Leadership and Team Decision-Making (Minor) (p. 1498)
- Health (Minor) (p. 1488)
- Leadership: Cross Disciplinary Perspectives (Minor) (p. 1503)
- Military Studies: Aerospace Studies (Minor) (p. 1505)
- Military Studies: Military Science (Minor) (p. 1492)
- Military Studies: Naval Science (Minor) (p. 1497)
- Music (Minor) (p. 1494)
- Outdoor Leadership (Minor) (p. 1489)
- Sports Science (Minor) (p. 1490)
- Theatre (Minor) (p. 1506)

Certificates

- Global Perspectives (Certificate) (p. 1499)
- Interdisciplinary Entrepreneurship (Certificate) (p. 1502)

Department of Health and Exercise Studies

The mission of the Department of Health and Exercise Studies (HES) is to educate a globally diverse NC State population regarding the benefits of living a healthy and physically active lifestyle by providing equal opportunities and professional preparation in sport, fitness, health, and recreation.

HES offers a variety of courses that fulfill both the undergraduate general education program (GEP) requirement and five (5) academic minors: coaching education, health, outdoor leadership, sports science, and dance. Minor curricula immerse students deeper into the discipline as well as prepare them for industry or graduate studies.

Department Highlights:

- Both face to face and distance options for many courses
- All courses are “Think and Do” in action
- HES offers five academic minors each with a capstone practicum course providing opportunity for experiential application of the discipline
- HES encourages students to “Take 8 at State.” Take an activity course each semester during your undergraduate career to stay well in mind and body. Completing four courses earns a water bottle and all eight earns students a t-shirt.

For more information about the department, including contact information, visit https://hes.dasa.ncsu.edu/.

Department of Health and Exercise Studies
North Carolina State University
Campus Box 8111
Raleigh, NC 27695-8111

Beth Wright Fath M.F.A., C.M.A.
Associate Teaching Professor and Department Head
North Carolina State University
Box 8111
Raleigh, NC 27695-8111
Phone : 919-513-1545
Email: beth_fath@ncsu.edu
Reach Requirements
Email: slwill22@ncsu.edu
Raleigh, NC 27695-8111
Box 8111
North Carolina State University
Lecturer and Coaching Education Minor Coordinator
Suzanne Williams, M.A.
Raleigh, NC 27695-8111
Campus Box 8111
Department of Health and Exercise Studies
hes.dasa.ncsu.edu/minor-programs/coaching-education/
For more information about this program, visit our website: https://hes.dasa.ncsu.edu/minor-programs/coaching-education/

Coaching Education (Minor)
To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)
The Department of Health and Exercise Studies offers a 16 credit hour minor in coaching education designed to prepare students to assume coaching responsibilities with a sound theoretical and practical background. The minor provides students with a foundation of essential coaching skills; (a) the basic knowledge, understanding, and application of coaching philosophy, sport psychology, and effective teaching techniques; (b) the basic principles of human anatomy and physiology, kinesiology, and exercise science and the practical application to coaching; (c) injury prevention, risk management, and the treatment of sport-related injuries; (d) theories and techniques necessary to plan, organize, and implement sport programs; (e) and a demonstration of motor skills and strategies involved in coaching specific sports.

Recent practicum experiences have included:
- Assistant varsity lacrosse coach at Sanderson High School
- Assistant coach at the Raleigh Swimming Association
- Assistant soccer coach at Wake FC Soccer Club
- Assistant swim coach at Athens Drive Magnet High School
- Assistant soccer coach at Cardinal Gibbons High School
- Varsity wide receiver assistant coach and JV football special teams coordinator at Green Hope High School

For more information about this program, visit our website: https://hes.dasa.ncsu.edu/minor-programs/coaching-education/

Plan Requirements
- The Coaching Education minor requires the completion of 16 credit hours
- Students will complete six credit hours from the three required courses
- Students will complete 10 credit hours from eleven elective courses
- All minor program courses must be taken for a letter grade

Coaching Education (Minor)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HESM 301</td>
<td>Coaching Practicum</td>
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</tr>
<tr>
<td>HESM 370</td>
<td>Foundations of Sport Coaching and Instruction</td>
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<tr>
<td>HESM 477</td>
<td>Coaching Concepts</td>
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<tr>
<td>Select six credits of the following:</td>
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<tr>
<td>HESM 381</td>
<td>Athletic Training</td>
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<tr>
<td>HESM 476</td>
<td>Motor Learning and Sport Performance</td>
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<tr>
<td>HESM 478</td>
<td>Exercise Physiology and Sports Science</td>
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<tr>
<td>Select four credits of the following:</td>
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<tr>
<td>HESM 201</td>
<td>Coaching Baseball/Softball</td>
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<tr>
<td>HESM 202</td>
<td>Coaching Basketball</td>
<td></td>
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<tr>
<td>HESM 203</td>
<td>Coaching Football</td>
<td></td>
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<tr>
<td>HESM 204</td>
<td>Coaching Golf</td>
<td></td>
</tr>
<tr>
<td>HESM 205</td>
<td>Coaching Soccer</td>
<td></td>
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<tr>
<td>HESM 207</td>
<td>Coaching Tennis</td>
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</tr>
<tr>
<td>HESM 209</td>
<td>Coaching Volleyball</td>
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<tr>
<td>HESM 211</td>
<td>Strength Training and Conditioning</td>
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</tr>
<tr>
<td>Total Hours</td>
<td>16</td>
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</tbody>
</table>

Dance (Minor)
Plan Requirements

- Completion of a minimum of 16 required credit hours.
- A minimum overall GPA of 2.0 in the minor.
- Students may not take Minor coursework on a credit only (pass/fail) or S/U basis.
- The program coordinator will certify the minor prior to graduation.
- A minimum of 12 of the 16 required credit hours must be completed at NC State.
- A grade of a “C-” or better must be earned in each course to count towards completion of the minor.

Select two of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HESM 322</td>
<td>Dance and Society</td>
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<tr>
<td>HESM 324</td>
<td>Concert Dance History</td>
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<tr>
<td>HESM 326</td>
<td>Current Trends in Dance</td>
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<tr>
<td>HESM 320</td>
<td>Movement Improvisation</td>
<td>1</td>
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<tr>
<td>Select two of the following:</td>
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</tr>
<tr>
<td>DAN 272</td>
<td>Dance Composition - Solo Forms</td>
<td></td>
</tr>
<tr>
<td>HESM 328</td>
<td>Dance Composition - Group Forms</td>
<td></td>
</tr>
<tr>
<td>HESM 330</td>
<td>Introduction to Laban Movement Analysis and Bartenieff Fundamentals</td>
<td></td>
</tr>
<tr>
<td>HESM 332</td>
<td>Dance and Technology</td>
<td></td>
</tr>
<tr>
<td>Select two of the following:</td>
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<tr>
<td>HESD 227</td>
<td>African Dance I</td>
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<tr>
<td>HESD 230</td>
<td>Horton Dance Technique</td>
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<tr>
<td>HESD 234</td>
<td>Country Dance</td>
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<tr>
<td>HESD 240</td>
<td>Social Dance</td>
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<tr>
<td>HESD 263</td>
<td>Tap Dance</td>
<td></td>
</tr>
<tr>
<td>HESD 264</td>
<td>Ballet I</td>
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</tr>
<tr>
<td>HESD 273</td>
<td>Jazz Dance I</td>
<td></td>
</tr>
<tr>
<td>HESD 274</td>
<td>Modern Dance I</td>
<td></td>
</tr>
<tr>
<td>DAN 260</td>
<td>Hip-hop Dance</td>
<td></td>
</tr>
<tr>
<td>DAN 210</td>
<td>Current Trends in Afrocentric and World Dance</td>
<td></td>
</tr>
<tr>
<td>DAN 295</td>
<td>Problems of Dance Performance</td>
<td></td>
</tr>
<tr>
<td>HESM 304</td>
<td>Dance Practicum</td>
<td>1</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>17-20</td>
</tr>
</tbody>
</table>

Health (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Health and Exercise Studies offers a 15 credit hour health minor that is designed for undergraduate students wishing to pursue careers in health-related professions and for students wishing to gain in-depth knowledge in various contemporary health-related topics for their own personal development. The minor provides students with theories, concepts, and practical skills concerning health behavior and includes a practicum to apply theory to practice.

Recent practicum experiences have included projects with:

- Aids Alliance
- American Cancer Society
- Local middle school health classes
- Boys & Girls Club

For more information about this program, visit our website: https://hes.dasa.ncsu.edu/minor-programs/health/

Plan Requirements

- A grade of “C-” or better required in each course.
- Minimum overall GPA of 2.0 in the minor.
- All Health Minor courses (16 credit hours) must be taken for a letter grade to complete the Health minor.
- The minor will require a minimum of ten (10) hours taken at North Carolina State University.
- HESM 285 Personal Health will be a prerequisite for HESM 375 Health Planning and Programming.
- HESM 285 Personal Health and HESM 375 Health Planning and Programming will be prerequisites for HESM 377 Methods of Health Promotion.
• A maximum of TWO (2) courses may be used (double-counted) towards both departmental major requirements and minor requirements.
• No courses for the minor may be taken for S/U credit.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HESM 285</td>
<td>Personal Health</td>
<td>7</td>
</tr>
<tr>
<td>HESM 375</td>
<td>Health Planning and Programming</td>
<td></td>
</tr>
<tr>
<td>HESM 377</td>
<td>Methods of Health Promotion</td>
<td></td>
</tr>
<tr>
<td>HESM 300</td>
<td>Practicum in Health 1</td>
<td></td>
</tr>
</tbody>
</table>

| Elective Courses 2 |
| BIO 105         | Biology in the Modern World                        | 9     |
| & BIO 106       | and Biology in the Modern World Laboratory         |       |
| or BIO 181      | Introductory Biology: Ecology, Evolution, and Biodiversity | |
| GN 301          | Genetics in Human Affairs                          |       |
| MB 200          | The Fourth Horseman: Plagues that Changed the World |       |
| NTR 301         | Introduction to Human Nutrition                    |       |
| HESM 212        | Alcohol, Drugs and Tobacco                         |       |
| HESM 213        | Human Sexuality                                    |       |
| HESM 280        | Responding to Emergencies                          |       |
| HESM 284        | Women's Health Issues                              |       |
| HESM 286        | Nutrition, Exercise and Weight Control             |       |
| HESM 287        | Stress Management                                  |       |
| PRT 200         | Health, Wellness and the Pursuit of Happiness      |       |
| SOC 381         | Sociology of Medicine                              |       |

Total Hours 16

1 Students must complete HESM 285 Personal Health, HESM 375 Health Planning and Programming, HESM 377 Methods of Health Promotion and at least 6 hours of electives from the Health Minor before taking HESM 300 Practicum in Health.

2 The elective courses may be selected in consultation with your Health minor advisor. The following are a list of approved elective courses for your consideration.

Outdoor Leadership (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/).

The Department of Health and Exercise Studies offers a 16 credit hour minor in outdoor leadership that is designed for undergraduate students desiring to pursue careers as outdoor leaders of adventure-based programs or for those who wish to enhance their personal development and enjoyment. Students will develop a foundation of essential leadership skills and experience through course work focusing on outdoor skills and leadership training. Students will also have an opportunity to apply theory to practice through a practicum.

Recent practicum experiences include:
• Leading an ecotour to Mexico
• Leading fall break rock climbing expeditions

• Leading spring break backpacking expeditions
• Co-leading the Diversity and Inclusion Adventure Experience

For more information about this program, visit our website: https://hes.dasa.ncsu.edu/minor-programs/outdoor-leadership/

Department of Health and Exercise Studies
North Carolina State University
Campus Box 8111
Raleigh, NC 27695-8111

Terry Dash, M.S.
Senior Lecturer and Outdoor Leadership Minor Coordinator
North Carolina State University
Box 8111
Raleigh, NC 27695-8111
Phone: 919-515-3361 (main)
Email: terry_dash@ncsu.edu

Plan Requirements
• Complete a minimum of 16 hours of coursework in the following areas.
• A grade of “C-" or better required in each course.
• A minimum overall GPA of 2.0 in the minor.
• There are 5 required courses, totaling 11 semester hours.
• The remaining credit hours consist of 5 elective courses selected from a list of outdoor specific offerings.
• A student enrolled in the Outdoor Leadership minor can expect to incur program costs up to $500.00 or more. Costs will vary and are dependent on the courses(s) in which students are enrolled. Program costs help defray program expenses including guides, transportation, food, campground fees, and specialized equipment rental when required.
• A maximum of TWO (2) course may be used (double-counted) towards both departmental major requirements and minor requirements.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HESM/PRT 214</td>
<td>Introduction to Adventure Education (PEO)</td>
<td>3</td>
</tr>
<tr>
<td>HESM/PRT 215</td>
<td>Principles and Practices of Outdoor Leadership (PEO)</td>
<td>3</td>
</tr>
<tr>
<td>HESM 216</td>
<td>Backcountry Instruction Methodology (PEO)</td>
<td>2</td>
</tr>
<tr>
<td>HESM 280</td>
<td>Responding to Emergencies</td>
<td>2</td>
</tr>
<tr>
<td>HESM 302</td>
<td>Practicum Experience in Outdoor Programs (PEO)</td>
<td>1</td>
</tr>
</tbody>
</table>

Elective Courses
Select five of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HESA 223</td>
<td>Lifeguard Training (PE)</td>
<td></td>
</tr>
<tr>
<td>HESA 226</td>
<td>Skin and Scuba Diving I (PE)</td>
<td></td>
</tr>
<tr>
<td>HESA 227</td>
<td>Skin &amp; Scuba Diving II (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 253</td>
<td>Orienteering (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 255</td>
<td>Basic Canoeing (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 257</td>
<td>Backpacking (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 258</td>
<td>Basic Rock Climbing (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 259</td>
<td>Intermediate Rock Climbing (PE)</td>
<td></td>
</tr>
<tr>
<td>HESO 262</td>
<td>Introduction to Whitewater Canoeing (PE)</td>
<td></td>
</tr>
</tbody>
</table>
Sports Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Department of Health and Exercise Studies offers a 16 credit hour sports science minor designed for students who desire a greater understanding of the physiological and biomechanical principles of exercise and fitness. The minor provides coursework in anatomy, physiology, nutrition, biomechanical principles, prevention and treatment of athletic injuries, exercise leadership, and health behavior.

Recent practicum experiences have included:

- Pivot Physical Therapy: Shadowed physical therapist in an outpatient setting.
- NC State Dining, nutrition major: Learned process of menu design and execution, gained insight into providing proper nutrition to high volume kitchens, experienced communication and chain of command between directors, chefs, and nutritionists.
- NC State Nutrition and Athletics: Learned dietician’s role in athletics and how they promote what they know to athletes to ensure optimal nutrition.
- Raleigh Personal Training: Learned daily activity of a professional trainer. Learned through observation and gained experience by assisting with exercise programming and training for specific athletic activities.
- Barton College Athletic Training: Observed athletic training staff at a NCAA Division II institution. Specific experiences with football, including baseline screens for concussion, equipment fittings, team meetings, practice/game set-up, and daily operations.

For more information about this program, visit our website: https://hes.dasa.ncsu.edu/minor-programs/sport-science/

Plan Requirements

- Completion of 16 – 17 credit hours
- A grade of “C-” or better required in each course.
- There are five required courses totaling 13-14 credit hours.
- The remaining elective courses (3 credit hours) consist of selections from a list of specific offerings.
- The minor will require that a minimum of 10 credit hours be taken at NC State University which includes the practicum.
- Students are required to complete HESM 280 Responding to Emergencies or its equivalent, prior to entering HESM 303 Sports Science Practicum.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>HESM 480</td>
<td>Principles of Exercise Programming (PEF)</td>
<td>3</td>
</tr>
<tr>
<td>HESM 286</td>
<td>Nutrition, Exercise and Weight Control (PPEH)</td>
<td>2</td>
</tr>
<tr>
<td>or NTR 301</td>
<td>Introduction to Human Nutrition</td>
<td></td>
</tr>
<tr>
<td>HESM 303</td>
<td>Sports Science Practicum (PES)</td>
<td>1</td>
</tr>
<tr>
<td>HESM 478</td>
<td>Exercise Physiology and Sports Science (PEC)</td>
<td>3</td>
</tr>
<tr>
<td>BIO 240</td>
<td>Principles of Human Anatomy &amp; Physiology (A): Nervous, Skeletal, Muscular, &amp; Digestive Systems</td>
<td>4</td>
</tr>
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</table>

Elective Courses

Select three credit hours of the following:

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>HESM 211</td>
<td>Strength Training and Conditioning (PEC)</td>
<td>3</td>
</tr>
<tr>
<td>HESM 214</td>
<td>Introduction to Adventure Education (PES)</td>
<td></td>
</tr>
<tr>
<td>HESM 285</td>
<td>Personal Health (PEH)</td>
<td></td>
</tr>
<tr>
<td>HESM 381</td>
<td>Athletic Training (PEC)</td>
<td></td>
</tr>
<tr>
<td>BIO 245</td>
<td>Principles of Human Anatomy &amp; Physiology (B): Endocrine, Cardiovascular, Respiratory &amp; Renal Systems</td>
<td></td>
</tr>
<tr>
<td>NTR 500</td>
<td>Principles of Human Nutrition</td>
<td></td>
</tr>
<tr>
<td>NTR 555</td>
<td>Exercise Nutrition</td>
<td></td>
</tr>
<tr>
<td>PRT 200</td>
<td>Health, Wellness and the Pursuit of Happiness</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 16

Department of Military Science (Army ROTC)

William Neal Reynolds Coliseum
2411 Dunn Ave.
NC State Box 7309
Raleigh, NC 27695-7309
Phone: 919-515-0863
Website: https://army.dasa.ncsu.edu/
Email: army-rotc@ncsu.edu

Mission

The mission of the Army ROTC Program is to train college men and women to become commissioned officers in sufficient numbers to meet Active Army, Army Reserve and National Guard requirements.
Program of Instruction

The Army ROTC program consists of a voluntary Basic Course (freshmen and sophomore level) and a two-year Advanced Course (junior and senior level) that includes a four-week Cadet Leaders Course in the summer prior to the senior year. One may enter the Advanced Course without participating in the Basic Course by any of the following methods:

- **Simultaneous Membership Program** (SMP): Members of Reserve or National Guard units may take advantage of this program and, if accepted, enroll directly into the Advanced Course. SMP participants will be assigned to a unit near NC State or home for part-time monthly officer training and will receive the ROTC Advanced Course subsistence payment of $450 per month for Juniors and $500 for Seniors, plus approximately $200 per month for the one weekend of Reserve or Guard training. In addition, two weeks of Annual Training will be required for which the individual will receive full pay.
- **Prior Service**: Service veterans are eligible for placement into the Advanced Course.
- **Leader’s Training Course** (LTC): Successful completion of the four-week basic summer camp, held at Ft. Knox, Kentucky is an alternative to the Basic Course. Students with strong academic credentials may receive a scholarship after completing this course.
- **Transfer Credit**: Students entering as transfer students from other institutions may receive credit for work completed at other Senior ROTC units.
- **Junior ROTC**: Students who have participated in a Junior ROTC in high school may receive placement credit as determined by the Professor of Military Science.

Eligibility

All full-time freshmen and sophomores may enroll in any Military Science Basic Course offering without obligation to the Army. To be eligible for participation in the Advanced Course, applicants must be in good academic standing and demonstrate satisfactory performance in the Basic Course. Additionally, applicants for commissioning must be able to be commissioned by their 30th birthday. An age waiver may be obtained as long as the individual will be commissioned prior to his/her 32nd birthday. A student must have a minimum of two years remaining as a full-time student at either the undergraduate or graduate level.

Professional Military Education

There are five Professional Military Education (PME) courses which must be taken or have an approval of a waiver obtained for them. All but one content area (Military History) are automatically met by completion of the university’s General Education Distribution Requirements. PME requirements must be completed or waived prior to commissioning.

Delays for Graduate Study

Qualified ROTC graduates may delay their entry into active service in order to obtain advanced academic degrees. Fellowships for advanced academic study are available to selected ROTC graduates, allowing up to two years of graduate study while receiving full pay and allowances plus payment for tuition, all fees, textbooks, and required supplies.

Financial Aid

Army scholarships of two to four years which pay for tuition, all fees and textbooks are available on a competitive basis to students who are strongly motivated and academically qualified. Scholarships pay:

- Full tuition and mandatory fees or applied towards room & board
- A $900 per semester book allowance
- A tax-free stipend based on academic status during the academic year ($350 per month for Freshmen, $400 per month for Sophomores, $450 for Juniors, and $500 for Seniors)

Service Opportunities

Scholarship recipients may serve four years active duty upon commissioning or eight years in the United States Army Reserve or National Guard. Service consists of one weekend drill per month and two weeks annual training.

Program Features

Army ROTC classes are unique, offering instruction and a practical, working knowledge of leadership. Students are challenged early in the ROTC training to enable them to develop sound judgment, the desire to achieve, acceptance of responsibility, personal confidence, and to learn the principles of personnel management. The primary vehicle for this training during the academic year is Leadership Laboratory, where cadet officers and non-commissioned officers conduct instruction under the supervision of the Department of Military Science’s faculty. The intensive Cadet Summer Course is extremely effective in developing an individual emotionally, mentally and physically. All Army ROTC training is focused on preparing the student to meet the challenges of tomorrow’s society, whether in a military or civilian career.

Distinguished Military Students

The University names outstanding Army ROTC students as Distinguished Military Graduates.

Uniforms

Uniforms for contracted Cadets are provided by the federal government.

Departmental Offices

Our Administrative Office is located at the Reynolds Coliseum at 2411 Dunn Ave.

Faculty

Professor of Military Science

LTC Joshua Trimble

Cadre

MSG Joseph Aiello, Senior Military Instructor
CPT Cedric Cato, APMS/MSI Instructor
SSG Marshall Clark, National Guard Recruiter/Career Counselor
CPT Joseph Fix, APMS/MSII Instructor/Operations
SSG Arthur Jones, MSI/Color Guard Coordinator
MAJ Roger De Leon, Executive Officer/APMS  
SFC Gerardo Salazar, MSI Instructor/ Human Resources

Administration  
Mr. Stephen Johnson, Recruiting Operations Officer  
Mr. Robert Newman, Supply Technician  
Ms. Rashita Adams, Human Resources Assistant

Plans
• Military Studies: Military Science (Minor) (p. 1492)

Military Studies: Military Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Departments of Aerospace Studies (AS), Military Science (MS), and Naval Science (NS) offers a minor in Military Studies to any undergraduate degree student interested in learning about military skills and careers. Students will develop the mental, moral, and physical skills needed to make them capable of being stronger leaders. The desire to assume the highest responsibilities of command, citizenship, and government will be instilled. Students will also be instilled the highest ideals of duty, honor, and loyalty in order to commission college graduates as officers with a basic professional background and motivation toward careers in the military.

Admissions

Students may declare their intention to complete the Military Studies minor by consulting with one of the advisors listed below.

Certification

The commanders of the respective concentrations will certify the minor prior to graduation (see the contact information below). The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Persons

Aerospace Studies
Lt Col John Dumont, Air Force ROTC  
Reynolds Coliseum Suite 137  
(919) 515-2417  
jdumont@ncsu.edu

Military Science
Bill Boucher  
Reynolds Coliseum Room 151C  
919.513.0863

Naval Science

Curtis H. Bouché  
Reynolds Coliseum  
919.515.8931  
achertel@ncsu.edu

SIS Code: 24MSMSM

Plan Requirements

• Complete 15 credit hours from any one of the following concentrations.
• A grade of “C” or better must be achieved in all courses taken.
• A minimum of 6 hours must be taken at the 300 or 400 level. Students may combine courses from the lists.

Required Courses (15 credit hours)

Choose from one of the three (3) concentrations: Aerospace Studies, Military Science, or Naval Science.

Aerospace Studies

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 121</td>
<td>Heritage and Values I</td>
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</tr>
<tr>
<td>AS 122</td>
<td>Heritage and Values II</td>
<td>1</td>
</tr>
<tr>
<td>AS 221</td>
<td>Team and Leadership Fundamentals I</td>
<td>1</td>
</tr>
<tr>
<td>AS 222</td>
<td>Team and Leadership Fundamentals II</td>
<td>1</td>
</tr>
<tr>
<td>AS 321</td>
<td>Leading People and Effective Communication I</td>
<td>3</td>
</tr>
<tr>
<td>AS 322</td>
<td>Leading People and Effective Communication II</td>
<td>3</td>
</tr>
<tr>
<td>AS 421</td>
<td>National Security Affairs/Preparation for Active Duty I</td>
<td>3</td>
</tr>
<tr>
<td>AS 422</td>
<td>National Security Affairs/Preparation for Active Duty II</td>
<td>3</td>
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</table>

Military Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MS 101</td>
<td>Introduction to Leadership and Values I</td>
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</tr>
<tr>
<td>MS 102</td>
<td>Basic Military Leadership</td>
<td>1</td>
</tr>
<tr>
<td>MS 201</td>
<td>Intermediate Leadership Theory I</td>
<td>2</td>
</tr>
<tr>
<td>MS 202</td>
<td>Intermediate Leadership Theory II</td>
<td>2</td>
</tr>
<tr>
<td>MS 301</td>
<td>Military Leadership and Training Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 302</td>
<td>Applied Leadership in Small Unit Operations</td>
<td>3</td>
</tr>
<tr>
<td>HI 350</td>
<td>American Military History</td>
<td>3</td>
</tr>
<tr>
<td>HI 351</td>
<td>U.S. Naval History</td>
<td>3</td>
</tr>
<tr>
<td>MS 401</td>
<td>Advanced Military Science - Leadership and Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 402</td>
<td>Advanced Military Science - Military Justice, Ethics and Professionalism</td>
<td>3</td>
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</tbody>
</table>

Naval Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS 110</td>
<td>Introduction to Naval Science</td>
<td>2</td>
</tr>
<tr>
<td>NS 210</td>
<td>Leadership and Management</td>
<td>3</td>
</tr>
</tbody>
</table>
### Elective Courses

Students have the ability to choose among the various courses for the concentrations listed above.

### Department of Music

For more information about this department, including contact information, visit the department ([https://music.arts.ncsu.edu/](https://music.arts.ncsu.edu/)).

Price Music Center  
Campus Box 7311  
Raleigh, NC 27695-7311  
Phone: (919) 515-2981  
Fax: (919) 515-4204  
Email: music-info@ncsu.edu

The Department of Music is committed to providing broad-based educational opportunities for NC State students through a variety of musical experiences and introductory and upper-level academic courses. Departmental faculty seek to assist students in developing musical insights, musical skills, and the capacity to perceive and respond to music in its historical and cultural contexts.

Opportunities for direct student application as performers include many choral and instrumental ensemble courses. Registration in any ensemble is open to students with a disciplined interest in music. Auditions are scheduled during summer orientation, at the beginning of each semester, and by appointment with the conductor of the group. For further information, please call (919) 515-2981 or visit the Department of Music website ([https://music.arts.ncsu.edu/](https://music.arts.ncsu.edu/)) for audition information.

The department offers a variety of courses, most of which may be taken to fulfill specific general education programs. Any course may be taken as a free elective. Both a 15-hour minor in Arts Entrepreneurship and a 20-hour music minor is offered for qualified undergraduate students who wish to engage in more extensive study of music and the arts. Emphases include history, liberal arts, composition, and performance—piano, vocal, or instrumental.

The department also serves as a cultural resource for the university community and the public at large through concerts presented by ensembles, student-musicians, music faculty, and visiting artists. Concerts are open to students and the public.

### Faculty

#### Department Head

Dr. Daniel G. Monek, *Department Head, Professor*

#### Adjunct Lecturers

- Dr. Alison Arnold
- Jennifer Beattie
- Dr. William Boone
- Kathryn Brown
- Aaron Keane
- Darrick King
- Anatoly Larkin
- Dr. Robert Petters
- Darrell Thompson
- Dr. Kristen Turner
- Phyllis Vogel

#### Adjunct Applied Lecturers

- Sam Almaguer, *Applied Instructor of Clarinet*
- Mary Boone, *Adjunct Instructor of Flute*
- Don Eagle, *Adjunct Instructor of Trumpet*
- Simon Ertz, *Adjunct Instructor of Viola*
- Leonid Finkelshteyn, *Adjunct Instructor of Bass*
- Jason Foureman, *Adjunct Instructor of Jazz*
- Winifred Garrett, *Adjunct Instructor of Harp*
- Keenan McKenzie, *Adjunct Instructor of Saxophone*
Keenan McKenzie, Adjunct Instructor of Saxophone
Dr. DeMar Austin Neal, Applied Instructor of Voice
John Pederson, Adjunct Instructor of Bassoon
Jonathan Randazzo, Adjunct Instructor of Trombone
Lin-Ti Wang, Adjunct Instructor of Violin
Melanie Wilsden, Adjunct Instructor of Oboe

Plans

- Arts Entrepreneurship (Minor) (p. 1494)
- Music (Minor) (p. 1494)

Arts Entrepreneurship (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The minor in Arts Entrepreneurship introduces students to a variety of methods arts entrepreneurs employ to make decisions about, plan, execute and sustain an arts or arts-related venture.

In addition to examining arts and arts-related industries, the Minor guides students in recognizing opportunities in the arts economies and provides perspectives concerning art’s role in society, both as an aesthetic object and a commercial product. Likewise, the Minor helps students to reconsider either their role as artists in communities or their role in providing innovation to the production of art, by introducing the concept of the entrepreneurial artist-citizen. Students are also introduced to the challenges and rewards of being an emerging arts entrepreneur through the Capstone Experience Course.

As a program designed for the entire student body, the Arts Entrepreneurship Minor is a rigorous course of study for students interested in exploring entrepreneurial opportunities in the arts and arts-related fields, regardless of their major course of study.

Admissions

Students are required to meet with Dr. Gary Beckman to discuss the expectations established for the Arts Entrepreneurship Minor and complete an application form prior to enrolling in the Minor.

Certification

Students must earn an overall 2.75 GPA in their Minor coursework to be certified for the minor. Students may not take Minor coursework on a credit only (pass/fail) or S/U basis. The Department of Music Director, Dr. Mark Scearce will certify the minor prior to graduation. The minor must be completed no later than the penultimate semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Dr. Gary D. Beckman
Campus Box 7311
919.515.1637
gbeckma@ncsu.edu

SIS Code: 24EMAM

Plan Requirements

- Students must earn at least an overall 2.75 GPA in their Minor coursework to be certified for a minor.
- Students may not take Minor coursework on a credit only (pass/fail) or S/U basis.
- A total of 15 credit hours is required for this minor.

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMA 365</td>
<td>Foundations in Arts Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>EMA 370</td>
<td>Practical Arts Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>EMA 375</td>
<td>Understanding the Arts Economies</td>
<td>3</td>
</tr>
<tr>
<td>EMA 430</td>
<td>Capstone Experience in Arts Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>Advised Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

Music (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Music Minor is a 20-credit hour curriculum designed for undergraduate students who wish to engage in the study of music through one of three curricular tracks:

1. Performance,
2. Composition,
3. General Studies.

Students take four required courses (8 credit hours) in music theory, aural skills, class piano, and Western music history, and an additional 12 credit hours of required courses and electives in their area of specialization.

Admissions

For all students:

- Students may apply for the Music Minor electronically via the Music Minor Application or in person at the Music Department Office, 203 Price Music Center. Based on their chosen track, students will be assigned the appropriate minor advisor, who will then schedule a meeting to discuss a plan of study and the expectations established for the minor.
- For students in the Performance Track, admission is through a preliminary audition. Upon recommendation, students are assigned an advisor and applied instructor and enroll in MUS 193 Applied Music Lessons I. The jury exam at the end of their first semester of MUS 193 Applied Music Lessons I determines eligibility for continuation in the Performance Track.
- For students in the Composition and General Studies Tracks, admission to the Music Minor is granted upon the completion and processing of a Minor Declaration Form (https://studentservices.ncsu.edu/forms/registrar/declare_minor.pdf).
- During each semester’s registration period, students must schedule an appointment with their minor advisor to have their plan of study reviewed. This should take place before students meet with their Academic Advisor and enroll for the following semester’s courses.
Performance Track Requirements:

- Students preparing to enter their second semester of MUS 193 Applied Music Lessons I must first pass the Music Theory Placement Test or enroll concurrently in MUS 120 Introduction to Music Theory.
- Students who have not taken any of MUS 103 Theory and Musicianship I, MUS 104 Theory and Musicianship Lab I, or MUS 202 Introduction to Music Literature II by the end of their second semester of MUS 193 Applied Music Lessons I must enroll concurrently in one of these courses during their first semester of MUS 293 Applied Music Lessons II.

Composition Track Requirement:

- Students must enroll in MUS 498 Independent Study in Music during the registration period preceding the final semester of the minor. At this time, a Course Agreement contract is completed by the student and the student’s applied composition instructor. The goals and timeline for completing the composition project should be approved by the student’s minor advisor.

Certification

The Music Department Head or their designee will certify the Music Minor prior to graduation. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than the registration period prior to the student’s final semester at NC State.

Contact Person/Music Minor Advisor

Daniel Monek
203 Price Music Center
919.515.1692
dgmonek@ncsu.edu

SIS Code: 24MUM

Plan Requirements

- A total of 20 hours is required for the Music Minor.
- A maximum of 6 transfer credit hours may be applied to the Music Minor, as approved by the Music Minor Advisor and Department Head.
- A grade of C- or better is required in each course used toward the minor.
- No course for the minor may be taken for S/U credit.
- For students majoring in Arts Studies-Music, a maximum of one 3-credit course may be used (double-counted) toward both departmental major requirements and minor requirements.
- Certain courses allow for a placement test or audition; students who test out of a course must make up those credits by taking another approved MUS course.
- MUS 120 Introduction to Music Theory is a prerequisite for MUS 103 Theory and Musicianship I and does not count toward completion of the 20 hours required for the music minor. Students may elect to take the Music Theory Placement Test to test into MUS 103 Theory and Musicianship I.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MUS 103</td>
<td>Theory and Musicianship I</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 104</td>
<td>Theory and Musicianship Lab I</td>
<td>1</td>
</tr>
<tr>
<td>MUS 107</td>
<td>Class Piano I</td>
<td>1</td>
</tr>
<tr>
<td>MUS 202</td>
<td>Introduction to Music Literature II</td>
<td>3</td>
</tr>
<tr>
<td>MUS 207</td>
<td>Class Piano II</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Hours 9

1. Required for students in the General Studies and Composition Tracks only
2. Required for students in the Performance Track. However, Performance students who test out must take MUS 154 Theory and Musicianship Lab II.

Performance Track

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 154</td>
<td>Theory and Musicianship Lab II</td>
<td>1</td>
</tr>
<tr>
<td>MUS 193</td>
<td>Applied Music Lessons I</td>
<td>1</td>
</tr>
<tr>
<td>MUS 193</td>
<td>Applied Music Lessons I</td>
<td>1</td>
</tr>
<tr>
<td>MUS 293</td>
<td>Applied Music Lessons II</td>
<td>1</td>
</tr>
<tr>
<td>MUS 293</td>
<td>Applied Music Lessons II</td>
<td>1</td>
</tr>
<tr>
<td>MUS 393</td>
<td>Recital</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3-hour advised elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ensemble (4 semesters at 1 cr each semester)</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Hours 13

1. Required only for performance minors who have tested out of MUS 207 Class Piano II.
2. Piano minors fulfill this requirement by taking 2 semesters of ensembles (2 cr) and MUS 208 Piano Pedagogy (2 cr).

Composition Emphasis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 153</td>
<td>Theory and Musicianship II</td>
<td>3</td>
</tr>
<tr>
<td>MUS 154</td>
<td>Theory and Musicianship Lab II</td>
<td>1</td>
</tr>
<tr>
<td>MUS 320</td>
<td>Music of the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>MUS/ARS 306</td>
<td>Music Composition with Computers</td>
<td>3</td>
</tr>
<tr>
<td>or MUS 305</td>
<td>Music Composition</td>
<td></td>
</tr>
<tr>
<td>MUS 498</td>
<td>Independent Study in Music</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Total Hours 11-13

1. One additional free elective cr if the composition is performed

History Emphasis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 153</td>
<td>Theory and Musicianship II</td>
<td>3</td>
</tr>
<tr>
<td>MUS 154</td>
<td>Theory and Musicianship Lab II</td>
<td>1</td>
</tr>
<tr>
<td>MUS 201</td>
<td>Introduction to Music Literature I</td>
<td>3</td>
</tr>
<tr>
<td>Select two of the following:</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>MUS 200</td>
<td>Understanding Music: Global Perspectives</td>
<td></td>
</tr>
<tr>
<td>MUS 206</td>
<td>America’s Music</td>
<td></td>
</tr>
<tr>
<td>MUS 230</td>
<td>Introduction to African-American Music</td>
<td></td>
</tr>
<tr>
<td>MUS 260</td>
<td>History of Jazz</td>
<td></td>
</tr>
<tr>
<td>MUS 310</td>
<td>Music of the 17th and 18th Centuries</td>
<td></td>
</tr>
<tr>
<td>MUS 315</td>
<td>Music of the 19th Century</td>
<td></td>
</tr>
<tr>
<td>MUS 320</td>
<td>Music of the 20th Century</td>
<td></td>
</tr>
</tbody>
</table>
Motivated toward careers in the naval services, and have a potential for Marine officers who possess a basic professional background, are physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to commission college graduates as Navy and midshipmen and enlisted officer candidates mentally, morally, and future development in mind and character so as to assume the highest responsibilities of command, citizenship, and government.

4-year NROTC Program

There are two NROTC programs leading to a commission as a Navy or Marine Officer upon graduation: the Scholarship Program and the College Program.

Scholarship Program

The Scholarship Program leads to a commission in the Navy or Marine Corps. For students who receive a Navy/Marine Corps scholarship, the Navy will pay tuition and fees, provide a $375 book allowance each semester, supply uniforms, and pay a monthly tax-free subsistence allowance (currently $250 to $400 on a graduated scale; refer to the NROTC website (https://naval.dasa.ncsu.edu/) for updates), to help defray the cost of normal board at the university. During the summers between school years, Navy scholarship students receive approximately 4 weeks of at-sea training conducted on ships, submarines, or aviation squadrons. For select students, training with mobile Explosive Ordnance Disposal (EOD)/SEAL teams is also possible during the summer prior to their senior year. Marine scholarship students participate in a Mountain Warfare Training course between sophomore and junior year and complete Marine Officer Candidate School between their junior and senior year. The minimum active duty obligation following graduation for scholarship students is five years but can vary greatly depending on the warfare community a student commissions into.

College Program

For those students who are interested in a commission and do not desire a scholarship, or for those who are seeking an opportunity to qualify for a scholarship after entering NC State, the College Program is available. Selection for the College Program is made from students already enrolled at NC State with applications being accepted and considered by the staff of the NROTC unit. Students enrolled in the College Program are eligible to compete for merit based scholarships annually. If selected for a merit based scholarship, the student would begin their next academic year on a full scholarship, identical to the Scholarship Program description above.

If not selected for a three or two year side load scholarship, College Program students compete for selection to continue NROTC as “Advanced Standing” students at the end of their sophomore year. Selection is based on academic and demonstrated professional performance. Those selected for Advanced Standing receive a monthly subsistence allowance during the final two years of the program (refer to the NROTC website (http://catalog.ncsu.edu/undergraduate/otheracademicdepartments/navalsciencenavalrotc/) for amounts). College Program midshipmen participate in a single summer training cruise between the junior and senior year. Except for administrative differences, no distinction is made between Scholarship and College Program midshipmen. The minimum active duty obligation following graduation for College Program students is three years but can vary based on the warfare community a student commissions into.

Two-Year Programs

The Two-Year Scholarship Program offers an opportunity to participate in NROTC in the final two years of University study. This program

### Liberal Arts Emphasis

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUS 200</td>
<td>Understanding Music: Global Perspectives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ensemble (up to 3 semesters at 1cr each semester)</td>
<td>9</td>
</tr>
<tr>
<td>MUS 105</td>
<td>Introduction to Music in Western Society</td>
<td></td>
</tr>
<tr>
<td>MUS 150</td>
<td>Vocal Techniques</td>
<td></td>
</tr>
<tr>
<td>MUS 153</td>
<td>Theory and Musicianship II</td>
<td></td>
</tr>
<tr>
<td>MUS 154</td>
<td>Theory and Musicianship Lab II</td>
<td></td>
</tr>
<tr>
<td>MUS 201</td>
<td>Introduction to Music Literature I</td>
<td></td>
</tr>
<tr>
<td>MUS 206</td>
<td>America’s Music</td>
<td></td>
</tr>
<tr>
<td>MUS 207</td>
<td>Class Piano II</td>
<td></td>
</tr>
<tr>
<td>MUS/AFS 230</td>
<td>Introduction to African-American Music</td>
<td></td>
</tr>
<tr>
<td>MUS/AFS 260</td>
<td>History of Jazz</td>
<td></td>
</tr>
<tr>
<td>MUS 305</td>
<td>Music Composition</td>
<td></td>
</tr>
<tr>
<td>MUS/ARS 306</td>
<td>Music Composition with Computers</td>
<td></td>
</tr>
<tr>
<td>MUS 310</td>
<td>Music of the 17th and 18th Centuries</td>
<td></td>
</tr>
<tr>
<td>MUS 315</td>
<td>Music of the 19th Century</td>
<td></td>
</tr>
<tr>
<td>MUS 320</td>
<td>Music of the 20th Century</td>
<td></td>
</tr>
<tr>
<td>MUS 330</td>
<td>Survey of Musical Theater</td>
<td></td>
</tr>
<tr>
<td>MUS 350</td>
<td>Music of Asia</td>
<td></td>
</tr>
<tr>
<td>MUS/WGS 360</td>
<td>Women In Music</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours: 13

1 One free elective cr

### Department of Naval Science (Naval ROTC)

For more information about this department, including contact information, visit the department (https://naval.dasa.ncsu.edu/).

- 4172 Broughton Hall
- 2601 Stinson Drive
- NC State Box #7310
- Raleigh, NC 27695-7310
- Phone: 919-515-8931
- Website: https://naval.dasa.ncsu.edu/

### Mission

The purpose of the Department of Naval Science is to develop midshipmen and enlisted officer candidates mentally, morally, and physically and to imbue them with the highest ideals of duty, honor, and loyalty in order to commission college graduates as Navy and Marine officers who possess a basic professional background, are motivated toward careers in the naval services, and have a potential for
is offered only intermittently by the Navy and may or may not be available during any given year.

Applications for this program must be completed by early Spring prior to the starting year. Upon selection, the candidate attends a six-week training course at Newport, Rhode Island, during the summer between the sophomore and junior years so that he or she may receive instruction in the Naval Science subjects normally covered in the first two years at NC State. Participants in this training course receive uniforms, room and board, and officer candidate pay during the summer period and, upon satisfactory completion of training, enter the NROTC program as third year students. The application process can be time consuming. In order to meet the Spring deadline, students are encouraged to contact the Department of Naval Science before December 1 of their sophomore year.

Commissioning and Service

Graduates of the Navy program are commissioned as Ensigns and are selected to serve in one of the Navy’s front line warfare communities (Surface Warfare, Surface Nuclear, Submarine/Nuclear Power, Pilot, Naval Flight Officer, Special Operations/EOD, or Special Warfare/SEAL). Graduates of the Marine program are commissioned as Second Lieutenants and attend the Marine Officer Basic School at Quantico, Virginia where they select their Military Occupational Specialty (MOS).

Midshipmen Life

Academic excellence is emphasized and commensurate participation in the full range of campus extra curricular activities is encouraged. The NROTC unit is organized as a midshipmen battalion to facilitate leadership development. The battalion is staffed entirely by midshipmen under the supervision of staff instructors. Additionally, midshipmen have opportunities to examine all aspects of life in the Navy and Marine Corps and gain leadership experience through field trips, summer cruise, and social activities.

Further information regarding application for and admission into the NC State Naval ROTC may be obtained on campus in Room 4165 Broughton Hall, by writing to the Professor of Naval Science, Campus Box 7310, NC State, Raleigh, North Carolina 27695-7310 or by contacting the unit recruiting officer, LT Anthony Scalabrino at 919-515-6218 or via email at atscalar@ncsu.edu.

The Department of Military Science (Army ROTC), the Department of Aerospace Studies (Air Force ROTC), and the Department of Naval Science (Naval ROTC) are separate academic and administrative subdivisions of the institution. Students in the ROTC programs will receive free elective credit for Aerospace Studies (AS), Military Studies (MS), or Naval Science (NS) courses up to the limit of free electives in their curriculum.

Faculty

Commanding Officer
CAPT Marc Stern

Executive Officer
Maj Joseph Steinfels, USMC, Associate Professor of Naval Science - NS210

Assistant professors
LT Anthony Scalabrino, USN - NS110, Assistant Professor of Naval Science
LT Samuel Ansel, USN - NS325, Assistant Professor of Naval Science
LT Richard (Lee) Bowie, USN - NS315, Assistant Professor of Naval Science
Capt Barry Morris, USMC - NS430 & NS330, Assistant Professor of Naval Science
LT Abigail Rorapaugh, Assistant Professor of Naval Science

Lecturer
GySgt Roshod Browning, USMC - NS110, Naval Science Lecturer

Plans

- Military Studies: Naval Science (Minor) (p. 1497)

Military Studies: Naval Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Departments of Aerospace Studies (AS), Military Science (MS), and Naval Science (NS) offers a minor in Military Studies to any undergraduate degree student interested in learning about military skills and careers. Students will develop the mental, moral, and physical skills needed to make them capable of being stronger leaders. The desire to assume the highest responsibilities of command, citizenship, and government will be instilled. Students will also be instilled the highest ideals of duty, honor, and loyalty in order to commission college graduates as officers with a basic professional background and motivation toward careers in the military.

Admissions

Students may declare their intention to complete the Military Studies minor by consulting with one of the advisors listed below.

Certification

The commanders of the respective concentrations will certify the minor prior to graduation (see the contact information below). The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Persons

Aerospace Studies
Lt Col John Dumont, Air Force ROTC
Reynolds Coliseum Suite 137
(919) 515-2417
jjdumont@ncsu.edu
Global Leadership and Team Decision-Making (Minor)

Military Science

Bill Boucher
Reynolds Coliseum Room 151C
919.513.0863
wwbouche@ncsu.edu

Naval Science

Captain Andrew Hertel
Reynolds Coliseum
919.515.8931
achertel@ncsu.edu

SIS Code: 24MSNSM

Plan Requirements

• Complete 15 credit hours from any one of the following concentrations.
• A grade of “C” or better must be achieved in all courses taken.
• A minimum of 6 hours must be taken at the 300 or 400 level.
Students may combine courses from the lists.

Required Courses (15 credit hours)

Choose from one of the three (3) concentrations: Aerospace Studies, Military Science, or Naval Science.

Aerospace Studies

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 121</td>
<td>Heritage and Values I</td>
<td>1</td>
</tr>
<tr>
<td>AS 122</td>
<td>Heritage and Values II</td>
<td>1</td>
</tr>
<tr>
<td>AS 221</td>
<td>Team and Leadership Fundamentals I</td>
<td>1</td>
</tr>
<tr>
<td>AS 222</td>
<td>Team and Leadership Fundamentals II</td>
<td>1</td>
</tr>
<tr>
<td>AS 321</td>
<td>Leading People and Effective Communication I</td>
<td>3</td>
</tr>
<tr>
<td>AS 322</td>
<td>Leading People and Effective Communication II</td>
<td>3</td>
</tr>
<tr>
<td>AS 421</td>
<td>National Security Affairs/Preparation for Active Duty I</td>
<td>3</td>
</tr>
<tr>
<td>AS 422</td>
<td>National Security Affairs/Preparation for Active Duty II</td>
<td>3</td>
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</tbody>
</table>

Military Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>MS 101</td>
<td>Introduction to Leadership and Values I</td>
<td>1</td>
</tr>
<tr>
<td>MS 102</td>
<td>Basic Military Leadership</td>
<td>1</td>
</tr>
<tr>
<td>MS 201</td>
<td>Intermediate Leadership Theory I</td>
<td>2</td>
</tr>
<tr>
<td>MS 301</td>
<td>Military Leadership and Training Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 302</td>
<td>Applied Leadership in Small Unit Operations</td>
<td>3</td>
</tr>
<tr>
<td>MS 401</td>
<td>Advanced Military Science - Leadership and Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>MS 402</td>
<td>Advanced Military Science - Military Justice, Ethics and Professionalism</td>
<td>3</td>
</tr>
</tbody>
</table>

Naval Science

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS 110</td>
<td>Introduction to Naval Science</td>
<td>2</td>
</tr>
<tr>
<td>NS 210</td>
<td>Leadership and Management</td>
<td>3</td>
</tr>
<tr>
<td>NS 315</td>
<td>Naval Engineering</td>
<td>3</td>
</tr>
<tr>
<td>NS 315</td>
<td>Naval Engineering</td>
<td>3</td>
</tr>
<tr>
<td>NS 225</td>
<td>Navigation</td>
<td>4</td>
</tr>
<tr>
<td>NS 415</td>
<td>Naval Operations</td>
<td>4</td>
</tr>
<tr>
<td>NS 330</td>
<td>Evolution of Warfare</td>
<td>3</td>
</tr>
<tr>
<td>NS 325</td>
<td>Naval Weapons Systems</td>
<td>3</td>
</tr>
<tr>
<td>HI 351</td>
<td>U.S. Naval History</td>
<td>3</td>
</tr>
<tr>
<td>NS 420</td>
<td>Naval Leadership and Ethics</td>
<td>3</td>
</tr>
<tr>
<td>NS 430</td>
<td>Amphibious Warfare</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Students have the ability to choose among the various courses for the concentrations listed above.

Global Leadership and Team Decision-Making (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Global Leadership and Team Decision-Making minor is a 15-hour minor that is designed for students who seek to gain greater knowledge and understanding of leadership and team decision-making from a European global perspective in a cohort format. The coursework is composed of courses grounded in theory, inquiry, and application. The student will participate in a cohort of 12-15 for a semester abroad in the Czech Republic, United Kingdom and Germany. The student will be required to take SLC 250 Critical and Creative Decision Making Models either prior to or following the study abroad experience to complete the 15-hr requirement (prior to departure preferred). The student in the minor may be preparing for graduate work or any field of study within the university.

Admissions Requirements

Students are required to meet with the contact person for the minor to discuss expectations established for the Global Leadership and Team Decision-Making minor, submit a form to university registrar’s office and complete an application form through the European Center in Prague.

Contact Minor Coordinator

Debbie Reno Acker
Associate Director
Hunt Library 4100
919-513-0148
direno@ncsu.edu

European Center in Prague for Study Abroad Inquiry

Megan Winzeler,
Associate Director
919-515-1574
Plan Requirements

- Completion of a minimum of 15 required credit hours
- A minimum overall GPA of 2.5 in the minor
- Students may not take minor coursework on a credit only (pass/fail) or S/U basis
- The program coordinator will certify the minor prior to graduation
- The minor must be completed no later than the final semester in which the student expects to graduate from his or her degree program. Paperwork for certification must be completed no later than during the registration period for the student’s final semester at NC State.

Global Perspectives (Certificate)

The certificate allows students to document academic, professional, and co-curricular international involvement for future scholarship opportunities, employers and graduate schools. Upon completion, students will receive a notation on their transcript and an official certificate documenting their global experience during their studies.

Program Coordinator

Kasey Harris, GPC Coordinator
Email: global-perspectives@ncsu.edu
Phone: (919) 513-1937

Program Administrator

Dr. Bret Smith, Senior Associate Dean – University College
Park Shops 308
bhsmit6@ncsu.edu

Website: http://gpc.ncsu.edu/ (http://gpc.ncsu.edu/)

Plan Requirements

I. International Experience

This must take place in a country other than the U.S., and must be educational in some way. Options could include study abroad, international internships, overseas volunteer programs, research abroad, being an international student in the U.S., or any other international experience approved by the GPC Coordinator in consultation with the GPC Advisory Board.

II. Academic Experience

To successfully complete this portion of the certificate, NC State students must be in good standing and achieve a minimum GPA of 2.0 overall for the required courses.

- Language requirement: Students must complete either the equivalent of FLX 201 in the language in which they met the university foreign language requirement, or at least three credit hours at any level of study in a new language.
- Course requirement: (12 credit hours), which may simultaneously fulfill GEP or other degree requirements. Four courses with strong international emphases must be chosen from three different categories: European and Eurasian Studies (http://gpc.ncsu.edu/gpc_euro_courses.cfm); Asian, African, and Latin American Studies (http://gpc.ncsu.edu/gpc_africa_courses.cfm); and Modern Global Issues (http://gpc.ncsu.edu/gpc_mgi_courses.cfm). Students may substitute a course with U.S. multicultural emphasis in place of one of the required four courses. (International Studies major or minor automatically fulfills this requirement).

III. A. Co-Curricular activities

One important purpose of the co-curricular requirement is to help internationalize the NC State Campus overall, increasing the amount of internationally related activity, and helping those students who choose not to go abroad to nonetheless benefit from global perspectives.

Certificate recipients must engage in co-curricular activities totaling at least 30 points in the GPC system. One hour is worth roughly 1 point. Ten points are awarded to semester-long commitments for certain activities or programs.
Students may receive a maximum of 7 points for attending lecture or cultural events, and a maximum of 15 points for any one organization (e.g. Italian Club). Examples of activities within these categories are provided below. The GPC website will include an extensive list of co-curricular opportunities in which students can participate. Each will fall into one of these categories:

**One (1) Point Activities:**
The following categories are worth 1 point for attendance at each meeting or event. If a student holds an office in an organization, they may also earn 1 point for each planning meeting:

- International clubs on-campus
- International events on-campus
- International events in the community (in the U.S.)
- OIS Programs
- Lectures

**Ten (10) Point Activities:**
The following activities require semester-long commitments. Each are worth 10 points total for a semester:

- OIS International Friendship Program
- Alexander Global Village Resident (10 point maximum)
- University Scholars Language Exchange Program (8 week/1 semester commitment required)

### III. B. Community Service

Students must also complete at least 10 hours of volunteer service. The volunteer project must have an international focus (e.g. volunteer English tutor, helping immigrants with taxes or visas). Community service may be completed in the U.S. or in another country.

- Note: For some events, students may have the opportunity to volunteer to help set-up, plan, or work (e.g. International Festival). Volunteering is active service to others, and is considered separate from attending an event or being part of an on-campus organization. Attending an event does not count toward volunteer hours. Students must complete 10 volunteer hours in addition to 30 points of co-curricular activities.
- Documentation: Students must provide documentation proving their participation in these activities. This can be in the form of an email to the GPC Coordinator from the leader or president of an organization the student is in, showing the name of the student, the organization, and the number of meetings the student attended. For lecturers or events, students may save a ticket stub or program with the name of the lecture/event and the date. For programs listed on the University Scholars Program (USP) calendar, USP staff has offered to collaborate in the use of their attendance cards.

### IV. Final Project

Students must prepare a synthesizing project which answers specific questions about their experience in pursuing the Global Perspectives Certificate. The project may consist of a poster, a paper, powerpoint presentation, video, website, physical display or combination of media.

Before beginning the project, the students must create a proposal, and present it to their chosen GPC mentor/advisor for approval. This mentor will be the students contact for advice, guidance, and assessment of the final project. Assessment will be based on the provided rubric. The mentor then makes the final recommendation to the GPC Advisory Board for overall certificate approval. Students may choose any approved member of the NC State’s faculty or teaching staff for this mentor role.

The Advisory Board will identify faculty or teaching staff willing to serve as mentors/advisors. After confirming approval from mentors’ department head, the GPC Coordinator will post their names on-line, together with the maximum number of certificate candidates they will assist in a give semester (typically 2-3). Information for mentors will be available on the GPC website and workshops will be offered to answer mentors’ questions.

After approval by the mentor, final projects must be made available to the wider community in some way, such as by posting on the GPC website, or being presented on campus (classroom, residence hall, etc.). For students who choose to create a poster, an exhibition will be organized each semester by the GPC coordinator to fulfill the public presentation requirement.

### Honors and Scholars Programs

#### University Honors Program

The University Honors Program (UHP) is a highly selective academic program that seeks to provide a transformative learning experience which empowers students to critically engage meaningful problems in the world. Students in the program directly participate in the knowledge-building and creative activities of the NC State faculty and are encouraged and enabled to craft for themselves a unique undergraduate education that draws on the full range of opportunities that exist at a major research, land-grant university such as NC State.

[honors.dasa.ncsu.edu](https://honors.dasa.ncsu.edu)

#### University Honors Program Admission

Admission to the UHP is not automatic. Students are required to complete a separate application. The UHP application is electronic and is housed in WolfPAW. Students have to be admitted to NC State to apply to the University Honors Program. The UHP stops the invitation to apply process in early to mid-March. Prospective students can obtain an application one of two ways:

- Any student who has been accepted to NC State and meets two of the following three academic criteria will automatically be sent an invitation to apply:
  - 1350 SAT (Critical Reading and Math only) or 30 ACT Composite
  - 4.5 weighted GPA or 3.8 unweighted GPA
  - Rank in the top 5% of graduating high school class
- Additional criteria is utilized to encourage diversity and inclusion per the University’s strategic plan. Interested and motivated students who do not meet the criteria for the automatic invite are encouraged to contact the program at university_honors@ncsu.edu to obtain the admission application. Students have to be admitted to NC State to request the application and the application has to be requested prior to application request deadline (early/ mid-March).

Admission to the UHP is based on the assessment of your potential for exceptional academic work and understanding of research and scholarship. Primarily this is done by evidence of creativity, initiative, and aspirations for academic excellence as described on your UHP application. Secondly, the UHP considers SAT/ACT scores, high
school grades, rigor of courses taken in high school, class rank (when available).

**University Honors Program Requirements**

The curricular core of the UHP is the HON seminars, which are small, thought-intensive, graduate-style, interdisciplinary courses designed to expose students to how multiple disciplines approach and try to solve problems. University Honors Program students are required to take a minimum of 12 credit hours of HON seminars (generally one per semester in their first two years). These seminars are taught by some of the most innovative professors at NC State. The UHP also offers experiential learning courses that enable them to earn credit for activities such as working with a faculty member on a project or with a local museum to create educational materials for a new exhibit. The other major curricular dimension of the UHP is the Capstone project, which is a 6-credit-hour, 2 semester long independent research project, conducted under the guidance of a faculty mentor. The Capstone is the culmination of a student's NC State and University Honors Program experience because it is the process through which students truly move from being knowledge consumers to knowledge producers. The Capstone requires that a student articulate a problem or issue of interest and then use the tools and methods of their discipline in order to make a new discovery.

**The Honors and Scholars Village**

The Honors and Scholars Village is a dynamic living and learning community that enhances the intellectual exploration and personal development of its residents. The village, a collaborative effort between the University Honors and University Scholars programs, the Living Learning Initiatives, and University Housing, offers students a wide range of educational and social opportunities that ease the transition to college life and help students make connections with their peers, NC State, and the world around them.

**In Addition**

The Honors experience at NC State includes Honors programs located in the colleges and departments. Students are invited to participate in these programs at various times, depending upon the specific program (generally the second semester of the sophomore year or first semester of the junior year). Many of the students in the University Honors Program are also participants in one or more of the college or departmental Honors programs.

For more information about the UHP, contact:

University Honors Program, Division of Academic and Student Affairs
Campus Box 8610, Raleigh, NC 27695-8610
Phone: 919-513-4078  Fax: 919-513-4392

Email: university_honors@ncsu.edu or visit honors.dasa.ncsu.edu (https://honors.dasa.ncsu.edu)

**University Scholars Program**

"Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did. So throw off the bowlines, sail away from the safe harbor. Catch the trade winds in your sails. Explore. Dream. Discover." --Mark Twain.

The University Scholars Program introduces a community of high-achieving students to the visual and performing arts, encourages them to consider issues drawn from the sciences and politics, challenges them to excel academically and inspires them to explore and engage through international and outdoor education programs. Through these experiences, University Scholars are encouraged to connect their educational goals to their passions, to become active citizens, and to embrace the challenges of a rapidly evolving world.

**Scholars Forum**

University Scholars enroll in the Scholars Forum (https://scholars.dasa.ncsu.edu/forum/) for three semesters. The Forum features musical and theatrical performances, addresses by major public figures, authors and scientists, and debates and discussions of significant public policy issues. Scholars Forum guests have included:

- Dr. Christine Darden, mathematician and NASA engineer
- Broadway performer and comedian Lisa Jolley
- Blues musician Scott Ainslie
- NASA astronaut and USP graduate Christina Hammock
- Choreographer and activist David Roussévé
- Aerial performance group BANDALOOP, and
- National Geographic photographer Anand Varma.

The Scholars Forum also offers an extraordinary range of cultural, educational and outdoor opportunities. Take part in special tours of NC State's Nuclear Reactor, the Duke Lemur Center, or Piedmont Biofuels; participate in canoeing and hiking trips; and attend local theatre, music and dance performances and museum exhibitions.

**Special Courses**

University Scholars have the opportunity to enroll in special sections of academic courses that are taught by the very best faculty at NC State.

**Outdoor & Cultural Explorations**

With day, weekend and weeklong trips, our Outdoor Explorations (https://scholars.dasa.ncsu.edu/engagement/oe/) program offers University Scholars opportunities to explore the natural world, get to know their peers, and engage in personal reflection. Cultural Explorations (https://scholars.dasa.ncsu.edu/engagement/ce/) include a Fall Break trip to New York City, Spring Break trips overseas, and summer study abroad programs in Florence, Italy and Oxford, England.

**Honors & Scholars Village**

The Honors and Scholars Village is a dynamic living and learning community that enhances the intellectual exploration and personal development of its residents. The village, a collaborative effort between the University Honors and University Scholars programs, the Living Learning Initiatives, and University Housing, offers students a wide range of educational and social opportunities that ease the transition to college life and help students make connections with their peers, NC State, and the world around them.

For more information concerning the USP, contact:

University Scholars Program
Box 7316, NC State University
Raleigh, NC 27695-7316
phone: (919) 515-2353
e-mail: university_scholars@ncsu.edu or visit University Scholars Program website (https://scholars.dasa.ncsu.edu/). (https://scholars.dasa.ncsu.edu/)
Interdisciplinary Entrepreneurship (Certificate)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The Undergraduate Certificate in Interdisciplinary Entrepreneurship has been specifically designed to be applicable and accessible to students in all areas of study at NC State. Students who will find this certificate most engaging will be those students interested in turning ideas into action through starting ventures, working in a startup environment or applying entrepreneurial thinking skills to an existing organization. This certificate differs from the entrepreneurship minors available on campus by giving students a broad overview of the entrepreneurial process from an interdisciplinary perspective. Students will have the opportunity to explore entrepreneurial thinking in the arts, the social entrepreneurship sector, non-profits, for-profits, start-ups, growth ventures, B-Corps, and other areas of interest. Students who complete the Undergraduate Certificate in Interdisciplinary Entrepreneurship will specifically benefit from the interdisciplinary nature of instructors, peers, teams, mentors, materials, activities, opportunities, community partners and alumni.

Admissions Requirements

1. To declare your intent to complete the certificate, please fill out and submit the Undergraduate Certificate in Interdisciplinary Entrepreneurship Google Form https://goo.gl/forms/077JiW1D6ngJb939/v (https://docs.google.com/forms/d/e/1FAIpQLSejEO8Dxi2ulCiaF6MamE5_IgiH8uq79tLJhspr9hda/viewform/). You will receive an email confirmation of your submission, and you should hear from a certificate administrator within a week of your submission.

2. Once you have been accepted into the certificate program, a certificate administrator will follow up with you via email to acknowledge receipt of your declaration form and to provide instructions for accessing the Undergraduate Certificate in Interdisciplinary Entrepreneurship website via Moodle.

3. As you complete work towards the certificate, fill out and submit the appropriate information via Moodle to track your progress. This will help you establish a robust portfolio of your experiences in the Undergraduate Certificate in Interdisciplinary Entrepreneurship.

4. Submit your request to complete the Undergraduate Certificate in Interdisciplinary Entrepreneurship prior to November 15/April 15 of your graduating semester.

5. Contact Jennifer Capps at 919-515-4530 with any questions.

Program Coordinator

Jennifer Capps
Email: jennifer_capps@ncsu.edu
Phone: (919) 515-4530

Academic Structure

Term Effective: 8/2018
Plan Code: 24EICPTU
CIP Code: 24.0101
Description: Undergraduate Certificate in Interdisciplinary Entrepreneurship

Plan Requirements

Requirement 1 of 3: Choose 12 credit hours from the interdisciplinary course options below. No more than 2 courses counting towards the Undergraduate Certificate in Interdisciplinary Entrepreneurship may come from the same course prefix. Students will be required to submit work samples from their chosen certificate courses to an online portfolio via the Moodle Certificate Management website. The Moodle site for documenting student completion of certificate requirements is being modeled after the NC State Office of Faculty Development Certificate of Reflective Teaching.

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<tr>
<th>Code</th>
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<tr>
<td>EI 201</td>
<td>Exploring Interdisciplinary Entrepreneurship Thinking</td>
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<tr>
<td>EI 331</td>
<td>Interdisciplinary Entrepreneurship Thinking I: Skills and Planning Basics</td>
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<td>EMA 110</td>
<td>Introduction to Arts Entrepreneurship</td>
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<td>EMA 365</td>
<td>Foundations in Arts Entrepreneurship</td>
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<td>EMA 370</td>
<td>Practical Arts Entrepreneurship</td>
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<tr>
<td>MIE 310</td>
<td>Introduction to Entrepreneurship</td>
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<tr>
<td>MIE 410</td>
<td>Business Opportunity Analysis</td>
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<tr>
<td>MIE 412</td>
<td>Finance and Accounting for Entrepreneurs</td>
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<tr>
<td>MIE 413</td>
<td>New Venture Planning</td>
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<tr>
<td>MIE 416</td>
<td>The Legal Dynamics of Entrepreneurship</td>
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<td>MIE 419</td>
<td>Entrepreneurship Practicum</td>
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<td>FTM 310</td>
<td>Entrepreneurship &amp; New Product Development in Textiles</td>
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<tr>
<td>ECE/MAE 482</td>
<td>Engineering Entrepreneurship and New Product Development</td>
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<tr>
<td>ECE/MAE 483</td>
<td>Engineering Entrepreneurship and New Product Development II</td>
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<td>PS 203</td>
<td>Introduction to Nonprofits</td>
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<tr>
<td>ECE 383</td>
<td>Introduction to Entrepreneurship and New Product Development</td>
<td>4</td>
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</tbody>
</table>

Total Hours 12

1. MIE 413 New Venture Planning is a suggested co-requisite for Certificate participants
2. Students must have junior standing in order to enroll in this course; restricted to College of Textiles students in FTM, FTD or TT degree programs
3. Departmental approval required
4. Please note that ECE 383 Introduction to Entrepreneurship and New Product Development will be added to the Certificate options once it has received 3 credit hour status. In addition, members of the NC State Entrepreneurship faculty will work with programs, colleges and departments throughout campus to add new entrepreneurship courses that will become part of the certificate options when possible.
5. MIE 310 Introduction to Entrepreneurship is a prerequisite for this course
6. EI 201 Exploring Interdisciplinary Entrepreneurial Thinking is a prerequisite for this course

Requirement 2 of 3: Choose at least 1 Intensive Experience from the options below. Please note that Intensive Experiences must be
completed after declaring your intent to complete the Certificate in Interdisciplinary Entrepreneurship.

- Complete the Andrews Launch Accelerator program with the NC State Entrepreneurship Clinic
- Complete one semester as a volunteer with the NC State B Corp Clinic in an entrepreneurial environment
- Complete one full year of membership in the Albright Entrepreneurs Village
- Complete at least 15 Entrepreneurship Skills Workshops offered through NC State Entrepreneurship (To ensure that minimum standards for an Intensive Experience are met, acceptable workshops will be designated as approved for Certificate Intensive Experience)
- Complete the Social Innovation Fellows Program
- Additional Intensive Experiences may count towards the Undergraduate Certificate in Interdisciplinary Entrepreneurship. Please contact the Certificate Director for prior approval of independent Intensive Experiences such as internships, additional capstone courses, or other proposed projects including business development as an NC State Entrepreneurs Garage member, participation in the StartingBloc Institute, etc.
- Approved Intensive Experiences may be added to this list as they become available and are approved by members of the NC State Entrepreneurship Faculty Advisory Council.

Requirement 3 of 3: Complete and submit your responses to the required essay questions during your final semester of the Undergraduate Certificate in Interdisciplinary Entrepreneurship.

Leadership: Cross Disciplinary Perspectives (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/PGAS/)

The Leadership: Cross Disciplinary Perspectives minor is a 15-hour minor that is designed for students who seek to gain greater knowledge and understanding of leadership perspectives from a variety of academic fields of study. The coursework is composed of courses grounded in theory, inquiry, and application. The student has the opportunity to select the specific courses which best fulfill his/her needs while maintaining a broad perspective on leadership across fields of study. The student in the minor may be preparing for graduate work or any field of study within the university.

Admissions

Students are required to meet with the contact person for the minor to discuss expectations established for the Leadership: Cross-Disciplinary Perspectives minor and complete an application form.

Website

https://sheltonleadership.ncsu.edu/

Certification

Dr. Acker will certify completion of the minor. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Debbie Reno Acker
4100 Hunt Library
919.513.0148
direno@ncsu.edu

SIS Code: 24SLC

Plan Requirements

- Completion of a minimum of 15 required credit hours.
- A minimum overall GPA of 2.5 in the minor.
- Students may not take minor coursework on a credit only (pass/fail) or S/U basis.
- Four college discipline areas need to be represented toward minor requirements.
- The program coordinator will certify the minor prior to graduation.
- A minimum of 12 of the 15 required hours must be completed at NC State.
- The minor must be completed no later than the final semester in which the student expects to graduate from his or her degree program. Paperwork for certification must be completed no later than during the registration period for the student’s final semester at NC State.
- Students are required to take one 3hr course, SLC 250 Critical and Creative Decision Making Models.
- In addition, there are three categories related to leadership that students need to select courses: Cross-Functioning Teams; Ethics/Values; and Leadership.
- Students are required to take 3hrs from each category, totaling 12hrs toward the minor.
- For the remaining 3hrs, students can select from any of the three categories to meet requirements of the 15 credit hour minor

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>SLC 250</td>
<td>Critical and Creative Decision Making Models</td>
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<td><strong>Elective Courses</strong></td>
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<td>Select one count from any of the lists below</td>
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<tr>
<td></td>
<td>Cross-Functioning Teams</td>
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</tr>
<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
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</tr>
<tr>
<td>EI 201</td>
<td>Exploring Interdisciplinary Entrepreneurial Thinking</td>
<td></td>
</tr>
<tr>
<td>LPS 205</td>
<td>International Leadership for the Public Sector (DE)</td>
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<tr>
<td>LPS 302</td>
<td>Diversity and Leadership in the Public Sector (DE)</td>
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<td>MIE 201</td>
<td>Introduction to Business Processes</td>
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<td>USC 240</td>
<td>Leadership and Coalition Building in Diverse Communities</td>
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<td>NS 210</td>
<td>Leadership and Management</td>
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<td></td>
<td><strong>Values/Ethics</strong></td>
<td></td>
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<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td></td>
</tr>
<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
<td></td>
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</tbody>
</table>
Air Force Reserve Officer Training (AFROTC) Program

The AFROTC program at NC State University is geared toward students who desire to earn a commission as a Second Lieutenant in the U.S. Air Force. However, any student from NC State, or one of our four crosstown colleges, who wish to learn about the U.S. Air Force can take any AFROTC course with no obligation or commitment. All students who complete the Military Studies: Aerospace Studies academic program of study with a minimum of 15 hours in aerospace studies are eligible to receive an Military Studies: Aerospace Studies minor.

The four-year AFROTC program that leads to a commission as a U.S. Air Force Officer allows freshmen to enroll in Aerospace Studies courses in the same manner as other college courses for the first two years. It is during this time a student may join the program and become an Air Force ROTC cadet. All cadets must be attending college in “full time” status. Aerospace Studies courses are taken as free electives and cadets incur no military obligation unless they are receiving an AFROTC scholarship. The first two years in the AFROTC program are called the General Military Course (GMC) during which cadets learn the basics of military discipline, followership, and begin preparation for field training. The last two years of AFROTC comprise the Professional Officer Course (POC) where cadets lead each other through a time-tested leadership laboratory training environment that instills both character and leadership skills needed in preparation for life as an active duty officer. The pinnacle training event for AFROTC occurs in the summer between the sophomore and junior year when a cadet attends intense field training held at Maxwell AFB, Alabama and Camp Shelby, Mississippi.

For exceptionally qualified cadets, the four-year program can be compressed to as little as two and one half years for those who do not complete all four AS 100 and AS 200-level courses: The Foundation of the United States Air Force I and The Evolution of USAF Air and Space Power I are offered in the fall semester. The Foundations of the United States Air Force II and the Evolution of USAF Air and Space Power II are offered in the spring semester while enrolled in the Air Force ROTC program. Interested students must contact the Professor of Aerospace Studies to determine eligibility requirements.

Cadets at every level have numerous opportunities to further their knowledge of the Air Force and develop leadership. Throughout the school year, cadets have opportunities to examine all aspects of life in the Air Force and gain leadership experience through Air Force base visits, flying opportunities, and social activities. Additionally, a variety of summer programs allow cadets to visit bases and participate in programs such as the US Air Force Academy Free Fall program, manned glider training, and worldwide cultural immersion programs. POC cadets have similar opportunities, with focus on programs related to the cadet’s desired active duty career area, both in the U.S. and abroad.

Upon university graduation and satisfactory completion of the Air Force ROTC program, a cadet is commissioned a second lieutenant in the USAF and is obligated to serve a minimum of four years on active duty.

Scholarship Opportunities and Stipend

Cadets enrolled in the AFROTC program are encouraged to apply for Air Force ROTC scholarships. Competitive scholarships are awarded by the Air Force and are based primarily on college academic achievement, displayed leadership capabilities and the needs of the Air Force for specific academic degrees in technical and foreign languages. Additionally, special scholarships are awarded to fill critically needed
academic majors within the Air Force as long as eligibility is met. AFROTC scholarships pay for tuition, fees, books, and provide cadets a stipend each month during the academic year for miscellaneous expenses. Stipends for AFROTC scholarship cadets vary according to the cadet’s year of academic enrollment in AFROTC.

For example, scholarship freshmen currently receive $300 per month, sophomores $350 per month, juniors $450 per month, and seniors $500 per month. Additionally, cadets who complete field training and are enrolled in the POC receive a stipend regardless of scholarship status. All scholarships have minimum academic standards that must be maintained.

Eligibility

All full-time freshmen and sophomores with at least a 2.0 cumulative GPA and a desire to seek a commission may enroll in the GMC program without obligation to the Air Force through enrollment in the AS 100-level and 200-level blocks of Aerospace Studies curriculum. To enter the POC, cadets must meet physical, medical and academic requirements, and successfully complete field training (typically between your second and third year). In addition, some age, citizenship and background restrictions apply; contact the department for more details. Students desiring to enter the four-year program simply register for the AS 100-level course. All students interested should contact the Air Force ROTC office for more information.

Organization

The Air Force ROTC Cadet Corps, nicknamed “Wolfpack Warriors,” is organized as a cadet wing staffed entirely by cadets for leadership development. They are assisted and advised by experienced active duty officers and non-commissioned officers who are assigned as instructors to the detachment. Three collateral organizations, Arnold Air Society, Wolfpack Warrior Booster Club and Honor Guard, support the cadet wing organization as well as the university and community.

Uniforms

Uniforms are provided by the federal government and are worn by cadets on the day of Leadership Laboratory (Wednesday) or as specified by cadet corps leadership.

View the NC State Air Force (http://www.ncsu.edu/afrotc/) website

Faculty

Commander

Lieutenant Colonel John J. Dumont III, Professor of Aerospace Studies

Cadre

Major Kathryn E. Marron, Assistant Professor of Aerospace Studies and Operations Flight Commander

Major Victor M. Marichal, Assistant Professor of Aerospace Studies and Education/Recruiting Officer

Technical Sergeant Falon N. Lopez, Non-Commissioned Officer in Charge/Administrative Management

Technical Sergeant Deaven W. Gathers, Non-Commissioned Officer in Charge/Personnel

Ms. Teresa Wadford, Administrative Assistant

Plans

- Military Studies: Aerospace Studies (Minor) (p. 1505)

Military Studies: Aerospace Studies (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Departments of Aerospace Studies (AS), Military Science (MS), and Naval Science (NS) offers a minor in Military Studies to any undergraduate degree student interested in learning about military skills and careers. Students will develop the mental, moral, and physical skills needed to make them capable of being stronger leaders. The desire to assume the highest responsibilities of command, citizenship, and government will be instilled. Students will also be instilled the highest ideals of duty, honor, and loyalty in order to commission college graduates as officers with a basic professional background and motivation toward careers in the military.

Admissions

Students may declare their intention to complete the Military Studies minor by consulting with one of the advisers listed below.

Certification

The commanders of the respective concentrations will certify the minor prior to graduation (see the contact information below). The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Persons

Aerospace Studies

Lt Col John Dumont, Air Force ROTC
Reynolds Coliseum Suite 137
(919) 515-2417
jjdumont@ncsu.edu

Military Science

Bill Boucher
Reynolds Coliseum Room 151C
919.513.0863
wwbouche@ncsu.edu

Naval Science

Captain Andrew Hertel
Reynolds Coliseum
919.515.8931
achertel@ncsu.edu
Plan Requirements

• Complete 15 credit hours from any one of the following concentrations.
• A grade of “C” or better must be achieved in all courses taken.
• A minimum of 6 hours must be taken at the 300 or 400 level.
Students may combine courses from the lists.

Required Courses (15 credit hours)
Choose from one of the three (3) concentrations: Aerospace Studies, Military Science, or Naval Science.

Aerospace Studies

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Military Science

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<td>MS 201</td>
<td>Intermediate Leadership Theory I</td>
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<td>Intermediate Leadership Theory II</td>
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<td>Military Leadership and Training Management</td>
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<td>Applied Leadership in Small Unit Operations</td>
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<td>MS 401</td>
<td>Advanced Military Science - Leadership and Systems Management</td>
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<td>Advanced Military Science - Military Justice, Ethics and Professionalism</td>
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Naval Science

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<td>NS 210</td>
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<td>Naval Operations</td>
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<td>NS 330</td>
<td>Evolution of Warfare</td>
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<td>NS 325</td>
<td>Naval Weapons Systems</td>
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<td>NS 420</td>
<td>Naval Leadership and Ethics</td>
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<td>NS 430</td>
<td>Amphibious Warfare</td>
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Elective Courses

Students have the ability to choose among the various courses for the concentrations listed above.

Theatre (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

University Theatre offers an academic minor in theatre to all NC State undergraduate degree-seeking students. The minor includes a combination of courses that explore theatre in historical, theoretical, and practical contexts, while preserving an emphasis on application. There are opportunities for advanced study in performance, production, and design. No courses for the minor may be taken for S/U credit.

Admissions and Certification of Minor

In both instances, students should contact Mia Self, 201 Thompson Hall, 515-3147. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification should be completed during the registration period for the student’s final semester at NC State. The student should complete a Declare a Minor form (http://www.ncsu.edu/registrar/forms/pdf/minor.pdf) in consultation with the coordinator of the minor and submit to Registration and Records to have the minor added to their plan of study.

Coordinator of the Minor

Mia Self
201 Thompson Hall
Phone: 919.515.3147
Fax: 919.515.3679
mlself3@ncsu.edu

Plan Requirements

• Minimum of 15 credit hours is required to complete the minor, with 9 hours taken in required courses and 6 in elective courses.
• Only grades of “C-” and above will count toward the minor.
• A maximum of ONE (1) course may be used (double-counted) towards both departmental major requirements and minor requirements.

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<td>THE 203</td>
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<td>THE 223</td>
<td>Stagecraft</td>
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<td>THE 303</td>
<td>Stage Directing</td>
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<td>THE 334</td>
<td>Advanced Acting</td>
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<td>THE 340</td>
<td>African American Theatre</td>
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<td>THE 398</td>
<td>Special Topics in University Theatre</td>
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<td>THE 433</td>
<td>Period Styles in Acting</td>
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</table>

Total Hours 15
Wilson College of Textiles

1020 Main Campus Drive - NC State University
Box 8301 Raleigh, NC 27695-8301
Phone: (919) 515-6500

For more information about this college, including contact information, visit the college (https://textiles.ncsu.edu).

Textiles encompasses every aspect of our daily lives with applications in medicine, space, recreation and sports, fashion, personal safety, sustainability, energy, transportation, household and geotextiles. The textile industry continues to become more dynamic with an increased emphasis being placed on the use of new technology. For example, imagine wearing clothes that have electronics incorporated within them that allow them to change colors, monitor your heart rate or track your location; soldiers wearing uniforms made from nano-fibers that protect them from biological and chemical agents; artificial arteries, bones, ligaments and skins made from textile substrates and polymers; or getting your apparel custom made in a matter of minutes through body scanning, computer-aided design and computer-aided manufacturing.

The approximately 10,000 alumni of the Wilson College of Textiles hold diverse positions. Graduates of the department of Textile and Apparel, Technology and Management go on to careers including executive management positions for major textile organizations, retail buying, manufacturing management, marketing and sales, corporate management, design, sourcing, supply chain management, quality control and personnel management. Graduates of Textile Engineering, Chemistry and Science go on to careers in diverse industries represented by companies including Nike, North Face, HanesBrands, Under Armour, Duke Hospitals, Bank of America, Patagonia, Abercrombie and Fitch, Milliken & Company and Technimark. Many graduates of these programs pursue graduate degrees in Polymer Engineering, Chemical Engineering, Chemistry, Textile Chemistry, Textile Engineering, and Industrial Engineering, as well as professional degrees in Analytics, Medicine, Dentistry and Law. These textile graduates enter an exciting arena where they bring their creativity to the design/development process and their management decision-making skills to the industry. Graduates are key strategists in managing global textile-related operations. Developing engineering systems and products for industry, space, medical textiles, apparel, home textiles, transportation and nonwovens provide exciting opportunities.

The job market remains excellent with the college maintaining one of the university's best career placement records with an average rate of 90 percent or better each year. Demand for textile graduates from NC State University is particularly strong, due mainly to the strength of the academic programs and the college’s strong working relationships with industry and government. These programs are offered by two degree granting departments: Textile and Apparel, Technology and Management; and Textile Engineering, Chemistry and Science.

Facilities

The Wilson College of Textiles consists of nearly 200,000 square feet of modern laboratories, studios, classrooms and offices, with plans to expand in the near future. The college is located on Centennial Campus, which is adjacent to NC State University’s central campus. Centennial Campus is a “technopolis” that combines the university, corporate and government research and development facilities. There is no other campus or research park quite like this 1,334 acre site. The Wilson College of Textiles is also across the street from the internationally known James B. Hunt, Jr. Library.

Scholarships

The Wilson College of Textiles, with tremendous support from the North Carolina Textile Foundation and friends of the Wilson College of Textiles, has established an outstanding scholarship program for incoming freshmen and current textile students. The Wilson College of Textiles currently supports a larger percentage of its students with scholarship support than any other college at NC State University.

Centennial Scholarships are currently valued between $15,000 and $22,000 per year for both in-state and out-of-state students, and offers a $7,500 enrichment fund per recipient for educational enhancement activities. Candidates must be nominated by their high school or home school by Nov. 1, or must self-nominate before Nov 15. The application deadline for all Wilson College of Textiles scholarships is Dec 1. Restrictions do apply. Additional smaller scholarships are available through the Centennial Scholarship process as well. Contact Delisha Hinton at (919) 515-6530 for full details.

Study Abroad

Students at NC State have the opportunity to study abroad at universities in North and South America, Europe, Asia, Africa, and Australia/Oceania. Students can study abroad for as short a time period as one week or for as long as an entire academic year. Some financial assistance is available through the Wilson College of Textiles for students participating in study abroad opportunities.

Additional information about study abroad opportunities for Wilson College of Textiles students can be obtained from the Wilson College of Textiles (https://textiles.ncsu.edu/about/international/) website.

Career and Student Services

The Academic, Career and Student Services office is responsible for career services and scholarship programs for the Wilson College of Textiles. The office brings together industry recruiters and students for interview sessions for permanent and summer employment. Alumni may also take advantage of the placement office. Job opportunities for summer employment are available for textile students. Placement assistance is available through the office and frequently can be arranged in the student’s home community, as well as global locations.

Faculty

Dean

David Hinks

Associate Dean

Jerome Lavelle, Interim Associate Dean for Academic Programs
Behnam Pourdeyhimi, Associate Dean for Industry Research and Extension
Xiangwu Zhang, Associate Dean for Research
Assistant Dean
Shawn G. Dunning, Assistant Dean for Finance and Operations

Director
Roger Barker, Director of Textile Protection and Comfort Center
Carrie Bhada, Executive Director, North Carolina Textile Foundation
Jaclyn Hage, Director of Development, North Carolina Textile Foundation
Heather Lyerly, Director of Academic Services
Kina Morgan, Director of College Research Administration
Jeff Sackaroff, Director of Career Services
Melissa Sharp, Interim Director of Marketing and Communications
Michael T. Ward, Senior Director of Development, North Carolina Textile Foundation
Andre West, Director of Zeis Textiles Extension

Associate Director
Delisha Smith Hinton, Associate Director of Student Services
Don Thompson, Associate Director of Textile Protection and Comfort Center

Departments and Plans

Departments
- Department of Textile and Apparel, Technology and Management (p. 1508)
- Department of Textile Engineering, Chemistry and Science (p. 1519)

Majors
- Fashion and Textile Design (BS): Fashion Design Concentration (p. 1510)
- Fashion and Textile Design (BS): Textile Design Concentration (p. 1512)
- Fashion and Textile Management (BS): Brand Management and Marketing Concentration (p. 1515)
- Fashion and Textile Management (BS): Fashion Development and Product Management Concentration (p. 1517)
- Polymer and Color Chemistry (BS): ACS Certification Concentration (p. 1521)
- Polymer and Color Chemistry (BS): Medical Sciences Concentration (p. 1523)
- Polymer and Color Chemistry (BS): Science & Operations Concentration (p. 1525)
- Textile Engineering (BS): Chemical Processing Concentration (p. 1529)
- Textile Engineering (BS): Information Systems Concentration (p. 1531)
- Textile Engineering (BS): Machine Design Concentration (p. 1533)
- Textile Engineering (BS): Product Engineering Concentration (p. 1539)
- Textile Technology (BS) (p. 1544)
- Textile Technology (BS): Medical Textiles Concentration (p. 1546)
- Textile Technology (BS): Supply Chain Operations Concentration (p. 1548)
- Textile Technology (BS): Technical Textiles Concentration (p. 1550)

Minors
- Nonwovens (Minor) (p. 1553)
- Polymer and Color Chemistry (Minor) (p. 1528)
- Polymer Science (Minor) (p. 1528)
- Textile Technology (Minor) (p. 1552)

Department of Textile and Apparel, Technology and Management

The Department of Textile and Apparel, Technology and Management (TATM) offers Bachelor of Science degrees in Fashion and Textile Management, and in Fashion and Textile Design. The B.S. in Fashion and Textile Management permits the student to specialize in one of two concentrations: Textile Brand Management and Marketing, and Fashion Development and Product Management. The B.S. in Fashion and Textile Design degree offers two concentrations in Fashion Design and Textile Design. Each program requires a common series of foundation courses covering the principles, fundamentals, and applications of textile technology and business. The Department’s programs build on strong global textile complex industry partnerships (fiber to end use consumer) to prepare future industry leaders.

Department Highlights:
- The Department has state of the art laboratories and studios including the Textile Management Science Laboratory, Digital Design Center, Fashion Studio, Textile Design Studio, Surface Design Studio, Filament and Technology Lab, Specialty Software Computer Lab, and Digital Printing and Seamless Knitting Studio.
- TATM places a key importance on career management preparation for our students and strongly encourages internships as a preparation for full-time employment.
- The Department publishes an online electronic journal quarterly, Journal of Textile and Apparel, Technology and Management (JTATM), which provides industry, government and academic personnel with the timely dissemination of textile information. Visit JTATM online at http://ojs.cnr.ncsu.edu/index.php/JTATM (http://ojs.cnr.ncsu.edu/index.php/JTATM/).

For more information about our department, including contact information, visit our website (https://textiles.ncsu.edu/tatm/).
Faculty

Head
A. M. Seyam, Department Head
K. A. Thoney-Barletta, Associate Head and Director of Undergraduate Programs
L. L. Parrillo-Chapman, Associate Head and Director of Graduate Programs

University Distinguished Professors
A. B. Godfrey, Joseph D. Moore Professor of Textile & Apparel, Technology & Management

Distinguished Professors
B. E. Jin, Albert Myers Distinguished Professor of Textile Economics and Management
A. M. Seyam, Charles A. Cannon Professor of Textiles

Professors
M. Grasso
T. A. Lamar
K. K. Leonas
T. J. Little
M. M. Moore
K. A. Thoney-Barletta
Y. Xu

Associate Professors
K. E. Annett-Hitchcock
H. H. Hergeth
K. Mathur
L. L. Parrillo-Chapman
L. F. Rothenberg
M. Suh
A. J. West

Assistant Professors
D. R. Matthews
K. E. Nartker

J. A. Porterfield
J. F. Woodbridge

Adjunct Professors
R. McMahon Jr.
T. W. Theyson

Adjunct Associate Professors
M. T. Fralix
G. M. Garland
W. I. Long
J. Meng
M. A. Messura
T. Montgomery
S. B. Moore
J. F. Wataon
N. W. Webster

Adjunct Assistant Professors
G. Barbee
C. H. Kwon
E. D. Parrish

Adjunct Lecturers
M. Restaino
E. Rohde

Emeritus Professors
R. A. Barnhardt
S. K. Batra
N. L. Cassill
R. A. Donaldson
A. H. El-Shiekh
C. L. Istook
M. H. Mohamed
N. B. Powell
W. C. Stuckey
M. W. Suh
Fashion and Textile Design (BS): Fashion Design Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The B.S. in Fashion and Textile Design offers an excellent opportunity for students to pursue interests in Fashion Design and Textile Design Concentrations with a focus on designing innovative textile and fashion products utilizing the knowledge taught in Design Thinking, Textile Products Characteristics, Niche Market analysis, Color Science, Computer Aided Design, Drawing and Illustration and Senior Design. To gain global experience in the field, students study abroad for one semester in the junior year, in locations known for Fashion and Design Innovation and Creativity, such as France, England, Italy, the Czech Republic, Australia, China, and India.

The Fashion Design Concentration focuses on taking apparel designs from concept to completed garments. Emphasis is placed on fundamental areas of fashion design including patternmaking, sewing, and draping.

For more information about this program, visit our website (https://textiles.ncsu.edu/tatm/fashion-and-textile-design/).

Department of Textile and Apparel, Technology and Management
North Carolina State University
Campus Box 8301
Raleigh, NC 27695-8301

For answers to questions about the admissions process, please contact:

Heather M. Lyerly
Director of Academic Services
Wilson College of Textiles
hemurphy@ncsu.edu

(919) 515-1177

Meggie Metcalf
Academic Advisor
Wilson College of Textiles
meggie_metcalf@ncsu.edu
(919) 515-0596

Plan Requirements

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<td>Mathematics and Sciences</td>
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<td>MA 231 Calculus for Life and Management Sciences B</td>
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<td>CH 101 Chemistry - A Molecular Science</td>
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<td>PY 211 College Physics I</td>
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<td>TMS 211 Introduction to Fiber Science</td>
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<td>TTM 106 Yarn Formation, Classification and Numbering Systems</td>
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<td>TT 252 Formation and Structure of Textile Fabrics</td>
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<td>FTM 282 Introduction to Textile Brand Management and Marketing</td>
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<td>PCC 302 Technology of Textile Wet Processing</td>
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<td>FTM 310 Entrepreneurship &amp; New Product Development in Textiles</td>
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<td>ADN 281 Drawing I</td>
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<td>FTM 318</td>
<td>Fashion Development Processes</td>
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<td>FTM 320</td>
<td>Retail Merchandising in Fashion and Textiles</td>
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<td>FTM 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
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<td>FTM 382</td>
<td>Intermediate Textile Brand Management and Marketing</td>
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<td>FTM 384</td>
<td>Visual Merchandising Principles and Management</td>
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<td>FTM 385</td>
<td>Fashion and the Consumer</td>
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<td>FTM 387</td>
<td>Textile Brand Communications &amp; Promotions</td>
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<td>Major Fashion Designers</td>
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<td>The Fashion Industry</td>
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<td>Retail Buying in Fashion and Textiles</td>
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<td>FTM 431</td>
<td>Quality Management and Control in Textile and Manufacturing</td>
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<td>FTM 460</td>
<td>Textile Market Research</td>
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<td>FTM 480</td>
<td>Operations Management Decisions for Textiles</td>
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<td>Product Costing in the Textile and Apparel Industry</td>
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<td>Advanced Textile Brand Management and Marketing</td>
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<td>FTM 483</td>
<td>Global Trade &amp; Sourcing</td>
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<td>Strategic Planning and Decision Making in the Textile and Fashion Industries</td>
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<td>Textile Computer Integrated Enterprise</td>
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<td>Supply Chain Management in the Textile Industry</td>
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<td>Textile and Apparel Labor Management</td>
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<td>FTM 490</td>
<td>Development Projects in Textile and Apparel Management</td>
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<td>Special Topics in Textile and Apparel Management</td>
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<td>International Industrial Internship in Textile Management</td>
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<td>Senior Fashion Collection Studio</td>
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<td>Textile Senior Project</td>
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<td>TT 341</td>
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<td>TT 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
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<td>TT 431</td>
<td>Quality Management and Control In Textile Manufacturing</td>
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<td>TT 485</td>
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Acad Writing Research

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Transfer Sequence

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Semester Sequence

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<td>TT 105</td>
<td>Introduction to Textile Technology</td>
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<tr>
<td>D 100</td>
<td>Design Inquiry I: Methods and Processes</td>
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<td>FTD 104</td>
<td>Fashion and Textile Design First Year</td>
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<td>T 101</td>
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<td>Design Skills Workshop</td>
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<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>FTD 105</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<td>FTD 215</td>
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<td>College Physics I</td>
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<td>TTM 106</td>
<td>Yarn Formation, Classification and Numbering Systems</td>
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Second Year

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<tr>
<td>FTD 215</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<tr>
<td>TTM 106</td>
<td>Yarn Formation, Classification and Numbering Systems</td>
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</table>
ADN 281  
Drawing I  
3

**Spring Semester**

- FTD 216  Fashion Workroom Practices  
  3
- FTM 217  The Textile Industry  
  3
- TT 252  Formation and Structure of Textile Fabrics  
  4
- GEP Health and Exercise Studies (p. 1422)  
  1
- FTD 218  Fashion Illustration  
  3
- FTM 317  Computer-Aided-Design for Apparel  
  3

**Hours**  
17

**Third Year**

**Fall Semester**

- CH 101  Chemistry - A Molecular Science  
  3
- CH 102  General Chemistry Laboratory  
  1
- MA 231  Calculus for Life and Management Sciences B  
  3
- TMS 211  Introduction to Fiber Science  
  3
- FTD 321  Fashion Design by Draping  
  3
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  
  3

**Hours**  
16

**Spring Semester**

- FTD Advised Elective  
  3
- GEP Social Sciences (p. 1430)  
  3
- FTM 282  Introduction to Textile Brand Management and Marketing  
  3
- FTD Advised Elective  
  3

**Hours**  
12

**Fourth Year**

**Fall Semester**

- FTD 419  Fashion Design 2  
  3
- FTM 310  Entrepreneurship & New Product Development in Textiles  
  3
- PCC 302  Technology of Textile Wet Processing  
  4
- GEP Humanities (p. 1423)  
  3

**Hours**  
13

**Spring Semester**

- FTM 497  Senior Fashion Collection Studio  
  6
- GEP Social Sciences (p. 1430)  
  3
- GEP Humanities (p. 1423)  
  3

**Hours**  
12

**Total Hours**  
120

1 C- or better  
2 C or better

---

**Fashion and Textile Design (BS): Textile Design Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orip.ncsu.edu/pgas/).

The B.S. in Fashion and Textile Design offers an excellent opportunity for students to pursue interests in Fashion Design and Textile Design Concentrations with a focus on designing innovative textile and fashion products utilizing the knowledge taught in Design Thinking, Textile Products Characteristics, Niche Market analysis, Color Science, Computer Aided Design, Drawing and Illustration and Senior Design.

To gain global experience in the field, students study abroad for one semester in the junior year, in locations known for Fashion and Design Innovation and Creativity, such as France, England, Italy, the Czech Republic, Australia, China, and India.

The Textile Design Concentration focuses on developing technical skills and innovation to create textiles for such applications as home furnishings and apparel. Emphasis is placed on key textile design concepts in knitting, weaving, yarn, and surface design.

For more information about this program, visit our website (https://textiles.ncsu.edu/tatm/fashion-and-textile-design/).

---

**Department of Textile and Apparel, Technology and Management**
North Carolina State University
Campus Box 8301
Raleigh, NC 27695-8301

For answers to questions about the admissions process, please contact:

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Wilson College of Textiles  
hemurphy@ncsu.edu  
(919) 515-1177

Meggie Metcalf  
Academic Advisor  
Wilson College of Textiles  
meggie_metcalf@ncsu.edu  
(919) 515-0596

---

**Plan Requirements**

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<th>Hours</th>
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<tr>
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<tr>
<td>MA 131</td>
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<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
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<td>TT 105</td>
<td>Introduction to Textile Technology</td>
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<td>TTM 106</td>
<td>Yarn Formation, Classification and Numbering Systems</td>
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<td>FTM 217</td>
<td>The Textile Industry</td>
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<td>FTD 200</td>
<td>Design Skills Workshop</td>
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<td>TT 252</td>
<td>Formation and Structure of Textile Fabrics</td>
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<td>FTD 201</td>
<td>Computer-Aided Textile Design and Color Studio</td>
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<tr>
<td>FTM 282</td>
<td>Introduction to Textile Brand Management and Marketing</td>
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<tr>
<td>PCC 302</td>
<td>Technology of Textile Wet Processing</td>
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1 C- or better  
2 C or better
FTM 310  Entrepreneurship & New Product Development in Textiles  3
ADN 281  Drawing I  3
D 100  Design Inquiry I: Methods and Processes  3
D 101  Design Inquiry II: Methods and Processes  3
FTD 104  Fashion and Textile Design First Year Studio I  6
FTD 105  Fashion and Textile Design First Year Studio II  6

**Concentration Requirements**

FTD 373  Yarn Design Studio  3
FTD 374  Surface Design and Texture  3
FTD 375  Woven Textile Design Studio I  3
FTD 376  Knitted Textile Design Studio I  3
FTD 475  Woven Textile Design Studio II  3
FTD 476  Knitted Textile Design Studio II  3
FTD 479  Senior Textile Design Studio  6

18 FTD Advised Electives
FTD Advised Elective (p. 1513)  6

**GEP Courses**

Acad Writing Research (p. 1513)  4
GEP Humanities (p. 1423)  6
GEP Social Sciences (p. 1430)  6
GEP Health and Exercise Studies (p. 1422)  2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours  120

1  C or better
2  C- or better

**FTD Advised Elective**

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<td>Entrepreneurship &amp; New Product Development in Textiles</td>
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<td>FTM 315</td>
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<td>FTM 317</td>
<td>Computer-Aided-Design for Apparel</td>
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<td>FTM 318</td>
<td>Fashion Development Processes</td>
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<td>FTM 320</td>
<td>Retail Merchandising in Fashion and Textiles</td>
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<td>FTM 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
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<td>FTM 382</td>
<td>Intermediate Textile Brand Management and Marketing</td>
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<td>FTM 384</td>
<td>Visual Merchandising Principles and Management</td>
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<td>FTM 385</td>
<td>Fashion and the Consumer</td>
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<td>FTM 387</td>
<td>Textile Brand Communications &amp; Promotions</td>
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<td>FTM 400</td>
<td>Major Fashion Designers</td>
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<td>FTM 415</td>
<td>Fashion Product Development</td>
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<td>FTM 416</td>
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<td>FTM 420</td>
<td>Retail Buying in Fashion and Textiles</td>
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<td>FTM 431</td>
<td>Quality Management and Control In Textile Manufacturing</td>
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<td>Operations Management Decisions for Textiles</td>
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<td>Product Costing in the Textile and Apparel Industry</td>
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<td>Global Trade &amp; Sourcing</td>
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<td>Strategic Planning and Decision Making in the Textile and Fashion Industries</td>
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<td>FTM 487</td>
<td>Textile and Apparel Labor Management</td>
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<td>FTM 490</td>
<td>Development Projects in Textile and Apparel Management</td>
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<td>FTM 491</td>
<td>Special Topics in Textile and Apparel Management</td>
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<td>FTM 494</td>
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**Semester Sequence**

This is a sample.

**Critical Path Courses:** Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

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<td>ENG 101</td>
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<table>
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<tbody>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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D 100  Design Inquiry I: Methods and Processes  3
FTD 104  Fashion and Textile Design First Year Studio I (CP)  6
T 101  Introduction to the College of Textiles  1

### Hours  17

#### Spring Semester

D 101  Design Inquiry II: Methods and Processes  3
FTD 200  Design Skills Workshop  2  3
MA 131  Calculus for Life and Management Sciences A  3
FTD 105  Fashion and Textile Design First Year Studio II (CP)  6
GEP Health and Exercise Studies (p. 1422)  1

### Hours  17

#### Second Year

##### Fall Semester

FTD 201  Computer-Aided Textile Design and Color Studio (CP)  2  6
FTM 217  The Textile Industry  3
PY 211  College Physics I  4
TTM 106  Yarn Formation, Classification and Numbering Systems  1
ADN 281  Drawing I  3

### Hours  16

##### Spring Semester

TMS 211  Introduction to Fiber Science  3
TT 252  Formation and Structure of Textile Fabrics (CP)  2  4
FTD 373  Yarn Design Studio (CP)  3
FTD 374  Surface Design and Texture (CP)  3
MA 231  Calculus for Life and Management Sciences B  3
GEP Health and Exercise Studies (p. 1422)  1

### Hours  17

#### Third Year

##### Fall Semester

FTM 310  Entrepreneurship & New Product Development in Textiles  3
FTD 375  Woven Textile Design Studio I (CP)  2  3
FTD 376  Knitted Textile Design Studio I (CP)  2  3
CH 101  Chemistry - A Molecular Science  3
CH 102  General Chemistry Laboratory  1
GEP Humanities  3

### Hours  16

##### Spring Semester

FTD Advised Elective  3
FTM 282  Introduction to Textile Brand Management and Marketing  3
GEP Social Sciences (p. 1430)  3
FTD Advised Elective  3

### Hours  12

### Fourth Year

##### Fall Semester

FTD 475  Woven Textile Design Studio II  3
FTD 476  Knitted Textile Design Studio II  3
PCC 302  Technology of Textile Wet Processing  4
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3

### Hours  13

##### Spring Semester

FTD 479  Senior Textile Design Studio  6
GEP Social Sciences (p. 1430)  3
GEP Humanities (p. 1423)  3

### Hours  12

### Total Hours  120

1. C- or better
2. C or better

---

## Fashion and Textile Management (BS)

The B.S. in Fashion and Textile Management has two concentrations. The Textile Brand Management and Marketing Concentration focuses on studying textile branding strategies, consumer trends, product trends, licensed products, and the global textile marketplace dynamics. The Fashion Development and Product Management Concentration focuses on design and development of fashion products, integrating trend analysis, computer-aided-design, coloration, silhouette selection, pattern making, fabric selection, consumer research, costing, sourcing and quality assessment. Students in both Fashion and Textile Management concentrations are encouraged to pursue global studies, including study abroad, to further enhance their understanding of global market opportunities.

For more information about this program, visit our website [here](https://textiles.ncsu.edu/tatm/fashion-and-textile-management/).

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Meggie Metcalf
Academic Advisor
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(919) 515-0596
Fashion and Textile Management (BS): Brand Management and Marketing Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Brand Management and Marketing concentration of the Fashion and Textile Management Degree focuses on the marketing functions required to promote and distribute products in the fiber, textile and apparel industries. Courses provide knowledge and skills for planning and execution of marketing strategy, brand management, retail planning and allocation, consumer behavior, advertising and promotion, and international trade and sourcing. Courses incorporate active learning, including teamwork and application of classroom knowledge to real-world industry challenges.

For more information about this program, visit our website (https://textiles.ncsu.edu/tatm/fashion-and-textile-management/).

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Plan Requirements

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<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>T 101</td>
<td>Introduction to the College of Textiles</td>
<td>1</td>
</tr>
<tr>
<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<tr>
<td>or MA 141</td>
<td>Calculus I</td>
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<tr>
<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<tr>
<td>or MA 114</td>
<td>Introduction to Finite Mathematics with Applications</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
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<td>and Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td>or PY 211</td>
<td>College Physics I</td>
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Major Requirements

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GEP Courses

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Free Electives

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Total Hours 120
1. C- or better
2. Students should consult their academic advisors to determine which courses fill this requirement.

### Brand Marketing & Mgmt Elec

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### Acad Writing Research

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### Transfer Sequence

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### Semester Sequence

This is a sample.

**Critical Path Courses:** Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

**Course** | **Title**                                                      | **Hours** |
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EC/ARE 201 | Principles of Microeconomics                                   | 3         |
ENG 101   | Academic Writing and Research                                  | 4         |
MA 131    | Calculus for Life and Management Sciences A                   | 3         |
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**Spring Semester**

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**Second Year**

**Fall Semester**

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<td>Principles of Macroeconomics</td>
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**Third Year**

**Fall Semester**

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<td>Visual Merchandising Principles and Management</td>
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**Fourth Year**

**Fall Semester**

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**Spring Semester**

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**Total Hours**

120-121

**Fashion and Textile Management (BS): Fashion Development and Product Management Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Fashion Development and Product Management concentration of the Fashion and Textile Management degree focuses on the design and manufacture of apparel and textile products for both functional and fashion end uses. Courses cover the fundamentals of product development for apparel and textiles, with a strong emphasis on technology. This concentration provides students with knowledge of sewing, flat pattern making and draping, computer-aided design, and apparel line development and production. Students work actively with industry to address timely challenges in product design and development for textiles and apparel.

For more information about this program, visit our website (https://textiles.ncsu.edu/tatm/fashion-and-textile-management/).

Department of Textile and Apparel, Technology and Management
North Carolina State University
Campus Box 8301
Raleigh, NC 27695-8301

For answers to questions about the admissions process, please contact:

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(919) 515-1177

Meggie Metcalf
Academic Advisor
Wilson College of Textiles
meggie_metcalf@ncsu.edu
(919) 515-0596
Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>T 101</td>
<td>Introduction to the College of Textiles</td>
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**Mathematics and Sciences**

- MA 131 or MA 141: Calculus for Life and Management Sciences A, Calculus I  3
- MA 231 or MA 114: Calculus for Life and Management Sciences B, Introduction to Finite Mathematics with Applications  3
- CH 101: Chemistry - A Molecular Science  3
- CH 102: General Chemistry Laboratory  1
- PY 205 or PY 206 or PY 211: Physics for Engineers and Scientists I, Physics for Engineers and Scientists I Laboratory, College Physics I  4

**Major Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td>3</td>
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<tr>
<td>BUS 320</td>
<td>Financial Management</td>
<td>3</td>
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<tr>
<td>FTM 217</td>
<td>The Textile Industry</td>
<td>3</td>
</tr>
<tr>
<td>FTM 220</td>
<td>Principles of Retailing and Supply Chain Management in Textiles</td>
<td>3</td>
</tr>
<tr>
<td>FTM 282</td>
<td>Introduction to Textile Brand Management and Marketing</td>
<td>3</td>
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<tr>
<td>FTM 310</td>
<td>Entrepreneurship &amp; New Product Development in Textiles</td>
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<td>FTM 382</td>
<td>Intermediate Textile Brand Management and Marketing</td>
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<td>FTM 385</td>
<td>Fashion and the Consumer</td>
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<td>FTM 416</td>
<td>The Fashion Industry</td>
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<tr>
<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
<td>3</td>
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<tr>
<td>PCC 302</td>
<td>Technology of Textile Wet Processing</td>
<td>4</td>
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<td>TT 105</td>
<td>Introduction to Textile Technology</td>
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<td>TTM 106</td>
<td>Yarn Formation, Classification and Numbering Systems</td>
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<td>TT 252</td>
<td>Formation and Structure of Textile Fabrics</td>
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Select one of the following:

- ARE 201 or ARE 201A or EC 201: Introduction to Agricultural & Resource Economics, Introduction to Agricultural & Resource Economics, Principles of Microeconomics  3
- EC 202: Principles of Macroeconomics  3
- ST 311 or ST 370: Introduction to Statistics, Probability and Statistics for Engineers  3

Select one of the following:

- ENG 331 or ENG 332 or ENG 333: Communication for Engineering and Technology, Communication for Business and Management, Communication for Science and Research  3

**Concentration Requirements**

- FTM 219: Fashion Product Analysis  3
- FTM 271: Computer-Aided Textile Design  3
- FTM 315: Fashion Product Design  3
- FTM 317: Computer-Aided-Design for Apparel  3
- FTM 318: Fashion Development Processes  3
- FTM 415: Fashion Product Development  3

**FD & PM Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>ADN 111</td>
<td>Introduction to Two-Dimensional Design</td>
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<td>ADN 112</td>
<td>Introduction to Three-Dimensional Design</td>
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<td>ADN 414</td>
<td>Color and Light</td>
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<td>FTM 320</td>
<td>Retail Merchandising in Fashion and Textiles</td>
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<td>FTM 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
<td>3</td>
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<tr>
<td>FTM 387</td>
<td>Textile Brand Communications &amp; Promotions</td>
<td>3</td>
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<tr>
<td>FTM 400</td>
<td>Major Fashion Designers</td>
<td>3</td>
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<tr>
<td>FTM 420</td>
<td>Retail Buying in Fashion and Textiles</td>
<td>3</td>
</tr>
<tr>
<td>FTM 431</td>
<td>Quality Management and Control In Textile Manufacturing</td>
<td>3</td>
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<tr>
<td>FTM 480</td>
<td>Operations Management Decisions for Textiles</td>
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<tr>
<td>FTM 481</td>
<td>Product Costing in the Textile and Apparel Industry</td>
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<td>FTM 484</td>
<td>Strategic Planning and Decision Making in the Textile and Fashion Industries</td>
<td>3</td>
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<td>FTM 485</td>
<td>Textile Computer Integrated Enterprise</td>
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<td>FTM 486</td>
<td>Supply Chain Management in the Textile Industry</td>
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<tr>
<td>FTM 497</td>
<td>Senior Fashion Collection Studio</td>
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<tr>
<td>MT 323</td>
<td>Introduction to Theory and Practice of Medical Fiber and Yarn Formation</td>
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<td>MT 366</td>
<td>Biotextile Product Development</td>
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<td>MT 381</td>
<td>Medical Textile and the Regulatory Environment</td>
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<td>Impact of Industry on the Environment and Society</td>
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<td>TT 331</td>
<td>Performance Evaluation of Textile Materials</td>
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<td>TT 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
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<td>TT 431</td>
<td>Quality Management and Control In Textile Manufacturing</td>
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<td>TT 480</td>
<td>Operations Management Decisions for Textiles</td>
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<td>TT 485</td>
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<td>TT 486</td>
<td>Supply Chain Management in the Textile Industry</td>
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**FD & PM Electives (p. 1518)**

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<tr>
<th>Code</th>
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</table>
| GEP Courses
| Acad Writing Research (p. 1519)  1                                    | 4     |
| GEP Humanities (p. 1423)                                               | 6     |
| GEP Social Sciences (p. 1430)                                           | 3     |
| GEP Health and Exercise Studies (p. 1422)                               | 2     |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |
| GEP Interdisciplinary Perspectives (p. 1426)                            | 5     |
| GEP U.S. Diversity (p. 1431) (verify requirement)                       |       |
| GEP Global Knowledge (p. 1419) (verify requirement)                     |       |
| Foreign Language Proficiency (p. 1417) (verify requirement)              |       |

**Free Electives**

Free Elective  2  1

Total Hours  120

1. C- or better
2. Students should consult their academic advisors to determine which courses fill this requirement.
Acad Writing Research

<table>
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<td>FLE 101</td>
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Transfer Sequence

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<td>ENG 202</td>
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<td>100 Level English Composition</td>
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Semester Sequence

This is a sample.

Critical Path Courses: Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

<table>
<thead>
<tr>
<th>Course</th>
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<td>Principles of Microeconomics</td>
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<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<td>MA 131</td>
<td>Calculus for Life and Management Sciences A</td>
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<td>TT 105</td>
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<td>T 101</td>
<td>Introduction to the College of Textiles</td>
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<td>GEP Health and Exercise Studies (p. 1422)</td>
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<tr>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<td>FTM 217</td>
<td>The Textile Industry (CP)</td>
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<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
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<td>FTM 220</td>
<td>Principles of Retailing and Supply Chain Management in Textiles</td>
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<td>Concepts of Financial Reporting</td>
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<td>EC 202</td>
<td>Principles of Macroeconomics</td>
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<td>PY 211</td>
<td>College Physics I</td>
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<td>TTM 106</td>
<td>Yarn Formation, Classification and Numbering Systems</td>
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<td>Fashion Product Analysis (CP)</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>BUS 320</td>
<td>Financial Management</td>
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<td>Formation and Structure of Textile Fabrics</td>
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<td>Computer-Aided Textile Design</td>
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<td>FTM 282</td>
<td>Introduction to Textile Brand Management and Marketing (CP)</td>
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<td><strong>Fourth Year</strong></td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>Option Course</td>
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<tr>
<td><strong>Hours</strong></td>
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<td><strong>Spring Semester</strong></td>
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<td>FTM 497</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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<td>Free Elective</td>
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<td><strong>Total Hours</strong></td>
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Department of Textile Engineering, Chemistry and Science

The Department of Textile Engineering, Chemistry, and Science offers Bachelor of Science degrees in Polymer and Color Chemistry, Textile Engineering, and Textile Technology as well as several minors. The department is uniquely interdisciplinary, dedicated to providing a fundamental education in chemistry, engineering, and technology principles related to fibers, fiber-based materials, and fabrics within areas ranging from polymer and color science and biomedical textiles to process improvement (lean Six Sigma) and design engineering principles.

Department Highlights:

- Undergraduates in our department have opportunities to participate in and conduct research programs
• Our department has a high rate of industry internship placement, many paid
• Students can choose to accelerate their education through our accelerated Bachelor's and Master's program, earning a BS in our department an a Master of Science in Textile of Engineering

For more information about our department, including contact information, visit our website (https://textiles.ncsu.edu/tecs/).

Department of Textile Engineering, Chemistry and Science
North Carolina State University
Campus Box 8301
Raleigh, NC 27695-8301

Dr. Jeff A. Joines
Professor and Department Head
North Carolina State University
Wilson College of Textiles 3271
Raleigh, NC 27695-8301
Phone: 919-513-4188
Email: jeffjoines@ncsu.edu

Faculty

Head of Department of Textile Engineering, Chemistry and Science
J. A. Joines

Associate Head
E. DenHartog, Director of Graduate Programs
R.E. Gorga, Director of Undergraduate Programs

Burlington Distinguished Professor
R.L. Barker

Ciba Professor of Textile Chemistry
R. Shamey

Cone Mills Professor of Textile Chemistry
D. Hinks, Dean, Wilson College of Textiles

INVISTA Professor of Fiber and Polymer Chemistry
A.E. Tonelli

William A. Klopman Distinguished Professor
T. Ghosh

Professors
R. Barker

A.M. El-Shafei
H. Freeman
T. K. Ghosh
R.E. Gorga
D. Hinks
S. M. Hudson
W. J. Jasper
J. A. Joines
M. W. King
J. P. Rust
R. Shamey
A. Tonelli
X. Zhang

Teaching Professor
H. Hamouda

Associate professors
P. Banks-Lee
N. Vinueza Benitez
P. D. Bradford
E. DenHartog
G. L. Hodge
J. S. Jur
R. Kotek
W. E. Krause
J. P. Lavelle
S. Salmon

Assistant professors
J. Budhathoki Uprety
X. Fang
E. Ford
W. Gao
J. Gluck
B. Ormond
E. Shim
Mengmeng Zhu

 Adjunct Lecturer
S. Dunning
G.D. Knight

Adjunct associate professor
B. Oliver

Postdoctoral Research Scholar
M. Dirican

Plans

• Polymer and Color Chemistry (BS): ACS Certification Concentration (p. 1521)
• Polymer and Color Chemistry (BS): Medical Sciences Concentration (p. 1523)
• Polymer and Color Chemistry (BS): Science & Operations Concentration (p. 1525)
• Polymer Science (Minor) (p. 1528)
• Textile Engineering (BS): Chemical Processing Concentration (p. 1529)
• Textile Engineering (BS): Information Systems Concentration (p. 1531)
• Textile Engineering (BS): Machine Design Concentration (p. 1533)
• Textile Engineering (BS): Product Engineering Concentration (p. 1539)
• Textile Technology (BS) (p. 1544)
• Textile Technology (BS): Medical Textiles Concentration (p. 1546)
• Textile Technology (BS): Supply Chain Operations Concentration (p. 1548)
• Textile Technology (BS): Technical Textiles Concentration (p. 1550)
• Textile Technology (Minor) (p. 1552)

Polymer and Color Chemistry (BS): ACS Certification Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)!"
Sciences
CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1
CH 201 Chemistry - A Quantitative Science 3
CH 202 Quantitative Chemistry Laboratory 1
CH 221 Organic Chemistry I 3
CH 222 Organic Chemistry I Lab 1
CH 223 Organic Chemistry II 3
CH 224 Organic Chemistry II Lab 1
CH 401 Systematic Inorganic Chemistry I 3
PY 205 Physics for Engineers and Scientists I 4
PY 206 and Physics for Engineers and Scientists I Laboratory 4
PY 208 Physics for Engineers and Scientists II 4
PY 209 and Physics for Engineers and Scientists II Laboratory 4
ST 370 Probability and Statistics for Engineers 3

Major Electives
Select one of the following: 3
ARE 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics
PCC Electives (p. 1522) 5

GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 120

1 C- or better

Acad Writing Research

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>FLE 101</td>
<td>Academic Writing and Research</td>
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Transfer Sequence

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<th>Hours</th>
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<tbody>
<tr>
<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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<td>ENG 1GEP</td>
<td>100 Level English Composition</td>
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PCC Electives

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<tr>
<td>PCC 404</td>
<td>Introduction to the Theory and Practice of Fiber Formation</td>
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<td>PCC 410</td>
<td>Textile Preparation and Finishing Chemistry</td>
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<td>PCC 420</td>
<td>Textile Dyeing and Printing</td>
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<td>PCC 466</td>
<td>Polymer Chemistry Laboratory</td>
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<td>PCC 474</td>
<td>Forensic Chemistry Laboratory</td>
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<td>PCC 490</td>
<td>Undergraduate Research in Polymer and Color Chemistry</td>
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<tr>
<td>T 497</td>
<td>Independent Research in Textile Engineering, Chemistry and Materials Science I</td>
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Semester Sequence

This is a sample.

<table>
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</table>
| First Year Fall Semester
| T 101    | Introduction to the College of Textiles   | 1     |
| PCC 101  | Introduction to Polymer and Color Chemistry (CP) | 2     |
| PCC 104  | Introduction to Polymer and Color Chemistry Lab | 1     |
| MA 141   | Calculus I                                 | 4     |
| CH 101   | Chemistry - A Molecular Science            | 3     |
| CH 102   | General Chemistry Laboratory               | 1     |
| CH 105   | Introduction to Writing and Research       | 4     |
| Hours    |                                            | 16    |
| Spring Semester
| PCC 106  | Polymer Chemistry and Environmental Sustainability (CP) | 3     |
| CH 221   | Organic Chemistry I                        | 3     |
| CH 222   | Organic Chemistry I Lab                    | 1     |
| MA 241   | Calculus II                                | 4     |
| GEP Humanities (p. 1423) | 3 | |
| GEP Advised Elective | 3 | |
| Hours    |                                            | 17    |
| Second Year Fall Semester
| TE 200   | Introduction to Polymer Science and Engineering (CP) | 3     |
| CH 223   | Organic Chemistry II                       | 3     |
| CH 224   | Organic Chemistry II Lab                   | 1     |
| MA 242   | Calculus III                               | 4     |
| PY 205   | Physics for Engineers and Scientists I     | 3     |
| PY 206   | Physics for Engineers and Scientists I Laboratory | 1     |
| GEP Health and Exercise Studies (p. 1422) | 1 | |
| Hours    |                                            | 16    |
| Spring Semester
| TMS 211  | Introduction to Fiber Science              | 3     |
| CH 201   | Chemistry - A Quantitative Science         | 3     |
| CH 202   | Quantitative Chemistry Laboratory          | 1     |
| PY 208   | Physics for Engineers and Scientists II    | 3     |
| PY 209   | Physics for Engineers and Scientists II Laboratory | 1 | |
MA 341  Applied Differential Equations I  3

Third Year
Fall Semester
PCC 461  Chemistry of Polymeric Materials (CP)  3
PCC 464  Chemistry of Polymeric Materials Laboratory  1
PCC 301  Technology of Dyeing and Finishing (CP)  3
PCC 304  Technology of Dyeing & Finishing Laboratory  1
TMS 212  Yarn and Fabric Formation and Properties  2
CH 431  Physical Chemistry I  3

Spring Semester
PCC 350  Introduction to Color Science and Its Applications (CP)  2
PCC 354  Intro to Color Science Laboratory  1
CH 433  Physical Chemistry II  3
GEP Humanities (p. 1423)  3
ST 370  Probability and Statistics for Engineers  3
GEP Interdisciplinary Perspectives (p. 1426)  2-3

Fall Semester
PCC 442  Theory of Physico-Chemical Processes in Textiles II  3
PCC 462  Characterization and Physical Properties of Polymers  3
CH 401  Systematic Inorganic Chemistry I  3
PCC Electives  2-3
PCC 201  Impact of Industry on the Environment and Society  3

Spring Semester
PCC 412  Textile Chemical Analysis  2
PCC 414  Textile Chemistry Analysis Lab  1
PCC Elective  3
PCC 471  The Chemistry of Synthetic and Natural Bipolymers  3
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)  3
GEP Health and Exercise Studies (p. 1422)  1
GEP Social Sciences (p. 1430)  3

Plan Requirements

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Polymer and Color Chemistry (BS): Medical Sciences Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).
Polymer and Color Chemistry (BS): Medical Sciences Concentration

PCC 464 Chemistry of Polymeric Materials Laboratory 1
BCH 451 Principles of Biochemistry 3
or PCC 471 The Chemistry of Synthetic and Natural Bipolymers

Mathematics
MA 131 Calculus for Life and Management Sciences A 3
or MA 141 Calculus I
MA 231 Calculus for Life and Management Sciences B 3
or MA 241 Calculus II

Sciences
CH 101 Chemistry - A Molecular Science 3
CH 102 General Chemistry Laboratory 1
CH 201 Chemistry - A Quantitative Science 3
CH 202 Quantitative Chemistry Laboratory 1
CH 221 Organic Chemistry I 3
CH 222 Organic Chemistry I Lab 1
CH 223 Organic Chemistry II 3
CH 224 Organic Chemistry II Lab 1

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4
BIO 183 Introductory Biology: Cellular and Molecular Biology 4

PY 211 College Physics I 4
PY 212 College Physics II 4
MB 351 General Microbiology 3
MB 352 General Microbiology Laboratory 1

Major Electives
Select one of the following: 3
ARE 201 Introduction to Agricultural & Resource Economics
ARE 201A Introduction to Agricultural & Resource Economics
EC 201 Principles of Microeconomics
EC 205 Fundamentals of Economics

PCC Electives (p. 1524) 5
Advised Elective Group II (p. 1524) 9

GEP Courses
GEP Humanities (p. 1423) 6
GEP Social Sciences (p. 1430) 3
GEP Health and Exercise Studies (p. 1422) 2
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/VISUAL AND PERFORMING ARTS) 3
GEP Interdisciplinary Perspectives (p. 1426) 2
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Knowledge (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 120

1 C- or better

Acad Writing Research

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Transfer Sequence

ENG 1GEP 100 Level English Composition 3
ENG 202 Disciplinary Perspectives in Writing 3

PCC Electives

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Advised Elective Group II

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<td>MB 411</td>
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Semester Sequence

This is a sample.

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**Polymer and Color Chemistry (BS): Science & Operations Concentration**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The B.S. in Polymer and Color Chemistry (PCC) is a flexible and rigorous program that provides courses in fundamental chemistry, while incorporating some unique areas of applied chemistry in polymer and color chemistry. The applied courses are heavily oriented to the chemistry and technology of polymers, including polymer synthesis, extrusion and characterization. In addition, the color chemistry component of the degree includes the synthesis and application of dyes and other compounds associated with the coloration of textiles, fibers, and other materials, as well as the science of color perception and color measurement.

The degree program offers three concentrations: American Chemical Society (ACS) Certified, Science and Operations, and Medical Sciences. The ACS Certified concentration is designed for students wishing to pursue advanced studies in chemistry and related subjects and the Medical Sciences Concentration is for those students who wish to pursue medical school, dental school, pharmacy or optometry. This concentration includes all courses a student will need for application to these professional programs. Each concentration incorporates a number of electives allowing students to develop focus areas, including medical textiles, polymer chemistry, and color chemistry.


Dr. Renzo Shamey
TECS Department
Wilson College of Textiles
Phone: 919-515-6546
Email: rshamey@ncsu.edu
## Plan Requirements

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<td>ST 370</td>
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<td>ST 380</td>
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<td>GEP Humanities (p. 1423)</td>
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<td>GEP Social Sciences (p. 1430)</td>
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<td>GEP U.S. Diversity (p. 1431) (verify requirement)</td>
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<tr>
<td>Foreign Language Proficiency (p. 1417) (verify requirement)</td>
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^1 C- or better

## Acad Writing Research

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<td>Academic Writing and Research</td>
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<td>FLE 101</td>
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<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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## PCC Electives

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<tr>
<td>CH 144</td>
<td>Forensic Chemistry</td>
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<tr>
<td>MT 471</td>
<td>The Chemistry of Synthetic and Natural Bipolymers</td>
<td>3</td>
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<tr>
<td>PCC 404</td>
<td>Introduction to the Theory and Practice of Fiber Formation</td>
<td>3</td>
</tr>
<tr>
<td>PCC 410</td>
<td>Textile Preparation and Finishing Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>PCC 420</td>
<td>Textile Dyeing and Printing</td>
<td>3</td>
</tr>
<tr>
<td>PCC 466</td>
<td>Polymer Chemistry Laboratory</td>
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<tr>
<td>PCC 471</td>
<td>The Chemistry of Synthetic and Natural Bipolymers</td>
<td>3</td>
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<tr>
<td>PCC 474</td>
<td>Forensic Chemistry Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>PCC 490</td>
<td>Undergraduate Research in Polymer and Color Chemistry</td>
<td>1-6</td>
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<tr>
<td>T 497</td>
<td>Independent Research in Textile Engineering, Chemistry and Materials Science I</td>
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## Advised Elective Group II

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<tr>
<th>Code</th>
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<tr>
<td>CH 441</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<tr>
<td>MB 351</td>
<td>General Microbiology</td>
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</table>
MT 366  Biotextile Product Development  3
MT 381  Medical Textile and the Regulatory Environment  3
MT 432  Biotextiles Evaluation  3

PCC Electives

CH 441  Forensic Chemistry  3
MT 471  The Chemistry of Synthetic and Natural Bipolymers  3
PCC 404  Introduction to the Theory and Practice of Fiber Formation  3
PCC 410  Textile Preparation and Finishing Chemistry  3
PCC 420  Textile Dyeing and Printing  3
PCC 466  Polymer Chemistry Laboratory  3
PCC 471  The Chemistry of Synthetic and Natural Bipolymers  3
PCC 474  Forensic Chemistry Laboratory  3
PCC 490  Undergraduate Research in Polymer and Color Chemistry  1-6
T 497  Independent Research in Textile Engineering, Chemistry and Materials Science I  1-3

Semester Sequence

This is a sample.

Course  Title  Hours

First Year  

Fall Semester  
T 101  Introduction to the College of Textiles  1
PCC 101  Introduction to Polymer and Color Chemistry  2
PCC 104  Introduction to Polymer and Color Chemistry Lab  1
MA 131 or MA 141  Calculus for Life and Management Sciences A or Calculus I  3-4
CH 101  Chemistry - A Molecular Science  3
CH 102  General Chemistry Laboratory  1
ENG 101  Academic Writing and Research  4
Hours  15-16

Spring Semester  
PCC 106  Polymer Chemistry and Environmental Sustainability (CP)  3
CH 221  Organic Chemistry I  3
CH 222  Organic Chemistry I Lab  1
MA 231 or MA 241  Calculus for Life and Management Sciences B or Calculus II  3-4
GEP Humanities (p. 1423)  3
GEP Advised Elective Group  3
Hours  14-15

Third Year  

Fall Semester  
PCC 461  Chemistry of Polymeric Materials (CP)  3
PCC 464  Chemistry of Polymeric Materials Laboratory  1
PCC 301  Technology of Dyeing and Finishing (CP)  3
PCC 304  Technology of Dyeing & Finishing Laboratory  1
TMS 212  Yarn and Fabric Formation and Properties  2
TMS 214  Yarn and Fabric Formation and Properties Lab  1
TE 303 or CH 331  Thermodynamics for Textile Engineers or Introductory Physical Chemistry  3-4
Hours  15

Spring Semester  
PCC 350  Introduction to Color Science and Its Applications  2
PCC 354  Intro to Color Science Laboratory  1
PCC Elective  3
GEP Elective Group 2  3-4
Advised Elective Group 3  3
Hours  15-16

Fourth Year  

Fall Semester  
PCC 442  Theory of Physico-Chemical Processes in Textiles II  3
PCC 462  Characterization and Physical Properties of Polymers  3
PCC Electives  6
PCC 201  Impact of Industry on the Environment and Society  3
Hours  15

Spring Semester  
PCC 412  Textile Chemical Analysis  2
PCC 414  Textile Chemistry Analysis Lab  1
PCC Elective  3
Advised Elective Group 2  6

GEP Health and Exercise Studies (p. 1422)  1
GEP Interdisciplinary Perspectives (p. 1426)  2-3

Hours  14-15

Spring Semester  
TMS 211  Introduction to Fiber Science  3
CH 201 & CH 202  Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory  4
PY 212 or PY 208/209  College Physics II or Physics for Engineers and Scientists II  4
GEP Health and Exercise Studies (p. 1422)  1
GEP Social Sciences (p. 1430)  3

Hours  15
Program Requirements

GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3

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Total Hours 119-124

Polymer and Color Chemistry (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The Textile Engineering, Chemistry, and Science Department (TECS) offers a minor in Polymer and Color Chemistry to majors in any field except Polymer and Color Chemistry. The program is designed to expose students to the technical and scholarly disciplines of polymer chemistry, fiber formation, color physics, dyeing, and chemical modification of fabrics, and gives them an opportunity to learn how basic disciplines are applied in an industrial environment. Any interested student should contact the TECS Associate Department Head for Undergraduate Programs for information about the minor and its prerequisites.

Admissions

Any interested student should contact the person listed below for information about the minor and its prerequisites.

Certification

Once pursuing the minor, students should contact the person listed below for advice about course selection and certification. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found with 3307 College of Textiles and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person

Russell Gorga
College of Textiles 3267
919-515-6553
regorga@ncsu.edu

SIS Code: 18PCCM

Plan Requirements

- Students take a minimum of 15 hours in Polymer and Color Chemistry consisting of 4 required courses and 2 advised elective courses.
- Students must achieve a grade of ‘C’ or better in all courses to be used toward the minor.
- Students need to pay special attention to course prerequisites.
- Comment and Restrictions:
  - Required prerequisite courses in mathematics consist of MA 131
    Calculus for Life and Management Sciences A and MA 231 Calculus for Life and Management Sciences B, or MA 141 Calculus I and MA 241 Calculus II.
  - Required prerequisite courses in physics consist of PY 211
    College Physics I and PY 212 College Physics II or PY 205 Physics for Engineers and Scientists I and PY 208 Physics for Engineers and Scientists II.
  - Required prerequisite courses in chemistry consist of CH 101 Chemistry - A Molecular Science, CH 201 Chemistry - A Quantitative Science, CH 221 Organic Chemistry I and CH 223 Organic Chemistry II.
  - Required prerequisite courses in biology consist of BI 141 Biology for Scientists I.
- TE 200 Introduction to Polymer Science and Engineering may be required of students who have not completed one year of organic chemistry before starting the program.

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<td>Technology of Dyeing and Finishing</td>
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<tr>
<td>PCC 350</td>
<td>Introduction to Color Science and Its Applications</td>
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<tr>
<td>PCC 354</td>
<td>Intro to Color Science Laboratory</td>
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</tr>
<tr>
<td>PCC 461</td>
<td>Chemistry of Polymeric Materials</td>
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</table>

Elective Courses

Select two advised elective courses

Total Hours 15

1 The advised electives are to be selected by student in consultation with Dr. Sam Hudson, 3116 College of Textiles, 919.515.6545 or Sam_Hudson@ncsu.edu, Polymer and Color Chemistry Program Director and advisor for the Minor.

Polymer Science (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The minor in Polymer Science is intended to allow students to develop a fundamental understanding of polymers and macromolecules, which dominate both our natural and synthetic worlds. The chemical, physical and structural aspects of polymers and their application in a wide range of materials are examined in a series of courses designed to introduce the basic concept of macromolecules to students.

The Textile Engineering, Chemistry, and Science Department (TECS) offers a minor in Polymer Science to majors in all fields (provided the prerequisites are met). The program is designed to expose students to the technical and scholarly disciplines of polymer science, including their syntheses, structures, characterization, and properties. Students are given the opportunity to learn how polymers are applied in industrial settings and how they function in nature.

Admissions and Certification of Minor

- Admissions
  Request for information and additional details about the minor and its prerequisites should be directed to the address listed below.
- Certification
  Once pursuing the minor, students should contact the director for advice about course selection and certification. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found with 3307 College of Textiles and should be completed no later than during the registration period for the student’s final semester at NC State.
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Plan Requirements

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| Orientation
| E 101 | Introduction to Engineering & Problem Solving 1 | 1     |
| E 115 | Introduction to Computing Environments | 1     |
| Mathematical & Physical Science
| MA 141 | Calculus I 1 | 4     |
| MA 241 | Calculus II 1 | 4     |
| MA 242 | Calculus III | 4     |
| MA 341 | Applied Differential Equations I | 3     |
| CH 101 | Chemistry - A Molecular Science 1 | 3     |
| CH 102 | General Chemistry Laboratory 1 | 1     |
| CH 201 | Chemistry - A Quantitative Science | 3     |
| CH 202 | Quantitative Chemistry Laboratory | 1     |
| PY 205 & PY 206 | Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory 1 | 4     |
| PY 208 & PY 209 | Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory | 4     |
| Major Requirements
| T 101 | Introduction to the College of Textiles | 1     |
| TE 110 | Computer-Based Modeling for Engineers 1 | 3     |
| TE 200 | Introduction to Polymer Science and Engineering | 3     |
| TE 201 | Fiber Science | 4     |
| TE 205 | Analog and Digital Circuits | 4     |
| TE 301 | Engineering Textile Structures I: Linear Assemblies | 3     |
| TE 302 | Textile Manufacturing Processes and Systems II | 4     |
| TE 303 | Thermodynamics for Textile Engineers | 3     |
| TE 401 | Textile Engineering Design I | 4     |
| TE 402 | Textile Engineering Design II | 4     |
| TE 404 | Textile Engineering Quality Improvement | 3     |
| TE 424 | Textile Engineering Quality Improvement Laboratory | 1     |
| TE 435 | Process Systems Analysis and Control | 3     |
| Select one of the following:
| ARE 201 | Introduction to Agricultural & Resource Economics | 3     |
| ARE 201A | Introduction to Agricultural & Resource Economics | 3     |
| EC 201 | Principles of Microeconomics | 3     |
| EC 205 | Fundamentals of Economics | 3     |
| Concentration Requirements
| CHE 205 | Chemical Process Principles | 4     |
| CHE 225 | Introduction to Chemical Engineering Analysis | 3     |
| CHE 311 | Transport Processes I | 3     |
| GC 120 | Foundations of Graphics | 3     |
| MAE 206 | Engineering Statics | 3     |
| or CE 214 | Engineering Mechanics-Static | 3     |
| ST 370 | Probability and Statistics for Engineers | 3     |

Concentration Elective

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<td>Technology of Dyeing and Finishing</td>
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<td>&amp; PCC 304</td>
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GEP Courses

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1 C- or better

Concentration Elective

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<td>BME 566</td>
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<td>CHE 312</td>
<td>Transport Processes II</td>
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<td>CHE 475</td>
<td>Advances in Pollution Prevention: Environmental Management for the Future</td>
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<td>TE 565</td>
<td>Textile Composites</td>
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<td>TE 566</td>
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<td>TMS 565</td>
<td>Textile Composites</td>
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Acad Writing Research

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<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>FLE 101</td>
<td>Academic Writing and Research</td>
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| Transfer Sequence
| ENG 1GEP | 100 Level English Composition | 3     |
| ENG 202 | Disciplinary Perspectives in Writing | 3     |

Semester Sequence

This is a sample.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
</table>
| First Year
| Fall Semester
| CH 101 | Chemistry - A Molecular Science 1 | 3     |
| CH 102 | General Chemistry Laboratory 1 | 1     |
### Textile Engineering (BS): Information Systems Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The B.S. in Textile Engineering (administered jointly by the Wilson College of Textiles and the College of Engineering) is an interdisciplinary curriculum drawing on diverse science and engineering principles. Textile engineering students develop a unique background, through the curriculum, undergraduate research opportunities, summer internship experiences, and design projects ranging from the development of artificial arteries to the design of novel high-tech sporting and personal protective equipment. Textile engineers also design computer information systems that can integrate a worldwide distribution program eliminating a company’s reliance on regional stockpiles or streamline an industrial process using Six Sigma quality which can result in saving millions of dollars. The program offers small class sizes with personal attention from faculty. With the focus on interdisciplinary research, the opportunities for textile engineers have never been brighter. Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/senior-design/), where projects are sponsored by industry partners and government agencies.

The Textile Engineering degree program is accredited by the Accreditation Board for Engineering and Technology (ABET), http://www.abet.org. The TE program: Information Systems Design concentration provides the student with the use of database information systems and is linked with Industrial Engineering.

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<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>GC 120</td>
<td>Foundations of Graphics</td>
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<tr>
<td>GEP Requirement (p. 1417)</td>
<td></td>
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</table>

#### Hours

1. Must be completed with grade of C-or higher for matriculation.
2. Must be completed with grade of C-or higher for major requirements.
which allows most of the students to minor in IE while some choose to minor double major in Computer Science.

- Minors in associated engineering fields (e.g., Computer Science, Industrial Engineering, and Materials Science) as well as foreign language minors are strongly encouraged as part of the academic plan.
- For exceptional students, dual degree programs with Chemical and Biomolecular Engineering, Biomedical Engineering, and Materials Science and Engineering provide a bachelor degree in two engineering majors with one additional semester of course work.
- Our courses deals with the application of scientific and engineering principles to the design and control of all aspects of fiber, textile, and apparel processes, products, and machinery.

For more details about the program, see description under the College of Engineering (p. 604) and the TECS TE website (https://textiles.ncsu.edu/tecs/undergraduate/textile-engineering/).

Contact:

Dr. Philip Bradford  
Associate Professor and Textile Engineering Program Director  
Department of TECS  
Phone: 919-515-1866  
Email: philip_bradford@ncsu.edu

Plan Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
<td>1</td>
</tr>
<tr>
<td>E 115</td>
<td>Introduction to Computing Environments</td>
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</tr>
<tr>
<td>MA 141</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<tr>
<td>MA 242</td>
<td>Calculus III</td>
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</tr>
<tr>
<td>MA 341</td>
<td>Applied Differential Equations I</td>
<td>3</td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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</tr>
<tr>
<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PY 208 &amp; PY 209</td>
<td>Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory</td>
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Mathematical & Physical Science

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<td>Calculus I</td>
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<tr>
<td>MA 241</td>
<td>Calculus II</td>
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<td>MA 242</td>
<td>Calculus III</td>
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<td>MA 341</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>PY 205 &amp; PY 206</td>
<td>Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory</td>
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<tr>
<td>PY 208 &amp; PY 209</td>
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Major Requirements

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<td>T 101</td>
<td>Introduction to the College of Textiles</td>
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<td>TE 105</td>
<td>Textile Engineering: Materials and Systems</td>
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<td>TE 110</td>
<td>Computer-Based Modeling for Engineers</td>
<td>3</td>
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<tr>
<td>TE 200</td>
<td>Introduction to Polymer Science and Engineering</td>
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<tr>
<td>TE 201</td>
<td>Fiber Science</td>
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<tr>
<td>TE 205</td>
<td>Analog and Digital Circuits</td>
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<td>TE 301</td>
<td>Engineering Textile Structures I: Linear Assemblies</td>
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<td>TE 302</td>
<td>Textile Manufacturing Processes and Systems II</td>
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<td>TE 303</td>
<td>Thermodynamics for Textile Engineers</td>
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<tr>
<td>TE 401</td>
<td>Textile Engineering Design I</td>
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<td>TE 402</td>
<td>Textile Engineering Design II</td>
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<td>TE 404</td>
<td>Textile Engineering Quality Improvement</td>
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<td>TE 424</td>
<td>Textile Engineering Quality Improvement Laboratory</td>
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<td>TE 435</td>
<td>Process Systems Analysis and Control</td>
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<td>TE 440</td>
<td>Textile Information Systems Design</td>
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Select one of the following:

- ARE 201 Introduction to Agricultural & Resource Economics | 3 |
- ARE 201A Introduction to Agricultural & Resource Economics | 3 |
- EC 201 Principles of Microeconomics | 3 |
- EC 205 Fundamentals of Economics | 3 |

Concentration Requirements

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<td>MAE 206</td>
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<td>or CE 214</td>
<td>Engineering Mechanics-Statics</td>
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<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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<td>ISE 362</td>
<td>Stochastic Models in Industrial Engineering</td>
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<td>ISE 453</td>
<td>Modeling and Analysis of Supply Chains</td>
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<td>PCC 301</td>
<td>Technology of Dyeing and Finishing</td>
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<tr>
<td>&amp; PCC 304</td>
<td>and Technology of Dyeing &amp; Finishing Laboratory</td>
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<tr>
<td>GC 120</td>
<td>Foundations of Graphics</td>
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Select one of the following:

- ISE 352 Fundamentals of Human-Machine Systems Design | 3 |
- ISE 417 Database Applications in Industrial & Systems Engineering | 3 |
- ISE 441 Introduction to Simulation | 3 |
- ISE 452 Advanced Human-Machine Systems Design | 3 |
- TE 463 Polymer Engineering | 3 |

GEP Courses

- Acad Writing Research (p. 1532) | 4 |
- GEP Humanities (p. 1423) | 6 |
- GEP Social Sciences (p. 1430) | 3 |
- GEP Health and Exercise Studies (p. 1422) | 2 |
- GEP Additional Breadth (p. 1417) | 3 |
- GEP Interdisciplinary Perspectives (p. 1426) | 5 |
- GEP U.S. Diversity (p. 1431) | verify requirement |
- GEP Global Knowledge (p. 1419) | verify requirement |

Foreign Language Proficiency (p. 1417) | verify requirement |

Total Hours | 126 |

1 C- or better

Acad Writing Research

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<td>FLE 101</td>
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Transfer Sequence

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## Semester Sequence

This is a sample.

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<td><strong>Fall Semester</strong></td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>Computer-Based Modeling for Engineers</td>
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<td>Introduction to Polymer Science and Engineering</td>
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<td>Foundations of Graphics</td>
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<td><strong>Spring Semester</strong></td>
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<td>MA 341</td>
<td>Applied Differential Equations I</td>
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<td>TE 401</td>
<td>Textile Engineering Design I</td>
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<td>ISE 311</td>
<td>Engineering Economic Analysis</td>
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### Plan Requirements

<table>
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<tr>
<th>Code</th>
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<tbody>
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<td>History, Philosophy, Religion</td>
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<td>Visual and Performing Arts</td>
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<td>EC 205 Fundamentals of Economics</td>
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<td>Science, Tech &amp; Society (p. 1538)</td>
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<td>MA 242</td>
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<tr>
<td>MA 341</td>
<td>Applied Differential Equations</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>&amp; CH 102</td>
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FLG 307 Business German 3
FLG 311 Introduction to German Translation 3
FLG 315 German Civilization and Culture 3
FLG 318 New German Cinema and Beyond 3
FLG 320 Introduction to German Literature 3
FLG 323 Twentieth Century German Literature 3
FLG 325 German Lyric Poetry 3
FLG 390 German Studies Topics 3
FLG 398 Independent Study in German 1-6
FLG 401 German Graduate Reading 3
FLG 420 Current Issues in German-Language Media 3
FLG 430 Cultural Artifacts in the German-Speaking Countries 3
FLG 440 Green Germany: Nature and Environment in German Speaking Cultures 3
FLG 492 Senior Seminar in German Studies 3
FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland 1-6
FLI 201 Intermediate Italian I 3
FLI 202 Intermediate Italian II 3
FLI 208 Intermediate Italian Conversation 3
FLI 308 Italian Reading and Conversation 3
FLI 315 Italian Civilization and Culture 3
FLI 318 Italian Society Through Cinema 3
FLJ 201 Intermediate Japanese I 3
FLJ 202 Intermediate Japanese II 3
FLJ 203 Intermediate Japanese Conversation 1
FLJ 204 Intermediate Japanese II Conversation 1
FLJ 301 Intermediate Japanese III 3
FLJ 302 Intermediate Japanese IV 3
FLJ 342 Classical Japanese Literature in Translation 3
FLJ 344 Early Modern Japanese Literature in Translation 3
FLJ 345 Modern Japanese Literature in Translation 3
FLJ 351 Contemporary Culture in Japan 3
FLJ 401 Advanced Japanese I 3
FLJ 402 Advanced Japanese II 3
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FLN 202 Intermediate Hindi-Urdu II 3
FLN 203 Intermediate Hindi-Urdu I Conversation 1
FLN 204 Intermediate Hindi-Urdu II Conversation 1
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FLN 302 Modern Hindi & Urdu Poetry 3
FLP 401 Hindi Literature and South Asian Cultural Contexts 3
FLP 201 Intermediate Portuguese I 3
FLP 401 Brazilian Portuguese for Spanish Speakers 3
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## History, Philosophy, Religion

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<td>19th Century Philosophy</td>
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<td>Bio-Medical Ethics</td>
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## Religion

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Science Technology and Society

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<td>Asian Religions</td>
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<td>REL 317</td>
<td>Christianity</td>
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<td>REL 320</td>
<td>Religion in American History</td>
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<td>REL 323</td>
<td>Religious Cults, Sects, and Minority Faiths in America</td>
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<td>Issues in Contemporary Religion</td>
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<td>REL 331</td>
<td>The Hindu Tradition</td>
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<td>The Buddhist Traditions</td>
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<td>Chinese Religions</td>
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<td>Japanese Religions</td>
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<td>Introduction to Judaism</td>
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<td>Religion, Globalism, and Justice</td>
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<td>Advanced Readings in the Christian Gospels</td>
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<td>The Life and Letters of the Apostle Paul</td>
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<td>REL 472</td>
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<td>REL 482</td>
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**Science Technology and Society**

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<td>Darwinism and Christianity</td>
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**Semester Sequence**

This is a sample.

### Fall Semester

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<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>E 115</td>
<td>Introduction to Computing Environments</td>
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<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
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<tr>
<td>MA 141</td>
<td>Calculus</td>
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### Textile Engineering (BS): Product Engineering Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website ([https://apps.oirp.ncsu.edu/pgas/](https://apps.oirp.ncsu.edu/pgas/))!

The B.S. in Textile Engineering (administered jointly by the Wilson College of Textiles and the College of Engineering) is an interdisciplinary curriculum drawing on diverse science and engineering principles. Textile engineering students develop a unique background, through the curriculum, undergraduate research opportunities, summer internship experiences, and design projects ranging from the development of artificial arteries to the design of novel high-tech sporting and personal protective equipment. Textile engineers also design computer information systems that can integrate a worldwide distribution program eliminating a company’s reliance on regional stockpiles or streamline an industrial process using Six Sigma quality which can result in saving millions of dollars. The program offers small class sizes with personal attention from faculty. With the focus on interdisciplinary research, the opportunities for textile engineers have never been brighter. Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/senior-design/), where projects are sponsored by industry partners and government agencies.

The Textile Engineering degree program is accredited by the Accreditation Board for Engineering and Technology (ABET), [http://www.abet.org](http://www.abet.org/). The TE program: Product Engineering concentration focuses on the design of new and innovative products and is the most multi-disciplinary and flexible. Students may concentrate on specific areas of interest including bio-medical materials, sports textiles, and composites. Some students in this concentration choose to double major in Biomedical Engineering while others minor in Material Science.

- Minors in associated engineering fields (e.g., Computer Science, Industrial Engineering, and Materials Science) as well as foreign

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<td>Engineering Statics or Engineering Mechanics-Statics</td>
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For more details about the program, see description under the College of Engineering (p. 604) and the TECS TE website (https://textiles.ncsu.edu/tecs/undergraduate/textile-engineering/).

Contact:

Dr. Philip Bradford
Associate Professor and Textile Engineering Program Director
Department of TECS
Phone: 919-515-1866
Email: philip_bradford@ncsu.edu

### Plan Requirements

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<td>Calculus II ¹</td>
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#### Major Requirements

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#### Concentration Requirements

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<td>Structure and Properties of Engineering Materials</td>
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<td>GC 120</td>
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#### Concentration Elective (p. 1540)

- 9 Hours

#### Concentration Electives

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<td>MAE 208</td>
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¹ C- or better

**Foreign Language Proficiency**

- GEP Global Knowledge (p. 1417) (verify requirement)
- GEP Social Sciences (p. 1430)
- GEP Technical Writing (p. 1419) (verify requirement)
- GEP U.S. Diversity (p. 1431) (verify requirement)

**GEP courses**

- 125 Total Hours

**GEP Courses**

- Acad Writing Research (p. 1543) ¹
- GEP Humanities (p. 1423)
- GEP Social Sciences (p. 1430)
- GEP Health and Exercise Studies (p. 1422)
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)
- GEP Interdisciplinary Perspectives (p. 1426)
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)
MAE 214 Solid Mechanics 3
MAE 250 Introduction to Aerospace Engineering 1
MAE 251 Aerospace Vehicle Performance 3
MAE 252 Aerodynamics I 3
MAE 253 Experimental Aerodynamics I 1
MAE 302 Engineering Thermodynamics II 3
MAE 305 Mechanical Engineering Laboratory I 1
MAE 306 Mechanical Engineering Laboratory II 1
MAE 308 Fluid Mechanics 3
MAE 310 Heat Transfer Fundamentals 3
MAE 315 Dynamics of Machines 3
MAE 316 Strength of Mechanical Components 3
MAE 342 Introduction to Automotive Engineering 3
MAE 351 Aerodynamics II 3
MAE 352 Experimental Aerodynamics II 1
MAE 361 Dynamics & Controls 3
MAE 371 Aerospace Structures I 3
MAE 372 Aerospace Vehicle Structures Lab 1
MAE 403 Air Conditioning 3
MAE 405 Controls Lab 1
MAE 406 Energy Conservation in Industry 3
MAE 407 Steam and Gas Turbines 3
MAE 408 Internal Combustion Engine Fundamentals 3
MAE 410 Modern Manufacturing Processes 3
MAE 412 Design of Thermal System 3
MAE 415 Mechanical Engineering Design I 3
MAE 416 Mechanical Engineering Design 4
MAE 420 Dynamic Analysis of Human Movement 3
MAE 421 Design of Solar Thermal Systems 3
MAE 426 Fundamentals of Product Design 3
MAE 430 Applied Finite Element Analysis 3
MAE 435 Principles of Automatic Control 3
MAE 440 Non-Destructive Testing and Evaluation 3
MAE 451 Experimental Aerodynamics III 1
MAE 452 Aerodynamics of V/STOL Vehicles 3
MAE 455 Boundary Layer Theory 3
MAE 456 Computational Methods in Aerodynamics 3
MAE 457 Flight Vehicle Stability and Control 3
MAE 458 Propulsion 3
MAE 459 Rocket Propulsion 3
MAE 467 Introduction to Space Flight 3
MAE 472 Aerospace Structures II 3
MAE 480 Aerospace Vehicle Design I 3
MAE 481 Aerospace Vehicle Design II 3
MAE 482 Engineering Entrepreneurship and New Product Development I 3
MAE 483 Engineering Entrepreneurship and New Product Development II 3
MAE 484 Engineering Entrepreneurship Senior Design Lab 1
MAE 495 Special Topics in Mechanical and Aerospace Engineering 1-3
MAE 496 Undergraduate Project Work in Mechanical and Aerospace Engineering 1-6
MAE 501 Advanced Engineering Thermodynamics 3
MAE 504 Fluid Dynamics Of Combustion I 3
MAE 505 Heat Transfer Theory and Applications 3
MAE 511 Advanced Dynamics with Applications to Aerospace Systems 3
MAE 513 Principles of Structural Vibration 3
MAE 515 Advanced Automotive Vehicle Dynamics 3
MAE 517 Advanced Precision Manufacturing for Products, Systems and Processes 3
MAE 518 Acoustic Radiation I 3
MAE 520 Dynamic Analysis of Human Movement 3
MAE 521 Linear Control and Design For Mimo Systems 3
MAE 522 Non Linear System Analysis and Control 3
MAE 525 Advanced Flight Vehicle Stability and Control 3
MAE 526 Fundamentals of Product Design 3
MAE 528 Experimental Flight Testing 3
MAE 531 Engineering Design Optimization 3
MAE 532 Smart Structures and Micro-Transducers 3
MAE 533 Finite Element Analysis I 3
MAE 534 Mechatronics Design 3
MAE 535 Design of Electromechanical Systems 3
MAE 536 Micro/Nano Electromechanical Systems 3
MAE 537 Mechanics Of Composite Structures 3
MAE 538 Smart Structures and Materials 3
MAE 539 Advanced Materials 3
MAE 540 Advanced Air Conditioning Design 3
MAE 541 Advanced Solid Mechanics I 3
MAE 543 Fracture Mechanics 3
MAE 544 Real Time Robotics 3
MAE 545 Metrology For Precision Manufacturing 3
MAE 546 Photonic Sensor Applications in Structure 3
MAE 550 Foundations Of Fluid Dynamics 3
MAE 551 Airfoil Theory 3
MAE 552 Introduction to Experimental Fluid Dynamics and Measurement Systems 3
MAE 553 Compressible Fluid Flow 3
MAE 554 Hypersonic Aerodynamics 3
MAE 555 Applications of Acoustic and Elastic Wave Propagation 3
MAE 558 Microfluidics and Nanofluidics 3
MAE 560 Computational Fluid Mechanics and Heat Transfer 3
MAE 561 Wing Theory 3
MAE 562 Physical Gas Dynamics 3
MAE 573 Hydrodynamic Stability and Transition 3
MAE 575 Advanced Propulsion Systems 3
MAE 577 Multiscale Two-phase Flow Simulations 3
MAE 586 Project Work In Mechanical Engineering 1-6
MAE 589 Special Topics In Mechanical Engineering 1-6
MAE 593 Advanced Materials 3
NE 577 Multiscale Two-phase Flow Simulations 3
OR 562 Simulation Modeling 3
PY 570 Polymer Physics 3
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**Medical Textiles (Min: 9 Units)**

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**Materials & Sci Engineering (Min: 9 Units)**

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<td>MSE 270</td>
<td>Materials Science and Engineering Seminar</td>
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<td>MSE 300</td>
<td>Structure of Materials at the Nanoscale</td>
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<td>MSE 301</td>
<td>Introduction to Thermodynamics of Materials</td>
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<td>MSE 320</td>
<td>Introduction to Defects in Solids</td>
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<td>MSE 335</td>
<td>Experimental Methods for Analysis of Material Properties</td>
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<td>MSE 355</td>
<td>Electrical, Magnetic and Optical Properties of Materials</td>
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<td>MSE 360</td>
<td>Kinetic Processes in Materials</td>
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<td>MSE 370</td>
<td>Microstructure of Inorganic Materials</td>
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<tr>
<td>MSE 380</td>
<td>Microstructure of Organic Materials</td>
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<td>MSE 409</td>
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<tr>
<td>MSE 420</td>
<td>Mechanical Properties of Materials</td>
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<td>MSE 423</td>
<td>Introduction to Materials Engineering Design</td>
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<td>MSE 440</td>
<td>Processing of Metallic Materials</td>
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<td>Ceramic Processing</td>
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<td>Composite Materials</td>
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<td>MSE 460</td>
<td>Microelectronic Materials</td>
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<td>MSE 465</td>
<td>Introduction to Nanomaterials</td>
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<td>MSE 480</td>
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<td>Solid State Solar and Thermal Energy Harvesting</td>
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<td>MSE 490</td>
<td>Special Topics in Materials Engineering</td>
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<td>MSE 495</td>
<td>Materials Engineering Projects</td>
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<td>Modern Concepts in Materials Science</td>
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<td>MSE 531</td>
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<td>MSE 539</td>
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<td>TE 589</td>
<td>Special Studies In Textile Engineering and Science</td>
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<td>TMS 521</td>
<td>Filament Yarn Production Processing and Properties</td>
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<td>TMS 565</td>
<td>Textile Composites</td>
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<td>TT 521</td>
<td>Filament Yarn Production Processing and Properties</td>
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<td>TT 533</td>
<td>Lean Six Sigma Quality</td>
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<tr>
<td>TT 549</td>
<td>Warp Knit Engineering and Structural Design</td>
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**Acad Writing Research**

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**Transfer Sequence**

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<tr>
<td>ENG 1GEP</td>
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<td>ENG 202</td>
<td>Disciplinary Perspectives in Writing</td>
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**Semester Sequence**

This is a sample.

**First Year**

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<tr>
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<tbody>
<tr>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
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<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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<tr>
<td>E 101</td>
<td>Introduction to Engineering &amp; Problem Solving</td>
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<td>Introduction to Computing Environments</td>
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<td>Academic Writing and Research</td>
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<td>MA 141</td>
<td>Calculus I</td>
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<td>T 101</td>
<td>Introduction to the College of Textiles</td>
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<td>TTM 533</td>
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| Spring Semester |
| TE 105 | Textile Engineering: Materials and Systems                         | 2     |
| TE 110 | Computer-Based Modeling for Engineers                              | 3     |
| TE 200 | Introduction to Polymer Science and Engineering                    | 3     |
| TE 201 | Fiber Science                                                     | 4     |
| TE 205 | Analog and Digital Circuits                                        | 4     |
| TE 301 | Engineering Textile Structures I: Linear Assemblies               | 3     |
| TE 302 | Textile Manufacturing Processes and Systems II                     | 4     |
| TE 303 | Thermodynamics for Textile Engineers                               | 3     |
| TE 401 | Textile Engineering Design                                        | 4     |
| TE 402 | Textile Engineering Design II                                     | 4     |
| TE 404 | Textile Engineering Quality Improvement                            | 3     |
| TE 424 | Textile Engineering Quality Improvement Laboratory                 | 1     |
| TE 435 | Process Systems Analysis and Control                               | 3     |
| TE 440 | Textile Information Systems Design                                | 4     |
| TE 463 | Polymer Engineering                                               | 3     |
| TE 466 | Polymeric Biomaterials Engineering                                 | 3     |
| TE 467 | Mechanics of Tissues & Implants Requirements                      | 3     |
| TE 492 | Special Topics in Textile Engineering                             | 1-3   |
| TE 505 | Textile Systems and Control                                       | 3     |
| TE 533 | Lean Six Sigma Quality                                             | 3     |
| TE 540 | Textile Information Systems Design                                | 4     |
| TE 550 | Clothing Comfort and Personal Protection Science                   | 3     |
| TE 551 | Human Physiology for Clothing and Wearables                        | 3     |
| TE 562 | Simulation Modeling                                               | 3     |
| TE 565 | Textile Composites                                                | 3     |
| TE 566 | Polymeric Biomaterials Engineering                                 | 3     |
| TE 570 | Polymer Physics                                                   | 3     |

<p>| Second Year |
| Fall Semester |
| MA 242 | Calculus III                                                     | 4     |
| MAE 206 | Engineering Statics                                                | 2     |
| or CE 214 | Engineering Mechanics-Statics                                    | 3     |
| PY 208 | Physics for Engineers and Scientists II                          | 3     |</p>
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<td>GC 120</td>
<td>Foundations of Graphics</td>
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**Spring Semester**

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<td>Applied Differential Equations I</td>
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<td>Structure and Properties of Engineering Materials</td>
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<td>TE 201</td>
<td>Fiber Science</td>
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<tr>
<td>TE 205</td>
<td>Analog and Digital Circuits</td>
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<td>EC 205</td>
<td>Fundamentals of Economics</td>
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<td>EC 201</td>
<td>Principles of Microeconomics</td>
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<td>Introduction to Agricultural &amp; Resource Economics</td>
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**Fall Semester**

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<tr>
<td>TE 301</td>
<td>Engineering Textile Structures I: Linear Assemblies</td>
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<td>TE 303</td>
<td>Thermodynamics for Textile Engineers</td>
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<tr>
<td>MAE 214</td>
<td>Solid Mechanics or Mechanics of Solids</td>
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<td>or CE 225</td>
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<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
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**Third Year**

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<tr>
<td>TE 302</td>
<td>Textile Manufacturing Processes and Systems II</td>
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<tr>
<td>TE 404</td>
<td>Textile Engineering Quality Improvement</td>
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<td>TE 424</td>
<td>Textile Engineering Quality Improvement Laboratory</td>
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<tr>
<td>PCC 301</td>
<td>Technology of Dyeing and Finishing</td>
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<td>GEP Requirement (p. 1417)</td>
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<tr>
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<tr>
<td>Fall Semester</td>
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<td>TE 401</td>
<td>Textile Engineering Design I</td>
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<td>TE 463</td>
<td>Polymer Engineering</td>
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<td>Engineering Elective</td>
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<td>Select two GEP Requirement (p. 1417) courses</td>
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<tr>
<td>TE 402</td>
<td>Textile Engineering Design II</td>
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<td>Select two Engineering Elective courses</td>
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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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**Total Hours** 124-125

---

1. Must be completed with grade of C or higher for matriculation.
2. Must be completed with grade of C or higher for major requirements.

## Textile Technology (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The B.S. in Textile Technology provides students with basic knowledge of fiber materials, science and technologies of fiber processing, as well as fiber-based product design and development. The curriculum prepares students in product design and development processes, beginning with understanding of application to material selection to appropriate technologies to utilize.

The Textile Technology degree program offers a well rounded versatile degree, which prepares graduates to collaborate effectively with professionals in a global interdisciplinary environment. After introductory exposure to several of the fundamental aspects of fiber science and textile technology, the student can build additional depth in one of the three concentrations of Medical Textiles, Technical Textiles, and Textile Supply Chain Operations or stay in the general degree which allows students the flexibility of designing their own interest or transferring from other programs or community colleges. The Medical Textiles concentration covers design and methods of production of state-of-the-art textile products and devices used in medical applications including sutures for wound closing to cardiac support devices. The Technical Textiles concentration covers design principles, understanding of applications, and technologies relevant to the vast array of technical textiles materials and products used in such areas as transportation, storage, packaging, automobile engineering, geotechnical engineering, and much more. This concentration offers two options: Materials and Nonwovens. The Textile Supply Chain Operations concentration focuses on the design, management, and coordination all the activities required to transform raw materials into finished textile products to retail.

Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/senior-design/), where projects are sponsored by industry partners and government agencies. More information about the degrees is available on the TECS TT (https://textiles.ncsu.edu/tecs/undergraduate/textile-technology/) website.

### Plan Requirements

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<tr>
<td>T 101</td>
<td>Introduction to the College of Textiles</td>
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<td>Academic Writing and Research 1</td>
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### MA/ST and Natural Sciences

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<td>MA 131 &amp; MA 132</td>
<td>Calculus for Life and Management Sciences A and Computational Mathematics for Life and Management Sciences</td>
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<td>or MA 141</td>
<td>Calculus I</td>
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<td>MA 231</td>
<td>Calculus for Life and Management Sciences B</td>
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<td>or MA 241</td>
<td>Calculus II</td>
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<td>ST 311</td>
<td>Introduction to Statistics</td>
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<td>or ST 370</td>
<td>Probability and Statistics for Engineers</td>
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<td>CH 101</td>
<td>Chemistry - A Molecular Science 1</td>
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**Physics for Engineers and Scientists I** and Physics for Engineers and Scientists I Laboratory 4  
**Physics for Engineers and Scientists II** and Physics for Engineers and Scientists II Laboratory 4

**Major Requirements**

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<td>Fundamentals of Economics</td>
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<td>FTM 217</td>
<td>The Textile Industry</td>
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<td>MT 366</td>
<td>Biotextile Product Development</td>
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<td>PCC 302</td>
<td>Technology of Textile Wet Processing</td>
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<td>TE 200</td>
<td>Introduction to Polymer Science and Engineering</td>
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<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
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<td>TT 105</td>
<td>Introduction to Textile Technology</td>
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<td>TT 305</td>
<td>Introduction to Nonwoven Products and Processes</td>
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<td>TT 327</td>
<td>Yarn Production and Properties</td>
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<td>TT 331</td>
<td>Performance Evaluation of Textile Materials</td>
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<td>TT 341</td>
<td>Knitted Fabric Technology</td>
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<td>TT 351</td>
<td>Woven Products and Processes</td>
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<td>TT 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
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<td>TT 401</td>
<td>Textile Technology Senior Design I</td>
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<tr>
<td>TT 402</td>
<td>Textile Technology Senior Design II</td>
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<tr>
<td>TT 431</td>
<td>Quality Management and Control in Textile Manufacturing</td>
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<td>TT 481</td>
<td>Design and Technology of Technical Textiles</td>
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**Advised Electives**

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**GEP Courses**

| GEP Humanities (p. 1423) | 6 |
| GEP Social Sciences (p. 1430) | 3 |
| GEP Health and Exercise Studies (p. 1422) | 2 |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |
| GEP Interdisciplinary Perspectives (p. 1426) | 5 |
| GEP U.S. Diversity (p. 1431) (verify requirements) | |
| GEP Global Knowledge (p. 1419) (verify requirements) | |
| Foreign Language Proficiency (p. 1417) (verify requirements) | |

**Total Hours**

| 120 |

---

1. C- or better  
2. Students should consult their academic advisors to determine how to complete this requirement.

### Semester Sequence

This is a sample.

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<thead>
<tr>
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<th>Title</th>
<th>Hours</th>
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<tr>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
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</table>

### Second Year

**Fall Semester**

| EC 205 | Fundamentals of Economics | 3 |
| PY 212 | College Physics II | 4 |
| TE 200 | Introduction to Polymer Science and Engineering | 3 |
| TT 327 | Yarn Production and Properties (CP) | 4 |
| TT 380 | Management and Control of Textile and Apparel Systems | 3 |

| Hours | 17 |

**Spring Semester**

| ST 311 | Introduction to Statistics | 3 |
| TT 351 | Woven Products and Processes (CP) | 3 |
| TT 341 | Knitted Fabric Technology (CP) | 3 |

| Advised Elective | 3 |

| Hours | 15 |

### Third Year

**Fall Semester**

| TT 404 | Introduction to Nonwovens Products and Processes | 3 |
| TT 481 | Design and Technology of Technical Textiles | 3 |
| PCC 302 | Technology of Textile Wet Processing | 4 |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |

| Advised Elective | 3 |

| Hours | 16 |

**Spring Semester**

| TT 331 | Performance Evaluation of Textile Materials (CP) | 4 |
| MT 366 | Biotextile Product Development | 3 |
| Select two Advised Elective courses | 6 |

| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3 |

| Hours | 16 |
Fourth Year
Fall Semester

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<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
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Spring Semester

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<tr>
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Total Hours 120-121

1 Must be completed with a grade of C- or higher for major requirements

Textile Technology (BS): Medical Textiles Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The B.S. in Textile Technology provides students with basic knowledge of fiber materials, science and technologies of fiber processing, as well as fiber-based product design and development. The curriculum prepares students in product design and development processes, beginning with understanding of application to material selection to appropriate technologies to utilize.

The Textile Technology degree program offers a well-rounded versatile degree, which prepares graduates to collaborate effectively with professionals in a global interdisciplinary environment. After introductory exposure to several of the fundamental aspects of fiber science and textile technology, the student can build additional depth in one of the three concentrations of Medical Textiles, Technical Textiles, and Textile Supply Chain Operations or stay in the general degree which allows students the flexibility of designing their own interests or transferring to other programs or community colleges.

The Medical Textiles concentration covers design and methods of production of state-of-the-art textile products and devices used in medical applications including suture for wound closing to cardiac support devices. This concentration offers two options: Materials and Nonwovens. The Textile Supply Chain Operations concentration focuses on the design, management, and coordination all the activities required to transform raw materials into finished textile products to retail. Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/ senior-design/), where projects are sponsored by industry partners and government agencies. More information about the degrees is available on the TECS TT (https://textiles.ncsu.edu/tecs/undergraduate/textile-technology/) website.

Plan Requirements

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MA/ST and Natural Sciences

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<td>MT 366</td>
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Medical Textiles Concentration

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<tr>
<td>BIO 183</td>
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Medical Textiles Electives (p. 1547) 11

GEP Courses
- GEP Humanities (p. 1423) 6
- GEP Social Sciences (p. 1430) 3
- GEP Health and Exercise Studies (p. 1422) 2
- GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
- GEP Interdisciplinary Perspectives (p. 1426) 5
- GEP U.S. Diversity (p. 1431) (verify requirement)
- GEP Global Knowledge (p. 1419) (verify requirement)
- Foreign Language Proficiency (p. 1417) (verify requirement)

Total Hours 120

1 C- or better

### Acad Writing Research

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### Transfer Sequence

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### Medical Textiles Electives

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<td>Medical Textile and the Regulatory Environment</td>
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<td>MT 471</td>
<td>The Chemistry of Synthetic and Natural Bipolymers</td>
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### Semester Sequence

This is a sample.

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<th>Course</th>
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| First Year
| Fall Semester
| CH 101 | Chemistry - A Molecular Science 1 | 3     |
| CH 102 | General Chemistry Laboratory 1  | 1     |
| ENG 101| Academic Writing and Research                | 4     |
| MA 131 | Calculus for Life and Management Sciences A 1 | 3     |
| MT 105 | Introduction to Medical Textiles (CP)         | 3     |
| T 101  | Introduction to the College of Textiles       | 1     |
|        | Hours                                         | 15    |

| Spring Semester
| MA 231 | Calculus for Life and Management Sciences B | 3     |
| MA 132 | Computational Mathematics for Life and Management Sciences | 1     |
| PY 211 | College Physics I                            | 4     |
| TMS 211| Introduction to Fiber Science                | 3     |
| FTM 217| The Textile Industry                         | 3     |
| GEP Health and Exercise Studies (p. 1422) | 1     |
|        | Hours                                         | 15    |

| Second Year
| Fall Semester
| EC 205 | Fundamentals of Economics                    | 3     |
| PY 212 | College Physics II                           | 4     |
| TT 327 | Yarn Production and Properties (CP)          | 4     |
| TT 380 | Management and Control of Textile and Apparel Systems | 3     |
| GEP Humanities (p. 1423) | 3     |
|        | Hours                                         | 17    |

| Spring Semester
| ST 311 | Introduction to Statistics                   | 3     |
| TE 200 | Introduction to Polymer Science and Engineering | 3     |
| TT 351 | Woven Products and Processes (CP)            | 3     |
| TT 341 | Knitted Fabric Technology (CP)               | 3     |
|        | Hours                                         | 17    |

| Third Year
| Fall Semester
| TT 401 | Textile Technology Senior Design I           | 4     |
| MT 366 | Biotextile Product Development               | 3     |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3     |
| GEP Humanities (p. 1423) | 3     |
|        | Hours                                         | 15-16 |

| Spring Semester
| TT 331 | Performance Evaluation of Textile Materials (CP) | 4     |
| MT 366 | Biotextile Product Development                 | 3     |
| GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) | 3     |
| GEP Humanities (p. 1423) | 3     |
|        | Hours                                         | 15-16 |

| Fourth Year
| Fall Semester
| TT 401 | Textile Technology Senior Design I           | 4     |
| MT 432 | Biotextiles Evaluation                       | 3     |
| GEP Interdisciplinary Perspectives (p. 1426) | 2-3   |
| GEP Health and Exercise Studies (p. 1422) | 1     |
|        | Hours                                         | 15-16 |
Textile Technology (BS): Supply Chain Operations Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

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The Textile Technology degree program offers a well-rounded versatile degree, which prepares graduates to collaborate effectively with professionals in a global interdisciplinary environment. After introductory exposure to several of the fundamental aspects of fiber science and textile technology, the student can build additional depth in one of the three concentrations of Medical Textiles, Technical Textiles, and Textile Supply Chain Operations or stay in the general degree which allows students the flexibility of designing their own interest or transferring from other programs or community colleges. The Medical Textiles concentration covers design and methods of production of state-of-the-art textile products and devices used in medical applications including sutures for wound closing to cardiac support devices. The Technical Textiles concentration covers design principles, understanding of applications, and technologies relevant to the vast array of technical textiles materials and products used in such areas as transportation, storage, packaging, automobile engineering, geotechnical engineering, and much more. This concentration offers two options: Materials and Nonwovens. The Textile Supply Chain Operations concentration focuses on the design, management, and coordination all the activities required to transform raw materials into finished textile products to retail. Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/senior-design/), where projects are sponsored by industry partners and government agencies. More information about the degrees is available on the TECS TT (https://textiles.ncsu.edu/tecs/undergraduate/textile-technology/) website.

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### Acad Writing Research (p. 1549)  
Must be completed with grades of C- or higher for major requirements

### Major Requirements

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### Supply Chain Operations Concentration

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**Total Hours**: 120-122

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1) Must be completed with a grade of C- or higher for major requirements
GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts) 3
GEP Interdisciplinary Perspectives (p. 1426) 5
GEP U.S. Diversity (p. 1431) (verify requirement)
GEP Global Diversity (p. 1419) (verify requirement)
Foreign Language Proficiency (p. 1417) (verify requirement)
Total Hours 120

### Acad Writing Research

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### Transfer Sequence

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### Supply Chain Operations Concentration

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<td>Intermediate Textile Brand Management and Marketing</td>
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<td>Visual Merchandising Principles and Management</td>
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<td>The Chemistry of Synthetic and Natural Bipolymers</td>
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<td>Introduction to Nonwovens Products and Processes</td>
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Semester Sequence

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**Fourth Year**

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¹ Must be completed with a grade of C- or higher for major requirements
² Acceptable substitutions: MA 141 for MA 131 and 132, MA 241 for MA 231, (PY 205 and PY 206) for PY 211, (PY 208 and PY 209) for PY 212. ST 370 for ST 311, (EC 201 or ARE 201) for EC 205.

Textile Technology (BS): Technical Textiles Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The B.S. in Textile Technology provides students with basic knowledge of fiber materials, science and technologies of fiber processing, as well as fiber-based product design and development. The curriculum prepares students in product design and development processes, beginning with understanding of application to material selection to appropriate technologies to utilize.

The Textile Technology degree program offers a well rounded versatile degree, which prepares graduates to collaborate effectively with professionals in a global interdisciplinary environment. After introductory exposure to several of the fundamental aspects of fiber science and textile technology, the student can build additional depth in one of the three concentrations of Medical Textiles, Technical Textiles, and Textile Supply Chain Operations or stay in the general degree which allows students the flexibility of designing their own interest or transferring from other programs or community colleges. The Medical Textiles concentration covers design and methods of production of state-of-the-art textile products and devices used in medical applications including sutures for wound closing to cardiac support devices. The Technical
Textiles concentration covers design principles, understanding of applications, and technologies relevant to the vast array of technical textiles materials and products used in such areas as transportation, storage, packaging, automobile engineering, geotechnical engineering, and much more. This concentration offers two options: Materials and Nonwovens. The Textile Supply Chain Operations concentration focuses on the design, management, and coordination all the activities required to transform raw materials into finished textile products to retail. Students in this degree program will participate in the TE/TT Capstone Design Program (https://textiles.ncsu.edu/tecs/student-experience/senior-design/), where projects are sponsored by industry partners and government agencies. More information about the degrees is available on the TECS TT (https://textiles.ncsu.edu/tecs/undergraduate/textile-technology/) website.

## Plan Requirements

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<td>Yarn Production and Properties</td>
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<td>Performance Evaluation of Textile Materials</td>
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## Acad Writing Research

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## Transfer Sequence

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## Technical Textiles Concentration

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**Semester Sequence**

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<td>CH 101</td>
<td>Chemistry - A Molecular Science (^1)</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory (^1)</td>
<td>1</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>MA 141</td>
<td>Calculus I (^1)</td>
<td>4</td>
</tr>
<tr>
<td>TT 105</td>
<td>Introduction to Textile Technology (CP)</td>
<td>3</td>
</tr>
<tr>
<td>T 101</td>
<td>Introduction to the College of Textiles</td>
<td>1</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA 241</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PY 205</td>
<td>Physics for Engineers and Scientists I</td>
<td>3</td>
</tr>
<tr>
<td>PY 206</td>
<td>Physics for Engineers and Scientists I Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
<td>3</td>
</tr>
<tr>
<td>FTM 217</td>
<td>The Textile Industry</td>
<td>3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Second Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC 205</td>
<td>Fundamentals of Economics</td>
<td>3</td>
</tr>
<tr>
<td>PY 208</td>
<td>Physics for Engineers and Scientists II</td>
<td>3</td>
</tr>
<tr>
<td>PY 209</td>
<td>Physics for Engineers and Scientists II Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>TT 327</td>
<td>Yarn Production and Properties (CP)</td>
<td>4</td>
</tr>
<tr>
<td>TT 380</td>
<td>Management and Control of Textile and Apparel Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>TE 200</td>
<td>Introduction to Polymer Science and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>Technical Textiles Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td><strong>Third Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
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<tr>
<td>TT 404</td>
<td>Introduction to Nonwovens Products and Processes</td>
<td>3</td>
</tr>
<tr>
<td>GEP Social Sciences (p. 1430)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Technical Textiles elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PCC 302</td>
<td>Technology of Textile Wet Processing</td>
<td>4</td>
</tr>
<tr>
<td>TT 481</td>
<td>Design and Technology of Technical Textiles</td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15-16</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TT 331</td>
<td>Performance Evaluation of Textile Materials (CP)</td>
<td>4</td>
</tr>
<tr>
<td>GEP Additional Breadth (p. 1417) (Humanities/Social Sciences/Visual and Performing Arts)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MT 366</td>
<td>Biotextile Product Development</td>
<td>3</td>
</tr>
<tr>
<td>Select two Technical Textiles electives</td>
<td></td>
<td>5-6</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>15-16</td>
</tr>
<tr>
<td><strong>Fourth Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>2-3</td>
</tr>
<tr>
<td>GEP Health and Exercise Studies (p. 1422)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>TT 401</td>
<td>Textile Technology Senior Design I</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (p. 1423)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Technical Textiles Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>13-14</td>
</tr>
<tr>
<td><strong>Spring Semester</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Textile Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GEP Interdisciplinary Perspectives (p. 1426)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>TT 402</td>
<td>Textile Technology Senior Design II</td>
<td>4</td>
</tr>
<tr>
<td>TT 431</td>
<td>Quality Management and Control in Textile Manufacturing</td>
<td>3</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
<td></td>
<td>13</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>120-122</td>
</tr>
</tbody>
</table>

\(^1\) Must be completed with a grade of C- or higher for major requirements

**Textile Technology (Minor)**

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/)

The Department of Textile Engineering Chemistry and Science offers students the opportunity to take a minor in Textile Technology. Undergraduate students enrolled in all programs at NC State University are eligible to take this minor. The minor allows students to explore the principles of textile technology and design technical textile products. Students also have the opportunity to use textile technology facilities as part of the minor.
Admissions and Certification of Minor

Students seeking to pursue the Textile Technology minor should contact the Minor advisor in the College of Textiles.

Contact Person
Russell Gorga
College of Textiles 3267
919-515-6553
regorga@ncsu.edu

SIS Code: 18TTM

Plan Requirements

- A total of 16 credit hours are required for the minor.
- A grade of ‘C-‘ or better is required in all courses to be used towards this minor.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT 105</td>
<td>Introduction to Textile Technology</td>
<td>3</td>
</tr>
<tr>
<td>TMS 211</td>
<td>Introduction to Fiber Science</td>
<td>3</td>
</tr>
<tr>
<td>TT 327</td>
<td>Yarn Production and Properties</td>
<td>4</td>
</tr>
</tbody>
</table>

Elective Courses

Select two of the following: 1

- TT 305 Introduction to Nonwoven Products and Processes
- TT 341 Knitted Fabric Technology
- TT 351 Woven Products and Processes

Total Hours 16

1 Elective courses should be selected after consultation with the minor advisor.

Note: Students should be aware that some of these courses have prerequisites. Permission to waive prerequisites must be obtained from the course instructor after evaluation of student’s academic background.

Certification

Dr. Russell Gorga will serve as advisor and certify completion of the minor. The minor must be completed no later than the semester in which the student expects to graduate from his or her degree program. Paperwork for certification can be found with 3328 College of Textiles and should be completed no later than during the registration period for the student’s final semester at NC State.

Contact Person
Russell Gorga
College of Textiles 3267
919-515-6553
regorga@ncsu.edu

Effective Date: 1/2009

SIS Code: 18NONWOVM

Plan Requirements

All courses taken to complete this minor must be completed with a grade point average of 2.0 or higher.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT 203</td>
<td>Introduction to Nonwoven Products and Processes</td>
<td>3</td>
</tr>
<tr>
<td>TT 305</td>
<td>Introduction to Nonwoven Products and Processes</td>
<td>3</td>
</tr>
<tr>
<td>TT 405</td>
<td>Advanced Nonwovens Processing</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses

Select six credit hours of the following:

- TT 406
- TT 407 Characterization Methods in Nonwovens
- TT 408 Nonwoven Product Development

Total Hours 15

Note: Some of these courses have prerequisites. Permission to waive prerequisites must be obtained from the course instructor after evaluation of student’s academic background.

Nonwovens (Minor)

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.orp.ncsu.edu/pgas/)

The Minor in the Science of Nonwovens is available to all undergraduate students enrolled in the University as degree candidates, except Textile and Apparel, Technology and Management majors. The nine hours of required courses provide a comprehensive overview of nonwoven products and processes including various manufacturing techniques, and product/process/property interactions. Six elective hours may be chosen from areas including bonding technologies, nonwoven characterization methods and nonwoven product development.

Admissions

All undergraduate students enrolled in NC State as a degree candidate, other than TATM majors, are eligible for admission to this minor program. Students seeking to pursue the Minor in the Science of Nonwovens should contact Dr. Russell Gorga, the Minor Advisor, as listed below.
Course Descriptions

The course descriptions are arranged first in alphabetical order according to course prefix reflecting the department or discipline of the course. Some courses are cross-listed, indicating that they are offered in two or more departments or disciplines. Within each of the prefix groups, the course descriptions are arranged by course number. Numbers 100-299 are courses intended primarily for freshmen and sophomores. Numbers 300-499 are courses intended primarily for juniors and seniors; numbers 490-498 are seminar, project, or special topics courses; number 499 is for undergraduate research.

Courses numbered 500 - 600 are taught at the Masters level and most are available to advanced undergraduates. Doctoral courses are numbered 700 - 899. Graduate courses numbered at the 500 and 700 levels are letter graded (A+ through F), while 600 and 800 level courses are S/U graded. Courses regularly letter graded (A+ through F) may not be taken for S/U grading by graduate students. Courses numbered in the 900 series are open to College of Veterinary Medicine students.

A typical course description shows the prefix, number, and title followed by prerequisite, credit and offering information. Prerequisites are courses or levels of achievement that a student is expected to have completed successfully prior to enrolling in a course. Corequisites are courses which should be taken concurrently by students who have not previously completed the corequisites. Prerequisites or corequisites for a given course may be waived by the instructor of the course or section. It is the student's responsibility to satisfy prerequisites, or obtain from the instructor written waiver of prerequisites, for any course in which he or she may enroll. Failure to satisfy prerequisites may result in removal from enrollment in the course. Consent of the department is required for all practicum and individual special topics or special problems courses as well as internships and thesis or dissertation research. Some courses also have restrictive statements, such as “Credit in both MA 141 and MA 131 is not allowed.” Restrictive statements for a given course may be waived only by a college dean.

An example of credit information is: ACC 200 Introduction to Managerial Accounting 3. The 3 indicates the number of semester hours credit awarded for satisfactory completion of the course. Some courses are offered for variable credit, and a listing of 1-6 indicates that from one to six semester hours of credit may be earned as arranged by the department writing the course.

A
- Accounting (ACC) (p. 1556)
- Adult & Higher Education (EAC) (p. 1560)
- Advanced Analytics (AA) (p. 1566)
- Aerospace Studies (AS) (p. 1567)
- Africana Studies (AFS) (p. 1567)
- Agricultural and Extension Education (AEE) (p. 1570)
- Agricultural Economics (ARE) (p. 1576)
- Agricultural Institute (AGI) (p. 1581)
- Agriculture and Life Sciences (ALS) (p. 1581)
- Animal Science (ANS) (p. 1582)
- Anthropology (ANT) (p. 1590)
- Applied Ecology (AEC) (p. 1595)
- Architecture (ARC) (p. 1598)

B
- Biochemistry (BCH) (p. 1611)
- Biological and Agricultural Engineering (BAE) (p. 1614)
- Biological Sciences (BIO) (p. 1621)
- Biomanufacturing Training Education Center (BEC) (p. 1627)
- Biomathematics (BMA) (p. 1631)
- Biomedical Engineering (BME) (p. 1633)
- Bioprocessing (BBS) (p. 1639)
- Biotechnology (BIT) (p. 1640)
- Business Administration (MBA) (p. 1645)
- Business Management (BUS) (p. 1651)

C
- Chemical Engineering (CHE) (p. 1655)
- Chemistry (CH) (p. 1660)
- Civil Engineering (CE) (p. 1667)
- College of Natural Resources (CNR) (p. 1681)
- College of Sciences (COS) (p. 1681)
- Communication (COM) (p. 1682)
- Communication Rhetoric & Digital Media (CRD) (p. 1690)
- Comparative Biological Science (CBS) (p. 1691)
- Comparative Literature (CL) (p. 1695)
- Computer Science (CSC) (p. 1695)
- Cooperative Education (COP) (p. 1707)
- Counselor Education (ECD) (p. 1708)
- Crop Science (CS) (p. 1712)
- Curriculum and Instruction (ECI) (p. 1719)

D
- Dance (DAN) (p. 1733)
- Design (D) (p. 1733)
- Design courses for Graduate Students (DDN) (p. 1734)
- Design Studies (DS) (p. 1736)

E
- Ecology (ECO) (p. 1736)
- Economics (EC) (p. 1736)
- Educ Leadership & Program Eval (ELP) (p. 1738)
- Education (ED) (p. 1741)
- Educational Psychology (EDP) (p. 1745)
- EGR-Engineering Master's (EGR) (p. 1746)
- Electrical and Computer Engineering (ECE) (p. 1746)
- Elementary Education (ELM) (p. 1763)
- Engineering (E) (p. 1766)
- English (ENG) (p. 1767)
- Entomology (ENT) (p. 1786)
- Entrepreneurship in Music and the Arts (EMA) (p. 1790)
- Entrepreneurship Initiative (EI) (p. 1790)
• Environmental Assessment (EA) (p. 1791)
• Environmental Science (ES) (p. 1792)
• Environmental Technology (ET) (p. 1793)

F
• Fashion and Textile Design (FTD) (p. 1795)
• Fashion and Textile Management (FTM) (p. 1797)
• Feed Mill (FM) (p. 1800)
• Fiber and Polymer Science (FPS) (p. 1801)
• Financial Mathematics (FiM) (p. 1802)
• Fisheries & Wildlife Sciences (FW) (p. 1803)
• Food Science (FS) (p. 1807)
• Food Science (FSA) (p. 1814)
• Foreign Language - Chinese (FLC) (p. 1814)
• Foreign Language - English (FLE) (p. 1815)
• Foreign Language - French (FLF) (p. 1816)
• Foreign Language - German (FLG) (p. 1818)
• Foreign Language - Greek (GRK) (p. 1820)
• Foreign Language - Hindi (FLH) (p. 1820)
• Foreign Language - Italian (FLI) (p. 1821)
• Foreign Language - Japanese (FLJ) (p. 1822)
• Foreign Language - Latin (LAT) (p. 1823)
• Foreign Language - Persian (PER) (p. 1823)
• Foreign Language - Portuguese (FLP) (p. 1824)
• Foreign Language - Russian (FLR) (p. 1824)
• Foreign Language - Spanish (FLS) (p. 1825)
• Foreign Languages-Classical Studies (CLA) (p. 1829)
• Foreign Languages (FL) (p. 1830)
• Foreign Languages and Literatures - Arabic (FLA) (p. 1833)
• Forestry (FOR) (p. 1834)

G
• Genetic Engineering and Society (GES) (p. 1841)
• Genetics (GN) (p. 1841)
• Geographic Information Systems (GIS) (p. 1847)
• Geography (GEO) (p. 1850)
• Global Knowledge (GK) (p. 1850)
• Global Public Health (GPH) (p. 1850)
• Graduate Economics (ECG) (p. 1850)
• Graphic Communications (GC) (p. 1854)
• Graphic Design (GD) (p. 1855)

H
• Health and Exercise Studies Minor (HESM) (p. 1858)
• Health Exercise Studies Dance (HESD) (p. 1860)
• Health Exercise Studies Fitness (HESF) (p. 1861)
• Health Exercise Studies Outdoor (HESO) (p. 1863)
• Health Exercise Studies Racquet (HESR) (p. 1864)
• Health Exercise Studies Specialty (HESS) (p. 1865)
• Health Exercise Studies Team (HEST) (p. 1866)
• HESA - Health Exercise Aquatics (HESA) (p. 1866)
• History (Hi) (p. 1867)
• History of Art (HA) (p. 1868)
• Honors (HON) (p. 1887)
• Horticulture Science (HS) (p. 1890)
• Humanities and Social Sciences (HSS) (p. 1899)
• Humanities (HUM) (p. 1899)
• Humanities and Global Knowledge (HUMG) (p. 1899)
• Humanities and U.S. Diversity (HUMU) (p. 1899)

I
• Immunology (IMM) (p. 1900)
• Industrial and Systems Engineering (ISE) (p. 1900)
• Industrial Design (ID) (p. 1909)
• Integrated Manufacturing Systems (IMS) (p. 1912)
• Interdisciplinary Perspectives (IPGE) (p. 1912)
• Interdisciplinary Perspectives and Global Knowledge (IPGK) (p. 1913)
• Interdisciplinary Perspectives and U.S. Diversity (IPUS) (p. 1913)
• Interdisciplinary Studies (IDS) (p. 1913)
• International Studies (IS) (p. 1914)
• International Studies (MIS) (p. 1914)

L
• Landscape Architecture (LAR) (p. 1915)
• Leadership in the Public Sector (LPS) (p. 1919)
• Liberal Studies (MLS) (p. 1920)
• Life Sciences First Year (LSC) (p. 1920)
• Logic (LOG) (p. 1921)

M
• Management Innovation Entrepreneurship (MIE) (p. 1922)
• Management (M) (p. 1924)
• Marine, Earth, and Atmospheric Sciences (MEA) (p. 1925)
• Materials Science and Engineering (MSE) (p. 1937)
• Math & Science Education (EMS) (p. 1944)
• Math in Agriculture and Related Sciences (MAA) (p. 1951)
• Mathematical Sciences (MSGE) (p. 1951)
• Mathematics (MA) (p. 1951)
• Mechanical & Aerospace Engineering (MAE) (p. 1963)
• Mechanical Engineering Systems (MES) (p. 1973)
• Medical Textiles (MT) (p. 1975)
• Microbiology (MB) (p. 1975)
• Military Science (MS) (p. 1981)
• Multidisciplinary Studies (MDS) (p. 1982)
• Music (MUS) (p. 1982)

N
• Natural Resources (NR) (p. 1987)
• Natural Sciences (NSGE) (p. 1990)
• Natural Sciences and Global Knowledge (NSGK) (p. 1990)
• Naval Science (NS) (p. 1990)
• NC Global Training Initiative (GTI) (p. 1991)
• Nonprofit Studies (NPS) (p. 1991)
• Nonwovens (NW) (p. 1992)
Typically offered in Spring and Summer
conducting tax research and preparing actual
tax law learned in the course to a real world setting by
students will apply tax law learned in the course to a real world setting by

The course focuses on the fundamental concepts of individual income
taxation. It is suitable for business and nonbusiness students. Students

The course is designed to provide students with a basic understanding
of managerial accounting concepts. Students will analyze accounting
data that are useful in managerial decision making and in the control and evaluation of the decisions made within business organizations. An introduction to basic models, financial statement analysis, cost behavior analysis and cost control procedures.

Typically offered in Fall, Spring, and Summer

Financial reporting concepts, the accounting information generating process, reporting practices, financial statement preparation, and the interpretation and analysis of financial statements. Basic accounting principles and concepts, the accounting cycle, income measurement, and internal controls.

Typically offered in Fall, Spring, and Summer

The course is designed to provide students with a basic understanding
of managerial accounting concepts. Students will analyze accounting
data that are useful in managerial decision making and in the control and evaluation of the decisions made within business organizations. An introduction to basic models, financial statement analysis, cost behavior analysis and cost control procedures.

Typically offered in Fall, Spring, and Summer

Typically offered in Spring and Summer
ACC 280 Survey of Financial and Managerial Accounting (3 credit hours)
This course covers the basic principles and concepts of financial and managerial accounting. Students will learn about the role of accounting in business including how to prepare basic financial statements and how accounting information is used by: (1) external stakeholders (i.e., stockholders, creditors and government) to evaluate the financial performance of an organization; and (2) internal users (management) to fulfill the planning, control and performance evaluation functions.

This course cannot be used to satisfy degree requirements for the accounting degree or the business degree within the Poole College of Management. This course does not substitute for either ACC 210 or ACC 220.
Typically offered in Fall and Spring

ACC 295 Special Topics in Accounting (1-6 credit hours)
Presentation of accounting material at the 200-level not normally available in regular course offerings, or offering of new courses on a trial basis. Course may be taken multiple times only if topic is different.
Typically offered in Fall, Spring, and Summer

ACC 310 Intermediate Financial Accounting I (3 credit hours)
This course introduces the conceptual framework of financial accounting and process of developing professional standards along with the foundations of accounting and reporting systems. Students are provided an in-depth analysis of the income statement, the balance sheet, the statement of cash flows, and the reporting process. The course also covers measurement and reporting issues for major categories of assets on the balance sheet.
Prerequisite: ACC 210 with a C+ or better
Typically offered in Fall, Spring, and Summer

ACC 311 Intermediate Financial Accounting II (3 credit hours)
A continuation of topics introduced in Intermediate Financial Accounting I [ACC 310]. Topics include the Statement of Cash Flows, the Statement of Stockholders Equity, accounting for investments in equity and debt securities, liabilities, leasing, pension and post-retirement benefit plans, deferred income taxes, revenue recognition, and various forms of stock-based compensation plans.
Prerequisite: ACC 310 with grade of C- or better
Typically offered in Fall, Spring, and Summer

ACC 330 An Introduction To Income Taxation (3 credit hours)
Basic income tax principles and procedures (including research and planning) with an emphasis on all types of entities and business transactions. Exposure to a range of tax concepts within the framework of financial reporting.
Prerequisite: ACC 210 with a grade of C- or better
Typically offered in Fall, Spring, and Summer

ACC 340 Accounting Information Systems (3 credit hours)
Accounting is an information system that supports business processes and decision-making through record-keeping, reporting, and control. This course covers transaction cycles, related internal controls, and the use of computer applications (Microsoft Excel and Access, SAP, and Sage 50) to collect, organize, analyze, and report accounting data. Students will design, develop, and implement a database in this course.
Prerequisite: BUS 340 and ACC 210 with a grade of C- or better
Typically offered in Fall, Spring, and Summer

ACC 411 Business Valuation (3 credit hours)
Conceptual framework of how businesses work, value generation and reporting. Interpretation of financial statements and their use in valuation of the firm.
Prerequisite: ACC 210, BUS 320, and (BUS/ST 350 or ST 312 or ST 370 or ST 372)
Typically offered in Fall and Spring

ACC 420 Cost Accounting for Effective Management (3 credit hours)
Cost Accounting for Effective Management focuses on the development and use of managerial accounting information in planning, control, and decision making activities and in designing and implementing business strategies. Integration of performance measurement and cost control with corporate strategy.
Prerequisite: ACC 210 with C+ or better and ACC 200 or ACC 220 with a C- or better
Typically offered in Fall and Spring

ACC 440 Enterprise Resource Planning Systems (3 credit hours)
Enterprise resource planning (ERP) systems are business systems that integrate and streamline data across the company into one complete system that supports the needs of the entire organization. Course content includes ERP marketplace, ERP technology, business process redesign and process mapping, planning, package selection, implementation and operation of ERP systems, ERP module functionality, and visualization of ERP data. As NCSU is a member of the SAP University Alliance, you will have the opportunity to obtain hands-on experience with the SAP ERP system and SAP data analytics software. Credit will not be allowed for both ACC 440 and MBA 515.
Prerequisite: ACC 340
Typically offered in Fall and Spring

ACC 450 Auditing and Assurance Services (3 credit hours)
Introduction to auditing practice and theory. Focuses on developing skills for interpreting business strategies and identifying related business risks that may impact the risk of material misstatement in financial statements, describing internal control solutions to those risks, identifying evidential sources, and designing strategies to provide assurance about the financial statements, internal control over financial reporting, and other business information.
Prerequisite: ACC 311 with a C- or better and ACC 340 and (BUS/ST 350, or ST 312, or ST 370, or ST 372)
Typically offered in Fall, Spring, and Summer

ACC 451 Internal Auditing (3 credit hours)
An overview of the theory, practice, and design of internal audit activities. Examine industry standards and the professional practices of the internal audit. Evaluate risk and controls related to operations, information technology, fraud, and compliance. Design and manage assurance activities. Assess audit evidence and communicate engagement results.
Prerequisite: ACC 210 with grade of C- or better and ACC 340
Typically offered in Fall and Spring

ACC 460 Governmental and Nonprofit Accounting (3 credit hours)
Accounting and reporting for state and local governments, including budgeting and financial analysis. Accounting for nonprofit organizations emphasizing voluntary health and welfare organizations.
Prerequisite: ACC 210
Typically offered in Fall and Spring
ACC 495 Special Topics in Accounting (1-6 credit hours)
Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

ACC 498 Independent Study in Accounting (1-6 credit hours)
Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with the associate department head. Individualized/Independent

Typically offered in Fall, Spring, and Summer

ACC 499 Internship in ACC (1-6 credit hours)
A full-time accounting-related professional internship. Participants will communicate with instructor weekly over the course of the internship to discuss progress and insights. A post-internship interview and paper is also required. Internships may vary

Prerequisite: Completion of ACC 310 and ACC 311. Restricted to accounting majors. Departmental approval required.
Typically offered in Spring and Summer

ACC 508 Advanced Commercial Law (3 credit hours)
A study of law and regulation as a structure in which to develop business goals and strategies. Students will examine those elements of law and regulation that are a context for ethical business behavior. Students will also study the provisions of law

Prerequisite: MAC Program
Typically offered in Spring only

ACC 510 Advanced Financial Accounting (3 credit hours)
Study of complex financial reporting topics affecting U.S. corporations. Focus on the underlying business rationales associated with transactions/events triggering the complex financial reporting issue. Topics will include international accounting, consolidations, mergers and acquisitions, derivatives, SEC reporting, and other emerging issues.

Prerequisite: MAC Program
Typically offered in Spring and Summer

ACC 519 Applied Financial Management (3 credit hours)
A study of key business decision made and tools used by CFOs in their executive management roles. Students will focus on managerial analysis tools (e.g., business plans; budgeting) and finance issues (e.g., funding alternatives, treasury, and cash management). The course will include management skills related to the CFO, such as negotiations, leadership, delegation, interactions with boards, etc.

Prerequisite: MAC Program
Typically offered in Fall and Summer

ACC 520 Advanced Management Accounting (3 credit hours)
A study of how accounting and operating information is used in management planning and decision making. Students will apply advanced costing models and design and evaluate management decision making information systems. Topics will include issues that

Prerequisite: MAC Program
Typically offered in Spring only

ACC 530 Advanced Income Tax (3 credit hours)
A study of the tax consequences of business, financial, and personal wealth-planning transactions. Students will examine the economic or legal context of transactions along with the non-tax motives of the transacting parties. The course will consider the efficiency of tax strategies in terms of their impact on net cash flows and other financial reporting effects.

Prerequisite: MAC Program
Typically offered in Fall only

ACC 533 Accounting and Tax Research (3 credit hours)
A study of research methods, procedures and tools used to develop solutions to technical and policy-oriented business problems. Students will consult various competent authorities on taxation, accounting, auditing, and general business in the development of business problem solving techniques.

Prerequisite: MAC Program
Typically offered in Fall and Summer

ACC 540 IT Risks and Controls (3 credit hours)
A study of how business strategies use information technology (IT) as an efficient enabler of redesigned core business processes. Students will focus on how the use of IT affects risk management by eliminating certain risks and introducing others. Study

Prerequisite: MAC Program
Typically offered in Fall only

ACC 550 Advanced Auditing (3 credit hours)
A study of the impact of business risks on the design and performance of audit procedures to detect material misstatements in financial statements. Students will be exposed, through a case-based approach, to significant business issues related to audit planning, risk assessment and auditor response, corporate governance, reporting, and other significant business issues affecting audit professionals in their first years of employment.

Prerequisite: MAC Program
Typically offered in Spring and Summer

ACC 555 Advanced Income Tax (3 credit hours)
A study of the tax consequences of business, financial, and personal wealth-planning transactions. Students will examine the economic or legal context of transactions along with the non-tax motives of the transacting parties. The course will consider the efficiency of tax strategies in terms of their impact on net cash flows and other financial reporting effects.

Prerequisite: MAC Program
Typically offered in Fall only

ACC 556 Tools for Tax Analytics (1 credit hours)
In this course we will teach the skills needed to identify many of the situations where the method of accounting for tax purposes for revenue and expense differs from that used in financial accounting. Focus will be placed on analyzing and outlining those differences in a concise and visual manner in order to assist upper management understand the tax implications of their operational and financial accounting decisions. To assist us in this, we will utilize analytic tools that are regarded as required knowledge by today's tax departments. After a brief review of basic analytics skills, we will focus on more advanced analytic tools which will be reinforced with tax-focused examples and assignments specifically to allow the student to apply these featured analytics topics in tax situations. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer
ACC 561 Database Management in Tax (1 credit hours)
In this course, we will teach the skills needed to understand and identify many aspects of the state income tax apportionment process. Focus will be placed on the calculations and analyses required to present the state and local tax information in such a manner as to assist upper management in the business-expansion decision-making process. The tax apportionment process requires a solid understanding of database management. To assist us in this, we will utilize database management tools that are considered required knowledge by today's tax departments. After a brief review of introductory database management topics, we will focus on more advanced database management topics which will be reinforced with tax-focused examples and assignments specifically created to allow students to see these featured database management topics when applied to tax scenarios. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer

ACC 562 Forecasting Effective Tax Rates and Scenario Analysis - Introduction (1 credit hours)
In this course we will examine the different definitions of book income and taxable income with a focus on accounting for income taxes under ASC 740. Students will contrast the principles of conservatism reflected by generally accepted accounting principles and by the tax law. In addition, students will learn how to utilize regression analysis and scenario analysis to provide additional insights about these tax topics and to forecast future effective tax rates. Tax-focused examples and assignments created specifically to allow the student to apply regression analysis in tax situations will reinforce the technology covered in this course. In addition to utilizing regression analysis, this course will examine tax technical subjects to provide the student sufficient knowledge to complete the examples and assignments. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer

ACC 563 Forecasting Effective Tax Rates and Scenario Analysis - Advanced Application (1 credit hours)
In this course we will continue to examine the different definitions of book income and taxable income but the primary focus will be on examining tax disclosures in financial statements and gaining an understanding of how they can be used for financial statement analysis. We will also carry out regression and scenario analysis to provide additional insights into disclosed tax information. These types of insights are of significant benefit and often utilized in decision making by company management and financial analysts employed by investment funds. The skills learned will be reinforced with tax-focused examples and assignments created specifically to allow the student to apply regression and scenario analysis in tax situations. In addition to utilizing regression and scenario analysis, this course will examine tax technical subjects to provide the student sufficient knowledge to complete the examples and assignments. An undergraduate degree and basic tax and accounting knowledge required.

P: ACC 562
Typically offered in Fall, Spring, and Summer

ACC 564 Project Management and Process Documentation in Tax (1 credit hours)
In this course we will focus on tax project management and tax process documentation skills. Students will develop an understanding of project management in the context of a tax provision process assessment for a hypothetical company, Project Clarity. Students will also develop an understanding of internal control best practices and how they apply to a corporate tax department's tax provision process. In addition, they will develop the skills necessary to identify improvements within the tax provision process and learn how to prepare a flow chart of the process. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer

ACC 565 Visual Analytics in Tax (1 credit hours)
We will teach visual analytics to enhance the value and quality of the tax information provided to decision makers in an organization. All aspects of tax including planning, tax provision work, compliance and controversy work will be covered. The focus will be on state and local nexus, sales and use taxes, and foreign bank account reporting (FBAR) requirements. Students will also learn to manipulate data into a visual front end so that those reviewing the data with the purpose of decision-making will have an easier time reading and interpreting the data analytics. An undergraduate degree and basic tax and accounting knowledge required.

P: ACC 560
Typically offered in Fall, Spring, and Summer

ACC 566 Database Management Applications in Tax (1 credit hours)
In this course, we will examine the different definitions of book income and taxable income but the primary focus will be on examining tax disclosures in financial statements and gaining an understanding of how they can be used for financial statement analysis. We will also carry out regression and scenario analysis to provide additional insights into disclosed tax information. These types of insights are of significant benefit and often utilized in decision making by company management and financial analysts employed by investment funds. The skills learned will be reinforced with tax-focused examples and assignments created specifically to allow the student to apply regression and scenario analysis in tax situations. In addition to utilizing regression and scenario analysis, this course will examine tax technical subjects to provide the student sufficient knowledge to complete the examples and assignments. An undergraduate degree and basic tax and accounting knowledge required.

P: ACC 561
Typically offered in Fall, Spring, and Summer

ACC 567 Enterprise Resource Planning for Tax (1 credit hours)
In this course, we will teach Enterprise Resource Planning (ERP) concepts that will be useful to tax professionals to better understand the client's information environment and gauge how best to access needed client tax information. Students will learn about ERP systems and obtain hands-on experience with the financial accounting, asset accounting (AA), and plant maintenance (PM) courses in the SAP ERP system. ERP concepts will be reinforced with tax-focused examples and assignments including revisiting tax deduction material, as well as learning more about the Tangible Property and Repair Regulations. Credit will not be allowed for this course and for MBA 515. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer
ACC 568  Analysis of Unstructured Data in Tax  (1 credit hours)
The objective of this course is to get insight into the analysis of unstructured data and gain an understanding of how to utilize it within a tax focused environment. Upon finishing the course, students will be able to extract tax related information from a collection of text documents. Also, students will be able to uncover concepts and themes that are concealed in those documents. There will also be a demonstration of traditional data mining techniques. An undergraduate degree and basic tax and accounting knowledge required.

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer

ACC 569  Advanced Visual Analytics in Tax  (1 credit hours)
Visualization helps us see and understand the story the data tells us. In this course, students will be introduced to an interactive data visualization tool which allows users to select specific tax information and customize the format of visualization to assist in the management decision making process. Students will learn how to use this tools to increase the relevance and usefulness of tax data. The software will be used in specific tax-related applications, including foreign bank account reporting exposure and compliance, country by country reporting, state income tax exposure, compliance data and risk analysis. An undergraduate degree and basic tax and accounting knowledge required.

P: ACC 565
Typically offered in Fall, Spring, and Summer

ACC 570  Data Security and Warehousing in Tax  (1 credit hours)
The course is focused on the importance of data security with respect to all financial data but specifically tax data. It also covers the area of tax data warehousing from the standpoint of the differing financial detail needs of a tax department and th

R: Graduate Standing or PBS
Typically offered in Fall, Spring, and Summer

ACC 571  Enterprise Resource Planning - Advanced Applications  (1 credit hours)
In this course we will focus on extracting and manipulating data housed in an Enterprise Resource Planning system in order to address complex tax issues. The tax technical subjects to be covered include revisiting the tangible personal property regulations, the uniform capitalization rules as they apply to inventory, VAT taxes and the consolidated return rules. An undergraduate degree and basic tax and accounting knowledge required.

P: ACC 567
Typically offered in Fall, Spring, and Summer

ACC 588  Special Topics in Accounting  (1-6 credit hours)
Course objectives dependent upon unique circumstances motivating offering of course. Timely curriculum innovation the primary motivation. Departmental consent required.

Typically offered in Fall and Spring

ACC 600  Managerial and Career Effectiveness  (1 credit hours)
Knowledge and skills needed to advance professional accounting career. Strategic communication of self and ideas in professional and classroom settings. Diagnosis of organizational culture. Impression management and appropriate business behavior. Leadership of individuals, group dynamics, and team building.

Prerequisite: MAC Program
Typically offered in Fall only

ACC 630  Independent Study  (1-3 credit hours)
Advanced topics not otherwise included in curriculum by advanced graduate students on a tutorial basis. Determination of credits and content by participating faculty in consultation with Director of Graduate Programs. Departmental consent required

Typically offered in Spring only

Adult & Higher Education (EAC)

EAC 301  Introduction to Leadership Fundamentals  (3 credit hours)
This course will provide basic understandings of the components of leadership that can be applied to their current and future leadership experiences on campus or in their individual communities, and to provide a model of critical reflection for those applications.

Prerequisite: Sophomore standing, Junior standing, or Senior standing
Typically offered in Fall and Spring

EAC 496  Special Topics in Adult Learning and Leadership  (1-6 credit hours)
Exploration of specialized areas and topics of current interest in adult learning and leadership.

EAC 517  Current Issues in Higher Education  (3 credit hours)
Examination of important social, political and economic issues affecting present and future operation of colleges and universities in America. Graduate standing or PBS status required.

Typically offered in Spring only

EAC 522  Foundations of Adult Education  (3 credit hours)
Introduction to the field of adult education as an area of graduate study and practice. It is intended for those who have experience or desire to work with adult learners or with organizations that serve adult learner populations.

Typically offered in Fall only

EAC 532  Foundations of Adult Education  (3 credit hours)
Organization of health care delivery system, services and recourses. Focus on major social, economic, political and professional factors contributing to shaping the system and influencing change. Analysis of organizations and environments in regard to demand for health personnel and the implications for health occupations education.

EAC 536  Issues and Trends In Education For the Health Professions  (3 credit hours)
An analysis of educational and social factors influencing change in health professions education. Problems of student selection and program articulation, and implications for health occupations education and health services of recent legislation impacting health care.

EAC 538  Special Topics in Accounting  (1-6 credit hours)
Course objectives dependent upon unique circumstances motivating offering of course. Timely curriculum innovation the primary motivation. Departmental consent required.

Typically offered in Summer only

EAC 548  Issues and Trends In Education For the Health Professions  (3 credit hours)
EAC 538 Instructional Strategies In Adult and Higher Education  (3 credit hours)
Forms of instruction appropriate for the teaching of adults. Special emphasis upon methods for maximum involvement of the adult learner. Relevant concepts, theories and principles for selection, utilization and evaluation of instructional strategies with focus on integration of theory into practice. Development of student proficiency in use of applicable teaching techniques for adult and community college education through participation in classroom exercises.

Prerequisite: Graduate standing or PBS status

EAC 539 Teaching in the Online Environment  (3 credit hours)
The course focuses on exploring the issues and considerations in online teaching and introduce students to some of the tools involved in the process. Students will develop strategies for teaching online and for managing the online classroom.

Typically offered in Fall and Spring

EAC 540 Foundations of Higher Education and Student Affairs  (3 credit hours)
Examines knowledge that guides professional practice in higher education and student affairs, such as: history of higher education, professional development practices, student characteristics, group process, and helping and advising skills. Programmatic applications are emphasized through class assignments.

Typically offered in Fall only

EAC 541 Administration and Finance of Student Affairs  (3 credit hours)
Examination of the role of student affairs in higher education institutions to include: organizational structures, leadership and decision-making, planning and budgeting, staffing and supervision.

Prerequisite: EAC 540
Typically offered in Spring only

EAC 542 Student Characteristics and the College Environment  (3 credit hours)
Study of the history and philosophy of student affairs, the impact of college on students and current issues of concern to students and student affairs professionals. Good practices of student affairs in the context of student learning are identified and current literature is reviewed.

Typically offered in Spring only

EAC 543 Student Development Theory  (3 credit hours)
Gain an understanding of the major student development theories and emerging professional literatures in this area. Provide opportunities for students to develop skills in applying student developmental theory to specific student affairs settings, issues, and populations.

Prerequisite: EAC 540
Typically offered in Fall only

EAC 544 History of the College Student Experience in the United States  (3 credit hours)
This course will review the history of higher education in the United States from the colonial period to the present with particular attention to the ways in which shifting policies and practices in higher education institutions have affected the college

EAC 545 Higher Education Masters Professional Seminar  (3 credit hours)
Emphasizes application of concepts and theories learned in previously completed coursework to understand and analyze current issues facing student affairs professionals. Focuses particularly on the job search process and transition out of graduate school. Facilitates the transition from student to full-time student affairs professional through critical examination, synthesis, integration, and practical application of prior and concurrent coursework.

R: EAC 540 and EAC 542 and EAC 543
Typically offered in Spring only

EAC 548 Instructional Strategies In Adult and Higher Education  (3 credit hours)
Forms of instruction appropriate for the teaching of adults. Special emphasis upon methods for maximum involvement of the adult learner. Relevant concepts, theories and principles for selection, utilization and evaluation of instructional strategies with focus on integration of theory into practice. Development of student proficiency in use of applicable teaching techniques for adult and community college education through participation in classroom exercises.

Prerequisite: Graduate standing or PBS status

EAC 550 Foundations of Higher Education and Student Affairs  (3 credit hours)
Examines knowledge that guides professional practice in higher education and student affairs, such as: history of higher education, professional development practices, student characteristics, group process, and helping and advising skills. Programmatic applications are emphasized through class assignments.

Typically offered in Fall only

EAC 551 Research in Adult & Higher Education  (3 credit hours)
Introduces master's students studying adult learning and higher education to two major research paradigms in education, quantitative and qualitative research, and to the research literature of disciplines related to the education of adults. Students will learn how to distinguish between research and non-research materials, and how to evaluate quantitative and qualitative research studies on the basis of their research merit.

Prerequisite: Master's students in ACCE
Typically offered in Fall, Spring, and Summer

EAC 552 College Student Retention  (3 credit hours)
Exploration of college student retention theories, relevant research, and exemplary retention programs. Examines student retention and completion within four-year colleges and universities as well as student persistence within and transfer from community colleges.

Typically offered in Spring only

EAC 553 Student Development Theory  (3 credit hours)
Gain an understanding of the major student development theories and emerging professional literatures in this area. Provide opportunities for students to develop skills in applying student developmental theory to specific student affairs settings, issues, and populations.

Prerequisite: EAC 540
Typically offered in Fall only

EAC 554 History of the College Student Experience in the United States  (3 credit hours)
This course will review the history of higher education in the United States from the colonial period to the present with particular attention to the ways in which shifting policies and practices in higher education institutions have affected the college

Typically offered in Spring and Summer
**EAC 580 Designing Instructional Systems in Training and Development** (3 credit hours)
Introduction to instructional design models including needs assessment, systematic training design and development techniques and proactive strategies for evaluating training programs. Instructional design issues of work-based training, learner characteristics and effects of technology on instructional design, implementation and evaluation processes. Graduate standing or PBS status required.

*Typically offered in Fall, Spring, and Summer*

**EAC 581 Advanced Instructional Design in Training and Development** (3 credit hours)
In-depth analysis of instructional systems design (ISD) theory and practice using professional competency models. Organizational training requirements, development of performance objectives and measures, design of instructional materials, and address of evaluation issues in training programs in business and industry. Research and development of instructional design projects relating to ISD process and model. Graduate standing or PBS status required.

*Typically offered in Fall and Spring*

**EAC 582 Organization and Operation Of Training and Development Programs** (3 credit hours)
Overview of occupational education practice in business and industrial settings. Presentation of roles common to training and development specialists, including managerial concerns related to organization, operation and financial training and development programs.

*Typically offered in Fall only*

**EAC 583 Needs Assessment and Task Analysis in Training and Development** (3 credit hours)
Current needs assessment and task analysis methods and techniques used in business and industrial settings. Development of comprehensive needs assessment plans for diagnosing and documenting human performance deficiencies/improvement opportunities thro

*Typically offered in Fall only*

**EAC 584 Evaluating Training Transfer and Effectiveness** (3 credit hours)
Philosophy, strategies, and procedures for evaluating effectiveness of training programs. Development of multi-level evaluation plan for use with training program to study outcomes and process of training from perception to organizational impact. Design of evaluation methods and instruments, data collection, analysis, and interpretation for each level of evaluation emphasizing transfer of training. Graduate standing or PBS status required.

*Typically offered in Fall and Spring*

**EAC 585 Integrating Technology into Training Program** (3 credit hours)
Appropriate technologies for design and delivery of effective training programs. Performance-based training models for distance and individualized learning through audio, video, computer-based, and multimedia technologies. Planning decisions for selecting/developing appropriate technologies to support specific training outcomes, adult learner characteristics, and organizational training resources. Graduate standing or PBS status required.

*Typically offered in Fall and Summer*

**EAC 586 Methods and Techniques Of Training and Development** (3 credit hours)
Methods and techniques common to model occupational education programs in business and industrial settings. Focus on design and evaluation of effective learning programs and instructional methodologies. Graduate standing or PBS status required.

*Typically offered in Fall and Spring*

**EAC 587 Marketing for Education and Training Programs** (3 credit hours)
Strategic marketing in education and training. Identifying and understanding targeted organization and audience for education or training program. Design of basic marketing strategy for education or training program incorporating elements of marketing.

*Typically offered in Spring only*

**EAC 589 Special Topics** (3-6 credit hours)
*Typically offered in Fall, Spring, and Summer*

**EAC 595 Seminar In Adult and Higher Education** (1-3 credit hours)
Identification and scientific analysis of major issues and problems relevant to adult education or higher education. Course credit at the master's level through active student participation in a formal seminar and scientific appraisal and solution of a

Prerequisite: Graduate standing

**EAC 596 Topical Problems In Adult and Community College Education** (1-3 credit hours)
Study and scientific analysis of problems in adult education and preparation of a scholarly research type of paper. Credits Arranged.

Prerequisite: Graduate standing or PBS status

**EAC 597 Independent Study in Adult and Community College Education** (1-3 credit hours)
Independent study for master's students in Adult and community College Education.

*Typically offered in Fall, Spring, and Summer*

**EAC 598 Internship In Adult and Community College Education** (1-9 credit hours)
Utilization of the participant-observer role with required participation in selected educational situations. Emphasis upon observational skills' development, the recording of relevant observations through written journals, analysis of experiences identifying critical incidents and projection of events and consequences. Student development and selection of possible alternative courses of action in various situations and evaluation of the consequences of the selected course of action.

Prerequisite: Nine hrs. in graduate level courses

*Typically offered in Fall, Spring, and Summer*

**EAC 599 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student

*Typically offered in Fall, Spring, and Summer*
EAC 692 Research Projects In Education (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of graduate faculty. Choice of research on basis of individual students’ interests and not to be part of thesis or dissertation research.

Prerequisite: EAC 732
Typically offered in Fall, Spring, and Summer

EAC 693 Master’s Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

EAC 695 Master’s Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

EAC 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master’s student
Typically offered in Summer only

EAC 699/ECD 699/ECI 699/ELP 699/EMS 699/EOE 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master’s degree and are writing and defending their theses.

Prerequisite: Master’s student
Typically offered in Summer only

EAC 700 Community College and Two-Year Postsecondary Education (3 credit hours)
Comprehensive community colleges and technical institutes and the state systems of which they are part: underlying concepts, design of educational needs to be serve, role in meeting these needs, historical development, issues in establishment and operation of state systems and individual institutions, unresolved issues and emerging trends.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

EAC 701 Administrative Concepts and Theories Applied To Adult and Community College Educ (3 credit hours)
For persons interested in building more consistent philosophy of educational administration, extension and strengthening of understanding of administrative concepts and processes, improved comprehension of theoretical and research foundations upon which administrative processes predicated, and increased ability for application of administrative concepts, theories and principles to management of complex education system.

Prerequisite: EAC 787 or a comparable course(s) on organizational theory
Typically offered in Spring only

EAC 703 The Programming Process In Adult and Community College Education (3 credit hours)
Principles and processes in programming, including basic theories and support of concepts in programming process. Attention to general programming framework, organizational needs and program roles of both professional and lay leaders.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

EAC 704 Leadership In Higher and Community College Education (3 credit hours)
Issues and concepts of leadership development and practice in two- and four-year colleges and universities; interpretation and communication of institutional values and understanding of organizational processes. Attention to role of organizational culture.

Typically offered in Summer only

EAC 705 Group Process In Adult and Higher Education (3 credit hours)
Application of research and theory in small group behavior to administration and teaching in adult and higher education settings. Opportunities for participant experience of various aspects of group behavior and practice of group leadership skills applications

EAC 706 The College and University Presidency (3 credit hours)
Promotion of understanding of many facets of the college and university presidency. Investigation and analysis of college and university from the perspective of students’ own careers and from the literature on the presidency. The president as institutional leader.

Prerequisite: EAC 700 or EAC 716
Typically offered in Spring only

EAC 707 The Politics Of Higher Education (3 credit hours)
Differing and changing perceptions of role of higher education in American society; politics of competition for priority of attention and resources; organizational alternatives in its control; relevant elements in structure and processes of government.

Prerequisite: Graduate standing or Management Development Certificate Program and six sem. hrs. of 500-level course work

EAC 708 Continuing Education for the Professions (3 credit hours)
Theoretical and research literature related to continuing education for the professions. Examination of role of educator in providing and managing continuing professional education.

Prerequisite: EAC 703, 759
Typically offered in Summer only

EAC 710 Adult Education: History, Philosophy, Contemporary Nature (3 credit hours)
Historical and philosophical foundations of adult education from ancient times to present, with attention to key figures, issues, institutions, movements and programs, including consideration of relationship between adult education’s historical development and prevailing intellectual, social, economic and political conditions. Consideration of adult education’s contemporary nature, present-day schools of thought on its objectives and trends.

Prerequisite: Advanced Undergraduate standing
Typically offered in Fall only
EAC 711 Reflective Practice and Research Inquiry (3 credit hours)
Initial doctoral seminar to enhance understanding of critically reflective practice, doctoral scholarly inquiry and current issues and debates in adult education scholarship and research.

Typically offered in Fall only

EAC 712 The Change Process in Adult Education (3 credit hours)
Provides an introduction to theory and practice of change within the context of adult education organizations, communities, and societies. Emphasis on theory and practice of change in adult education and training and developmental contexts.

Prerequisite: Adult Education Doctoral student
Typically offered in Spring only

EAC 716 History Of Higher Education In the United States (3 credit hours)
History of higher education from colonial period to the present. Emphasis on influence of philosophic, political, social and economic forces upon function and structure of higher education.

Prerequisite: Six hrs. of grad. ED courses
Typically offered in Fall only

EAC 730 Foundations of Adult, Higher, and Human Res Education (3 credit hours)
An inquiry into the characteristics and background, learning processes, motivation and participation of adult learners in a variety of educational contexts. Emphasis on adult learning theories, models, principles and their application to educational design and delivery. Doctoral status required.

Typically offered in Fall only

EAC 731 Technology In Adult, Higher, and Human Resource Education (3 credit hours)
Introduces the students to the role of technology in education. Positive and critical aspects will be addressed. Draws on theory and practice from numerous disciplines, including: adult education; distance education; educational, instructional and communication technologies; and, the teaching and learning sciences. Analysis of how education in the workplace, higher education and adult/community contexts is being transformed by technology. Evaluation of the complex interrelationships among education, learning and technology. Doctoral status required.

Typically offered in Fall only

EAC 732 Globalization Intl Issues Adult Higher Hum Res Ed (3 credit hours)
This core course focuses on globalization and its implications for the study and practice of adult, higher, and human resource education, as well as the evolution and increase of diverse international perspectives in the scholarship and policy arenas viewed from an interdisciplinary perspective. Doctoral status required.

Typically offered in Spring only

EAC 737 The Extension and Public Service Function In Higher Education (3 credit hours)
Examination of background, history, philosophy and contemporary nature of extension and public service function of institutions of higher education in U.S. Emphasis on adult education role of public and private universities and colleges. Specific focus on: general extension, industrial extension, engineering extension, cooperative extension and continuing education.

Prerequisite: EAC 710
Typically offered in Spring only

EAC 743 Adult Development and Learning (3 credit hours)
This course examines key theories and research on the physical, and related socio-cultural changes across the adult lifespan. Special emphasis in this course will be on the intellectual and psycho-social aspects of adult development. Key implications for educational programs and services, as well as research investigations of adults in learning environments, will be explored.

Prerequisite: EAC 739
Typically offered in Spring only

EAC 745 Death and Dying: A Lifespan Issue (3 credit hours)
Examination of issues associated with dying process, death itself and bereavement. Perceptions and responses to these issues at various stages of the lifespan. Implications for students’ fields of practice.

Prerequisite: Graduate standing or PBS status
Typically offered in Summer only

EAC 749 Finance in Higher Education (3 credit hours)
Examination of theory, research, practices and issues in development and management of financial resources in higher education.

Typically offered in Fall only

EAC 750 The Environment for Learning In Adult and Higher Education (3 credit hours)
Planning and management of the physical environment for effective adult learning. Applicability of concepts and theories of learning and teaching environment to needs analysis, planning, resource development, cooperation with professional designers, and construction, operations, conservation and maintenance of educational facilities, equipment and grounds.

Prerequisite: EAC 700 and Graduate standing or PBS status

EAC 759 Adult Learning Theory (3 credit hours)
Requisite involvement and undergirding of principles in adult education programs including theories and concepts. Emphasis on interrelationship of nature of adult learning, the nature of the subject matter and setting for learning occurrence. Applicability of relevant principles and pertinent research findings to adult learning.

Prerequisite: Six semester hours in ED
Typically offered in Spring only

EAC 760 Diversity in Higher Education (3 credit hours)
This course uses a multicultural competence framework to explore issues of diversity and social justice in higher education and the broader society. Issues of privilege, power, and oppression are explored and discussed in depth as well as the intersection of multiple identities and oppressions.

Typically offered in Spring only
EAC 761 Gender Studies in Adult Higher Education (3 credit hours)
Explores topics and issues related to the experiences of men and women in adult and higher education. This includes examination of meanings and applications of diverse feminisms, particularly as they apply to study of gendered patterns of student development in higher education.

Typically offered in Spring only

EAC 762 Spirituality in Higher Education (3 credit hours)
With a focus on spirituality and religion in higher education, this course provides an introduction to an emerging area of research and practice among higher education administrators and scholars. The course encourages the development of knowledge and skills to understand and engage in religious and worldview diversity in postsecondary educational contexts.

Typically offered in Spring only

EAC 765 Current Issues in Adult Education (3 credit hours)
Analysis of social, political, economic, and ethical issues influencing effective practice of adult education. Participant formulation and analysis of problems, issues, and challenges relevant to their practice and advanced graduate study.

Prerequisite: 15 Semester hours of graduate credit in the Department of Adult and Community College Education, including 3 semester hours of either quantitative or qualitative research methods.

Typically offered in Spring only

EAC 767 Education Of Special Adult Populations (3 credit hours)
Analysis and development of adult education responses to needs and characteristics of special adult populations such as nonliterate, unemployed, handicapped and older adults.

Typically offered in Spring and Summer

EAC 775 Law and Higher Education (3 credit hours)
Emphasis on faculty, student and staff rights and tort liability.

Prerequisite: Six hrs. graduate credit

Typically offered in Fall only

EAC 777 Concepts and Principles Of Evaluation Applied To Non-Formal Adult Education Prog (3 credit hours)
Introduction to evaluation of non-formal adult educational programs; course topics include purposes of evaluation, alternative concepts and techniques, stakeholders and their concerns, specification of evidence, selection of standards for making judgments, gathering and analysis of data, use and dissemination of results and handling problems in evaluation.

Prerequisite: EAC 703

Typically offered in Spring only

EAC 786/EMS 786 Teaching in College (3 credit hours)
Focus on development of competencies to perform fundamental tasks of a college teacher as well as consideration of more long-range tasks such as course development and university responsibilities of a professor. In addition to attending lectures and other types of presentations, students make video tapes of their teaching, develop tests, design introductory courses in their teaching fields and consider current issues related to university and college teaching.

Typically offered in Fall only

EAC 787 Organizational Theories and Concepts in Higher Education (3 credit hours)
For present and potential administrators interested in increasing their understanding of organizational theories as a basis for administration of effective higher education programs.

Typically offered in Fall and Spring

EAC 788 Applied Qualitative Data Analysis (3 credit hours)
Intermediate graduate level course in applied qualitative methodology following an introductory course in qualitative methods. Focuses on analytical approaches and tools used with qualitative data, with particular emphasis on adult and higher education and human resource development.

Prerequisite: EAC 785

EAC 790 Advanced Qualitative Research Methods (3-6 credit hours)
Advanced guidance for students designing or preparing for qualitative study. Emphasis on developing deeper understanding of theoretical issues informing qualitative research, including assessing validity of data and justifying design. Student development of a research proposal.

Prerequisite: EAC 785

Typically offered in Fall only

EAC 795 Topical Problems in Adult and Community College Education (1-3 credit hours)
Identification and scientific analysis of major issues and problems relevant to adult education or higher education. Course credit at the doctoral level through active student participation in a formal seminar and scientific appraisal and solution of a problem.

Prerequisite: Graduate standing

EAC 803 Research Seminar in Adult and Higher Education (3-6 credit hours)
Examination and application of frameworks, processes and compositional approaches in developing research proposals focusing on problems in adult education and higher education.

Prerequisite: 6 semester hours of course work in research methodology/analysis

Typically offered in Spring only

EAC 824 Topical Problems In Adult and Higher Education (1-3 credit hours)
Study and scientific analysis of problems in adult and higher education at the doctoral level and preparation of a scholarly research paper or project. Credits Arranged.

Prerequisite: Graduate standing or PBS status

EAC 830 Independent Study in Adult and Higher Education (3 credit hours)
Independent study for doctoral students in Adult and Higher Education.

Typically offered in Fall, Spring, and Summer
EAC 851 Internship In Adult and Higher Education (1-9 credit hours)
Utilization of the participant-observer role with required participation in selected educational situations. Emphasis upon observational skills development, the recording of relevant observations through written journals, analysis of experiences identifying critical incidents and projection of events and consequences. Student development and selection of possible alternative courses of action in various situations and evaluation of the consequences of the selected course of action.

Prerequisite: Nine hrs. in graduate level courses
Typically offered in Fall, Spring, and Summer

EAC 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

EAC 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

EAC 892 Doctoral Research Project (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of graduate faculty. Choice of research on basis of individual students’ interests and not to be part of thesis or dissertation research.

Prerequisite: EAC 732
Typically offered in Summer only

EAC 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Summer only

EAC 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

EAC 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

EAC 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Advanced Analytics (AA)

AA 500 Analytics Tools and Techniques (3 credit hours)
This course equips the student with basic and advanced computer programming skills needed to use industry-standard analytics tools for data analysis, including but not limited to: data access and management, data cleaning, data mining, text mining, geospatial analytics, forecasting, and optimization. Restricted to AA majors.

Corequisite: AA 501
Typically offered in Summer only

AA 501 Analytics Foundations (3 credit hours)
This course equips the student with basic knowledge of statistics required for further study in analytics. Topics include, but are not limited to: Exploratory Data Analysis, Linear Regression, Multiple Linear Regression, Regression Diagnostics, Logistic Regression, ANOVA, Cluster Analysis, Analysis of Tables, and Survey Data Analysis. Restricted to AA major.

Corequisite: AA 670
Typically offered in Summer only

AA 502 Analytics Methods and Applications I (6 credit hours)
This course equips the students with the methods and applications of advanced analytics. Topics include, but are not limited to: Time Series and Forecasting, Geospatial Data Analytics, Linear Algebra, Data Mining, Survival Data Analysis and Logistic Regression Models. Restricted to AA major.

Prerequisite: AA 501 and AA 670; Corequisite: AA 504
Typically offered in Fall only

AA 503 Analytics Methods and Applications II (6 credit hours)
This course equips the student with the methods and applications of advanced analytics. Topics include, but are not limited to: Advanced Data Mining, Text Mining, Financial Analytics, Risk Analytics, Marketing Science and Customer Analytics, Linear and Non-Linear Programming. Restricted to AA major.

Prerequisite: AA 502; Corequisite: AA 506
Typically offered in Fall only

AA 504 Analytics Practicum I (6 credit hours)
This course equips the student with the knowledge and skills needed to conduct and present large-scale studies based on advanced analytics. Student teams conduct analysis using large amounts of real-world data. Restricted to AA major.

Prerequisite: AA 501 and AA 670; Corequisite: AA 502
Typically offered in Summer only

AA 505 Analytics Practicum II (6 credit hours)
A continuation of AA 504, this course equips the student with the knowledge and skills needed to conduct and present large-scale studies based on advanced analytics. Student team conduct analysis using large amounts of real-world data. Restricted to AA majors.

Prerequisite: AA 504; Corequisite: AA 503
Typically offered in Fall only

AA 591 Special Topics in Advanced Analytics (1-6 credit hours)
Special Topics in Advanced Analytics

AA 691 Special Topics in Advanced Analytics (1-6 credit hours)
Special Topics in Advanced Analytics
Aerospace Studies (AS)

AS 121 Heritage and Values I (1 credit hours)
AS 121 is the first semester of a survey course designed to introduce students to the United States Air Force and provide an overview of the basic characteristics, missions, and organization of the Air Force. Companion Lab AS201 required for active cadets.

Typically offered in Fall only

AS 122 Heritage and Values II (1 credit hours)
AS 122 is the second semester of a survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions, and organization of the Air Force. Companion Lab AS201 required for active cadets.

Typically offered in Fall only

AS 201 Freshman and Sophomore Leadership Laboratory (1 credit hours)
AS 201 is the leadership lab component for freshman and sophomore cadets enrolled in the AFROTC program. This laboratory is the hands-on military training where you will apply the knowledge and theory from your academic classes.

Typically offered in Spring only

AS 221 Team and Leadership Fundamentals I (1 credit hours)
Part I of a two-semester course laying the foundation for teams and leadership. The topics include skills that will allow students/cadets to improve their leadership on a personal level and within a team. The courses will prepare students/cadets for the

Typically offered in Fall and Spring

AS 222 Team and Leadership Fundamentals II (1 credit hours)
Part II of a two-semester course laying the foundation for teams and leadership. The topics include skills that will allow students/cadets to improve their leadership on a personal level and within a team. The courses will prepare students/cadets for th

Typically offered in Spring only

AS 321 Leading People and Effective Communication I (3 credit hours)
AS321 is a three-credit hour elective and part I of a two-semester course that teaches students/cadets advanced skills and knowledge in management and leadership. Topics include leadership and management fundamentals, ethics training and communication skills. Students will gain a more in-depth understanding of how to effectively lead people, as well as, hone their writing and briefing skills. Companion Lab AS401 required for active cadets.

Typically offered in Fall only

AS 322 Leading People and Effective Communication II (3 credit hours)
Part II of a two-semester course that teaches students/cadets advanced skills and knowledge in management and leadership. Topics include leadership and management fundamentals, ethics training and communication skills. Students will gain a more in-depth understanding of how to effectively lead people, as well as, hone their writing and briefing skills. Companion Lab AS401 required for active cadets.

Typically offered in Spring only

AS 401 Junior and Senior Leadership Laboratory (1 credit hours)
AS 401 is the leadership lab component for junior and senior cadets enrolled in the AFROTC program. This laboratory is the hands-on military training where you will apply the knowledge and theory from your academic classes. Additionally it provides cad

Typically offered in Fall and Spring

AS 421 National Security Affairs/Preparation for Active Duty I (3 credit hours)
AS 421 is a three credit hour course and is designed for college seniors. It will give students the foundation to understand their role as military officers in American society. Course examines the factors affecting national security; analyzes the evolution and formulation of U.S. defense policy, strategy, and joint doctrine; and investigates the methods for managing conflict. Companion Lab AS401 required for active cadets.

Typically offered in Fall only

AS 422 National Security Affairs/Preparation for Active Duty II (3 credit hours)
AS 422 is a three credit hour course and is designed for college seniors. It will give students the foundation to understand their role as military officers in American society. Course examines the factors affecting national security; analyzes the evolution and formulation of U.S. defense policy, strategy, and joint doctrine; and investigates the methods for managing conflict. This final semester provides information that will prepare the cadets for Active Duty. Companion Lab AS401 required for active cadets.

Typically offered in Spring only

AS 495 Special Topics in Aerospace Studies (2 credit hours)
Offered as needed to treat new or special subject matter relating to the Department of the Air Force.

Typically offered in Fall and Spring

Africana Studies (AFS)

AFS 230/MUS 230 Introduction to African-American Music (3 credit hours)
Comprehensive survey of African-American music in the United States from Colonial times to the present, with emphasis on its unique features and contributions to American culture.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Fall only

AFS 240 African Civilization (3 credit hours)
An interdisciplinary study of centers of African civilization from antiquity to the 1960s. Such centers include ancient Egypt, Nubia, Axum, Ghana, Mali, Songhai, Kilwa, Malinda, Sofola, Zinzibar and Monomotapa.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer
AFS 241  Introduction to African American Studies  (3 credit hours)
Introduces students to the field of African American/Black Studies. A transdisciplinary approach is used that includes humanistic and social scientific disciplines. The course offers an intellectual and methodological framework for understanding the past, present, and future of people of African descent in the United States of America. Topical areas are covered that capture the historical, political, economic, cultural, sociological and psychological experiences of African Americans.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

AFS 248/ENG 248  Survey of African-American Literature  (3 credit hours)
African-American writing and its relationships to American culture and history. Covers such writers as Wheatley, Douglass, Chesnutt, Dunbar, DuBois, Hughes, Hurston, Wright, and Morrison.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

AFS 260/MUS 260  History of Jazz  (3 credit hours)
A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse. This class may be scheduled with a small percentage of seats held for IDS Students Only.

AFS 275/HI 275  Introduction to History of South and East Africa  (3 credit hours)
The African kingdoms (Lunda, Buganda, and Zulu); the European encroachment; the origins of colonialism and the character of colonial societies and economies, South African apartheid; African protest, nationalism and independence.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

AFS 276/HI 276  Introduction to History of West Africa  (3 credit hours)
The history of Western Africa. Forest civilizations and the slave trade, trade and the expansion of Islam, colonialism in West Africa; African nationalism and the achievement of independence; and postcolonial West Africa.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

AFS 305/SOC 305  Racial and Ethnic Relations  (3 credit hours)
Study of the nature of the relationships among racial and ethnic groups in societies around the world but with emphasis on the United States. Explores topics such as inequalities of wealth, power, and status, racism, conflict, and social boundaries among groups. Current trends in intergroup relations are discussed.

Prerequisite: 3 cr. in SOC, 200 level
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

AFS 342  Introduction to the African Diaspora  (3 credit hours)
Exploration of the global experiences of people of African descent. Geographical areas include the Americas, Europe, Asia, and the Caribbean. Exploration of the web of interrelated histories, social dynamics, and politico-economic processes affecting and reflecting world cultures and histories. Foundational course for the exploration of methodological issues and theoretical concerns in the field of African Diaspora Studies.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

AFS 343/REL 343  African American Religions  (3 credit hours)
History of religions among Americans of African descent from the period of the development of the transatlantic slave trade to the present. Exploration of the complex ways religion has shaped the lifeworld of African Americans.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

AFS 344  Leadership in African American Communities  (3 credit hours)
Historical, cultural and political examination of the dynamics of leadership in African American communities. Focus on structure of Leadership in the context of gender, ideology, and style. Interdisciplinary examination of impact of leaders on broader American society.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

AFS 345/PSY 345  Psychology and the African American Experience  (3 credit hours)
Historical and cultural examination of the psychological experiences of African American experience from pre-American times to the present. Focus on mental health, personality, identity development, racism, oppression, psychological empowerment and an African-centered world view. Discussion of contemporary issues within the African American community.

Prerequisite: PSY 200 or PSY 201
GEP U.S. Diversity
Typically offered in Fall and Spring

AFS 346/ARS 346  Black Popular Culture  (3 credit hours)
A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse. This class may be scheduled with a small percentage of seats held for IDS Students Only.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

AFS 349/ENG 349  African Literature in English  (3 credit hours)
Anglophone literature in Africa. Emphasis on the relationship between the African world-view and literary production and the persistent trend by African writers to connect literature with politics. Writers such as Achebe, Ngugi, Soyinka, and Serote.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only
AFS 372/HI 372 African-American History Through the Civil War, 1619-1865 (3 credit hours)
African background and continuity of the particular role, experience and influence of African Americans in the United States through the Civil War.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

AFS 373/HI 373 African-American History Since 1865 (3 credit hours)
The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

AFS 375/ENG 375 African American Cinema (3 credit hours)
Survey and analysis of African American film culture from 1900-present. Examination of pre-Hollywood, classical Hollywood, and Independent filmmaking. Particular focus on independent filmmakers’ response to dominant industry representations and the work of filmmakers who seek to create a specifically African American cinematic style.

GEP U.S. Diversity
Typically offered in Spring only

AFS 380/WGS 380 Black Feminist Theory (3 credit hours)
Focused examination of Black feminist theory as a significant and distinct body of work. Interdisciplinary exploration of the impact of Black feminist theory on movements for social justice, the development of academic feminism generally, and the lived experience of Black women both in the United States and internationally.

Prerequisite: Any 200-level course in either WGS or AFS
GEP U.S. Diversity
Typically offered in Fall and Spring

AFS 409/PS 409 Black Political Participation in America (3 credit hours)
African American political participation in the United States; political culture, socialization, and mobilization, with a focus on the interaction between African Americans and actors, institutions, processes, and policies of the American political system.

Typically offered in Fall only

AFS 440 Senior Seminar in Africana Studies (3 credit hours)
In-depth examination of Africana Studies issues. Interdisciplinary exploration of key problems and proposed solutions for African communities on the African continent and throughout the world. Requires written research project using interdisciplinary ap

Prerequisite: AFS 342; Africana Studies Majors or Africana Studies Minors
Typically offered in Spring only

AFS 442 Issues in the African Diaspora (3 credit hours)
Multidisciplinary exploration of the interrelated histories, social dynamics, and politico-economic processes of the experiences of people of African descent throughout the world. Particular focus on the experiences of slavery, artistic expression, gender practices, and the impact of the nation-state.

GEP Humanities
Typically offered in Fall and Spring

AFS 448/ENG 548/AFS 548/ENG 448 African-American Literature (3 credit hours)
Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Hurston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

Prerequisite: Junior standing.
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring and Summer

AFS 455/HI 555/AFS 555/HI 455 History of the Civil Rights Movement (3 credit hours)
The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for AFS/HI 455 and AFS/HI 555.

P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

AFS 475/HI 575/AFS 575/HI 475 History of South Africa (3 credit hours)
Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI (AFS) 475 and HI 575.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall and Spring

AFS 476/HI 576/AFS 576/HI 476 Leadership in Modern Africa (3 credit hours)
Recent sub-Saharan African political history (excluding South Africa). Overview of concepts, vocabulary, historical trends. Detailed examination of specific African countries as case studies, such as Ghana, Nigeria, Zimbabwe, Tanzania. Credit will not be given for both HI (AFS) 476 and HI 576.

Prerequisite: 3 hours of history
GEP Global Knowledge

AFS 479/HI 579/AFS 579/HI 479 Africa (sub-Saharan) in the Twentieth Century (3 credit hours)
Developments in sub-Saharan Africa during the colonial period, from the end of the nineteenth century to the advent of decolonization in the early 1960s. Interplay of political, social, economic and cultural factors in the experiences of African peoples during this period. Credit will not be given for both HI (AFS) 479 and HI 579.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only
AFS 490 Africana Studies and Community Involvement  (3 credit hours)
First part of a two semester service-learning experience. Provides interdisciplinary and experientially based opportunity for students to engage in community and classroom-based experiences that examine issues of relevance to African American people(or communities in the African Diaspora). Students apply and examine concepts addressed in class to their own practical experience in service to others. Development of interpersonal and professional skills. Focus on the values, beliefs, attitudes, and ideas that are central to definitions of democracy, social justice, civic resiliency, self-help, and public life.
Prerequisite: Africana Studies Majors or Africana Studies Minors
Typically offered in Fall only

AFS 491 Study Abroad in Africana Studies  (3 credit hours)
Specific category of revolving set of field/seminar courses involving multidisciplinary focal areas taught in foreign countries through Africana Studies. Course includes pre-trip orientation and readings and onsite field experiences and lectures. Additional program fees, travel costs and appropriate immunizations are required beyond registration fees.
Typically offered in Summer only

AFS 497 Topics in African-American Studies  (3 credit hours)
Multidisciplinary examination of selected topics in African-American studies.
Prerequisite: AFS 240
Typically offered in Fall and Spring

AFS 548/ENG 448/AFS 448/ENG 548 African-American Literature  (3 credit hours)
Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Hurston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.
Prerequisite: Junior standing.
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring and Summer

AFS 555/HI 455/AFS 455/HI 555 History of the Civil Rights Movement  (3 credit hours)
The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for AFS/HI 455 and AFS/HI 555.
P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

AFS 575/HI 475/AFS 475/HI 575 History of the Republic of South Africa  (3 credit hours)
Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI (AFS) 475 and HI 575.
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall and Spring

AFS 576/HI 476/AFS 476/HI 576 Leadership in Modern Africa  (3 credit hours)
Recent sub-Saharan African political history (excluding South Africa). Overview of concepts, vocabulary, historical trends. Detailed examination of specific African countries as case studies, such as Ghana, Nigeria, Zimbabwe, Tanzania. Credit will not be given for both HI (AFS) 476 and HI 576.
Prerequisite: 3 hours of history
GEP Global Knowledge

AFS 579/HI 479/AFS 479/HI 579 Africa (sub-Saharan) in the Twentieth Century  (3 credit hours)
Developments in sub-Saharan Africa during the colonial period, from the end of the nineteenth century to the advent of decolonization in the early 1960s. Interplay of political, social, economic and cultural factors in the experiences of African peoples during this period. Credit will not be given for both HI (AFS) 479 and HI 579
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

Agricultural and Extension Education (AEE)

AEE 101 Introduction to Career and Technical Education  (1 credit hours)
Overview of career and technical education programs, objectives, and outcomes in secondary schools. Philosophy of career and technical education and how career and technical education programs fit into the overall mission of secondary education. Mission of agricultural education, major program objectives, and introduction to the curricula taught within the state. Roles and responsibilities of CTE teachers with specific emphasis on agricultural education teachers' roles and responsibilities. Historical context of agricultural education and other career and technical education programs, including major legislation affecting development of career and technical education.
Typically offered in Fall only

AEE 103 Fundamentals of Agricultural and Extension Education  (1 credit hours)
Introduction to the scope, purpose, and objectives of university education with an emphasis on agricultural education, extension education, and agricultural communications. Students will explore College and departmental resources, academic policies and procedures, the agricultural industry, career opportunities, and current trends and issues in agriculture. Cannot receive credit for both AEE 103 and ALS 103
Typically offered in Fall only

AEE 141 Computer Applications in the Agricultural Institute  (2 credit hours)
Introduction to computing concepts and the computing infrastructure in the Agricultural Institute. Use of computing hardware and software to perform common tasks, explore networked computer resources and solve problems associated with the various curricula in the Agricultural Institute.
BOSTICK
Typically offered in Spring only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEE 206</td>
<td>Introduction to Teaching Agriculture</td>
<td>3</td>
<td>Introduction to teaching agricultural education in middle and secondary schools and collaborative efforts for teaching agricultural education to adults as rural community situations dictate. Field experiences include three hours per week of structured observations of classroom teachers, teacher assistant activities, and reflections of the experience.</td>
</tr>
<tr>
<td>AEE 208/ANS 208/PB 208</td>
<td>Agricultural Biotechnology: Issues and Implications</td>
<td>3</td>
<td>Trends and issues of agricultural biotechnology in today's society are addressed while covering the basic biological science behind the technology. Applications of and policy issues associated with plant, animal, and environmental biotechnology used in the agricultural industry are examined from an interdisciplinary approach. Prerequisite: (BIO 105 or BIO 115 or BIO 181 or BIO 183)</td>
</tr>
<tr>
<td>AEE 226</td>
<td>Computer Applications and Information Technology in Agricultural &amp; Extension Ed</td>
<td>3</td>
<td>Use of computers and commercially produced agricultural software; the computer as a management tool; agricultural occupational applications of the computer; a multimedia instructional tool in agricultural classrooms and training situations; use of techn</td>
</tr>
<tr>
<td>AEE 230</td>
<td>Introduction to Cooperative Extension</td>
<td>3</td>
<td>This course is designed for all students who are interested pursuing a career with the cooperative extension service. An introduction to the cooperative extension mission, philosophy, history, organization, structure, administration, program areas, extension program development, extension teaching and delivery methods, and the involvement and use of volunteers. Students are expected to provide their own transportation for outside of class activities and assignments.</td>
</tr>
<tr>
<td>AEE 303</td>
<td>Administration and Supervision of Student Organizations</td>
<td>3</td>
<td>Principles and techniques for organizing, administering and supervising student organization activities.</td>
</tr>
<tr>
<td>AEE 311</td>
<td>Communication Methods and Media</td>
<td>3</td>
<td>Foundations of agricultural communications. Technologies of agricultural communication and the systematic approach to the development of agricultural communication materials. Development of applied skills in design, production, evaluation, and dissemination of information unique to agricultural sciences and media.</td>
</tr>
<tr>
<td>AEE 322</td>
<td>Experiential Learning in Agriculture</td>
<td>3</td>
<td>Planning, organizing, implementing, supervising and evaluating Supervised Agricultural Experience (SAE) programs in agriculture.</td>
</tr>
<tr>
<td>AEE 323</td>
<td>Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
<td>AEE 323 is designed to introduce you to the awesome complexity of leadership. Leadership educators believe that leadership can be learned. In this course, we study leadership theory to help us understand our leadership potential, the potential of others, and the impact great leadership can have on people, organizations, and society. We separate skills you gain from going out and doing leadership (the do) from theories that provide foundations for leadership (the think). Effective leadership is important in all contexts, including food and agriculture. We believe it is ESSENTIAL that effective leaders both THINK and DO!</td>
</tr>
<tr>
<td>AEE 325</td>
<td>Planning and Delivering Non-Formal Education</td>
<td>3</td>
<td>Adult learning theory and practice, including planning non-formal educational programs for adults, methods of instructional delivery, effective use of instructional technology, marketing educational programs, and evaluation of educational outcomes. Microteaching (practice teaching presentations) and group presentations required as part of laboratory assignments.</td>
</tr>
<tr>
<td>AEE 326</td>
<td>Teaching Diverse Learners in AED</td>
<td>3</td>
<td>Legislation and issues regarding diverse learners in middle and high school agricultural education are examined. Discussion and practice in planning and facilitating teaching strategies to help those with special needs in an agricultural setting are em</td>
</tr>
<tr>
<td>AEE 327</td>
<td>Conducting Summer Programs in Agricultural Education</td>
<td>1</td>
<td>Field experience emphasizing summer agricultural education programs. Individualized instruction for students during supervised agricultural experience visits and youth organization activities. Professional development and program improvement activities.</td>
</tr>
<tr>
<td>AEE 350</td>
<td>Personal Leadership Development in Agriculture and Life Sciences</td>
<td>3</td>
<td>This course focuses on the impact of personal leadership on agricultural organizations and society. The best leaders are those who have internalized personal leadership concepts and apply them to the practical situations in their environment. This course teaches individuals to achieve optimal results by changing their fundamental approach to work, relationships, and problem solving, using time-honored principles in time management, leadership, and effectiveness. Restricted to CALS students.</td>
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<tr>
<td>AEE 351</td>
<td>ESSENTIAL that effective leaders both THINK and DO!</td>
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AEE 360 Development Team Leadership in Agriculture and Life Sciences (3 credit hours)
Students in this course will study the impact of organized teams and team leaders on the development of agricultural organizations. Principles and techniques involved in creating, organizing, and directing teams will be explored. Students will develop skills in team decision-making and communication. Topics of discussion will include: components of a group and team, relationships of group and team members, effectiveness of groups and teams, and communication within groups and teams. This course is designed for students who are interested in positions of leadership and who want to learn more about making the groups and teams they work with more effective. Restricted to CALS students.
Prerequisite: AEE 323-Leadership Development in Agriculture
Typically offered in Fall only

AEE 423 Practicum in Agricultural Extension/Industry (8 credit hours)
Participation in professional work experiences in preparation for effective leadership positions in the Cooperative Extension Service or the agribusiness industry.
Prerequisite: AEE 230, AEE 325, and Corequisite of AEE 490
Typically offered in Spring and Summer

AEE 424 Planning Agricultural Educational Programs (3 credit hours)
Principles of program planning applied to educational programs in agriculture; includes theory and field experiences in planning, organizing, and evaluating high school and adult education programs.
Prerequisite: AEE(ED) 426, Corequisite: AEE(ED) 427
Typically offered in Spring only

AEE 426 Methods of Teaching Agriculture (3 credit hours)
Discussion and practice in planning and presenting instruction in agriculture in formal and informal settings. Principles and application of approaches to teaching and organizing instruction, motivating students, developing instructional objectives, selecting and using teaching techniques, evaluating instruction, and managing classroom and laboratory instruction.
Prerequisite: Junior standing.
Typically offered in Fall only

AEE 427 Student Teaching in Agriculture (8 credit hours)
Skills and techniques involved in teaching vocational agriculture through practice in a public school setting with concurrent on-campus seminars.
Prerequisite: AEE (ED) 426; Admission to Professional Semester,
Corequisite: AEE (ED) 490, AEE (ED) 424;
Typically offered in Spring only

AEE 433/AEE 533 Leadership and Management of Volunteers in Agricultural and Extension Education (3 credit hours)
This course is intended to prepare students to be effective managers of volunteer programs. Theory will be emphasized in the course because it is essential to be grounded in theory in order to apply it. Major topics of the course will include, but are not limited to: volunteer recruitment, training, evaluation, and reward. Students will be required to be active in and outside of class sessions, including a 20-hour field experience. Students must provide their own transportation for field trips and outside of class activities. Cannot receive credit for both AEE 433 and 533.
Prerequisite: Junior standing
Typically offered in Fall only

AEE 435 Professional Presentations in Agricultural Organizations (3 credit hours)
This course teaches effective listening strategies, communication strategies, interpersonal skills and presentation strategies essential for use in today's workplace. AEE 435 includes strategies and techniques for effective presentations in the food, agricultural, natural resources, as well as other professions, with emphasis on oral and visual presentation techniques. Presentation skills and strategies for formal and informal situations including conferences, poster presentations along with leadership, conflict resolution, interviewing, negotiation, and group communication theory and strategies will be discussed. Restricted to CALS students; Jr or Sr level status required.
Typically offered in Fall and Spring

AEE 460 Organizational Leadership Development in Agriculture and Life Sciences (3 credit hours)
This course focuses on the impact of effective leadership in organizations in both theory and practice. Students will examine the major theories and studies that are most relevant and informative with the regard to leadership in organizations. Students will develop skills in decision-making, management of organizations, and ethical leadership related to agricultural organizations. Restricted to CALS students.
Prerequisite: AEE 323-Leadership Development in Agriculture
Typically offered in Spring only

AEE 478 Advanced Issues in Extension Education (3 credit hours)
Advanced issues and trends contributing to the administration, organization, and structure of extension education in a changing world. Senior standing required.
Prerequisite: AEE 230
Typically offered in Spring only

AEE 490 Seminar in Agricultural and Extension Education (1 credit hours)
Analysis of opportunities and challenges facing educational leaders in agriculture.
Prerequisite: Admission to Professional Semester
Typically offered in Fall, Spring, and Summer

AEE 491 Seminar in Agricultural Education (1 credit hours)
This course helps students analyze the opportunities and challenges facing teachers of agriculture as they prepare for their careers. Topics include balancing work and professional life as a teacher, portfolio assessments of teachers and programs, classroom management, teacher liability, and preparation for the job search in agricultural education.
Corequisites: AEE 424 and AEE 427
Typically offered in Spring only

AEE 492 External Learning Experience in Agricultural and Extension Education (1-6 credit hours)
Learning experience within an academic framework that utilizes facilities and resources external to the campus. Contact and arrangements with prospective employers initiated by the student and approved by the faculty adviser, prospective employer, and the departmental teaching coordinator prior to the experience. Not intended for teaching licensure for students in AEE
Prerequisite: Sophomore standing
Typically offered in Fall and Spring
AEE 493 Special Problems in Agriculture and Extension Education (1-6 credit hours)
A learning experience in agriculture and extension education within an academic framework that utilizes departmental campus facilities and resources. Arrangements must be initiated by the student and approved by a faculty adviser and the departmental t
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

AEE 495 Special Topics in Agricultural and Extension Education (1-3 credit hours)
Offered as needed to present material not normally available in regular course offerings or for offerings of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

AEE 500 Agricultural Education, Schools and Society (3 credit hours)
The role and structure of modern agricultural education within the overall educational system. School organization and governance, curriculum, teacher roles and responsibilities, educational philosophy and history, multiculturalism, special need students, impact of technology, professionalism, and current educational trends and issues.
Typically offered in Fall and Summer

AEE 501 Foundations Of Agricultural and Extension Education (3 credit hours)
Development and organization of agricultural and extension education in America from colonial times to the present. Emphasis on role of societal and scientific changes, the federal government and philosophy on evolution of agricultural and extension education.
Typically offered in Fall only

AEE 503 Youth Program Management (3 credit hours)
Research, theory and principles of youth organization management. Analysis of youth development models and application of leadership theory in a youth organization. Using evaluation models to assess the effectiveness of major youth organization. Web-based course.
Typically offered in Spring only

AEE 505 Trends and Issues in Agricultural and Extension Education (3 credit hours)
Trends and Issues in Agricultural and Extension Education. Analysis and appraisal of current trends, problems and issues in Agricultural and Extension Education. May include but not limited to scientific, political, demographic, social, educational, technological, and environmental trends and issues that will contribute to the future structure and operation of agricultural and extension education in the United States.
Typically offered in Spring only

AEE 507 Comparative Agricultural and Extension Education (3 credit hours)
Organization and operation of formal and nonformal agricultural education and extension systems in the United States and in other countries. Field trip required - cost approx. $175.00.
Typically offered in Fall only

AEE 510 Information Technologies in Agricultural and Extension Education (3 credit hours)
Principles, theory and techniques of using information technologies to provide instruction to learners, both in person and at a distance, in formal and non formal educational settings.
Typically offered in Spring only

AEE 521 Program Planning in Agricultural and Extension Education (3 credit hours)
Consideration of the need for planning programs in education; objectives and evaluation of community programs; use of advisory group; organization and use of facilities.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

AEE 522 Occupational Experience in Agriculture (3 credit hours)
A major and critical element in all programs of vocational education is provision for appropriate student learning experiences in a real and simulated employment environment. Due to recent developments in education and agriculture, new and expanded concepts of occupational experience devised. Current research substantiates need and desire of teachers of agriculture for assistance in implementing new concepts. Also designed to develop depth of understanding of theoretical foundations underlying new developments in occupational experiences to stimulate individual growth and creativity in implementing further developments.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

AEE 523 Adult Education in Agriculture (3 credit hours)
Designed to meet needs of leaders in adult education. Opportunity to study issues in working with adult groups. Attention given to the problem of fitting educational program for adults into public school and other educational programs and to methods of
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

AEE 524 Coordinating the High School Agricultural Education Program (3 credit hours)
Principles of program planning applied to educational programs about agriculture; theory and field experiences in planning, organizing, and evaluating secondary agricultural education programs; development of plans for conducting all aspects of the complete agricultural education programs.
Typically offered in Spring only

AEE 526 Information Technologies in Agricultural and Extension Education (3 credit hours)
Principles, theory and techniques of using information technologies to provide instruction to learners, both in person and at a distance, in formal and non formal educational settings.
Typically offered in Spring only

AEE 529 Curriculum Development in Agricultural and Extension Education (3 credit hours)
Design and development of data based curriculum and curriculum evaluation procedures in agricultural and extension education. Critique of curriculum development models, contemporary trends and issues, curriculum resources and accountability tools. Analysis of the use of national and state standards as well as local community needs in curriculum development.
Typically offered in Spring only
AEE 533/AEE 433 Leadership and Management of Volunteers in Agricultural and Extension Education (3 credit hours)
This course is intended to prepare students to be effective managers of volunteer programs. Theory will be emphasized in the course because it is essential to be grounded in theory in order to apply it. Major topics of the course will include, but are not limited to: volunteer recruitment, training, evaluation and reward. Students will be required to be active in and outside of class sessions, including a 20-hour field experience. Students must provide their own transportation for field trips and outside of class activities. Cannot receive credit for both AEE 433 and 533.

Prerequisite: Junior standing
Typically offered in Fall and Spring

AEE 535 Teaching Agriculture in Secondary Schools (3 credit hours)
Application of theoretical models and research on effective teaching in secondary agricultural education programs. Teaching strategies, planning required, and instructional management for students with varying backgrounds. Evaluation of student learning and teacher evaluation of instruction.

Typically offered in Fall only

AEE 545 Methods of Change in Agricultural and Human Sciences (3 credit hours)
Processes by which professional change agents in agricultural and extension education influence the introduction, adoption, and diffusion of planned change. This course requires admission to any program of the NC State University Graduate School such as full graduate status, graduate unclassified status, post-baccalaureate studies, evening degree programs, etc. It has no other prerequisites, requisites, or restrictions.

Restriction: Graduate Standing or PBS status.
Typically offered in Spring only

AEE 550 Leadership Theory (3 credit hours)
Leadership is ubiquitous in our society. It remains one of the world's favorite buzz words. However, just because it's everywhere, doesn't mean everything labeled so, is leadership. This graduate course in leadership theory will require you to critically examine your ideas of leadership, and reflect on your own (and society's) notions of "what is leadership". In this class we will separate the skills you gain from going out and doing leadership (the do) and the theories that provide the foundations for leadership (the think). Many successful leaders learn their skills via practice; that is important. AEE 550, however, is a leadership education course where we study leadership theory. We will take those theories, long associated with the academic study of leadership, and deconstruct them using critical theory as our lens. Then, using the text as guide, reconstruct them in new ways to meet today's pressing challenges.

Typically offered in Fall only

AEE 556 Community Leadership (3 credit hours)
The Community Leadership course will prepare graduate students for leadership roles within an array of community settings. The three core competencies for community leadership will be shared which include farming ideas, building and using social capital, and mobilizing resources. Tools associated with each of these competencies will be examined as well as the ways in which to apply these tools to various community situations. Leadership theories that have been learned in AEE 550 will also be discussed to show how to move from theory to practice. This is a course that will require student participation both during class sessions and outside of class where students will be engaged in a team project.
The course will be offered in the spring of odd years.

Prerequisite: Graduate student status and AEE 550: Leadership Theory
Typically offered in Spring only

AEE 577 Evaluation in Agricultural and Extension Education (3 credit hours)
Evaluation is an important part of many social science disciplines and grant projects. The intent of this course is to teach students how to plan and conduct a meaningful and useful evaluation. Students will gain knowledge and skills in planning evaluat

Restriction: Graduate Standing or PBS
Typically offered in Spring only

AEE 578 Scientific Inquiry in Agricultural and Extension Education (3 credit hours)
Philosophy, design, interpretation and practice of scientific research in agricultural and extension education, with a particular focus on the skills necessary to be an effective and critical "consumer" of research that is practiced within the field. Web based course.

Typically offered in Fall, Spring, and Summer

AEE 579 Research Design in Agricultural and Extension Education (3 credit hours)
Design of Research in Agricultural and Extension education. Development of proposals for thesis research or competitive grants. Critical analyses of research in the field and proposed research.

Typically offered in Fall only

AEE 595 Special Topics in Agricultural and Extension Education (1-6 credit hours)
Presentation of material not normally available in regular graduate course offerings or for offerings of new 500 level courses on a trial basis.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

AEE 601 Seminar (1 credit hours)
Current topics and issues in agricultural and extension education. Selection and research of topics, presentation of seminars, and leading group discussions.

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

AEE 610 Special Topics (1-6 credit hours)
Presentation of material not normally available in regular graduate course offerings or for offerings of new 500 level courses on a trial basis.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer
AEE 620  Special Problems in Agricultural and Extension Education (1-6 credit hours)
Exploration of topics of special interest not covered by existing courses by individual students under faculty member's directions. Readings and independent study, problems or research not related to a thesis.
Typically offered in Fall, Spring, and Summer

AEE 641  Practicum In Agricultural and Extension Education (1-6 credit hours)
Faculty-supervised practicum in an educational, extension or agricultural industry setting.
Typically offered in Fall, Spring, and Summer

AEE 685  Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

AEE 690  Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

AEE 693  Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

AEE 695  Master's Thesis Research (1-9 credit hours)
Thesis research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

AEE 696  Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

AEE 699  Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall only

AEE 705  International Agricultural Development (3 credit hours)
This course provides an opportunity to learn about global agricultural and extension education issues, challenges and opportunities relating to agricultural development. The course emphasis is on building necessary knowledge and skills for analyzing global agricultural and extension education issues and formulating alternatives for agricultural development. This course has been designed to help graduate students understand agriculture and extension education with a global perspective.
Prerequisite: Graduate standing
Typically offered in Fall only

AEE 735  Effective Teaching in Agriculture and Life Sciences (3 credit hours)
Theory and practice of effective teaching in agricultural and life sciences. Emphasis on course planning, teaching and learning styles, instructional techniques, laboratory instruction, text construction, student evaluation, instructional technology, and faculty roles and responsibilities.
Prerequisite: Graduate standing
Typically offered in Fall only

AEE 777  Qualitative Research Methods in the Agricultural & Life Sciences (3 credit hours)
Qualitative research methods continue to gain popularity in the disciplines of agricultural & life sciences. It is becoming increasingly important for graduates to have a practical working knowledge of the development, implementation, and evaluation of these methodologies. Topics in the course will include but not be limited to: the foundation of qualitative research, data collection and analysis techniques, and review of qualitative research. Students are encouraged to have completed an introductory research methods course prior to enrolling. Introductory Research Methods course taken at the graduate level.
Typically offered in Spring only

AEE 805/YFCS 809  Colloquium in Agricultural and Human Sciences (1 credit hours)
This course will examine the richness and diversity of scholarship in agricultural and human sciences and its applications to professional practice in a colloquium setting. A primary purpose is to build capacities for individual, professional, and civic work as students apply their learning to develop scholarship and professionalism. The course explores advanced topics and research methods and supports students in presenting and defending their research and research proposals. In successive fall semesters, graduate students participate in three, one-credit colloquia that engage faculty and students from across the Department of Agricultural and Human Sciences. This course requires admission to any program of the NC State University Graduate School such as full graduate status, graduate unclassified status, post-baccalaureate studies, evening degree programs, etc.
Typically offered in Fall only

AEE 820  Special Problems in Agricultural and Extension Education (1-6 credit hours)
Exploration of topics of special interest not covered by existing courses by individual students under faculty member's directions. Readings and independent study, problems or research not related to a thesis.
Typically offered in Fall, Spring, and Summer
AEE 841 Practicum in Agricultural and Extension Education (1-6 credit hours)
Faculty-supervised practicum in an educational, extension or agricultural industry setting.

Typically offered in Fall, Spring, and Summer

AEE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

AEE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

AEE 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

AEE 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Fall only

AEE 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Agricultural Economics (ARE)

ARE 104 Agricultural Business Management (3 credit hours)
Insights into the management skills of a successful agribusiness firm manager. A topical approach to analytical and planning techniques applicable to business decisions. Managerial concepts such as financial analysis, budgeting, investment analysis, capital acquisition, financial and risk management of agribusiness firms. HENDRICKSON

Typically offered in Fall, Spring, and Summer

ARE 106 Agri Business Law (3 credit hours)
The application of legal principles to agribusiness. Includes a review of our legal system contracts, real property, personal property torts, business organization, estate planning, and laws affecting agribusiness.

Typically offered in Fall and Spring

ARE 112 Agricultural & Agribusiness Marketing (3 credit hours)
Marketing concepts, techniques and management of the U.S. marketing system from agricultural production, agribusiness, and traditional business perspectives. Broad, basic knowledge of marketing objectives, the marketing environment, strategic planning, marketing information sources, consumer demographics and lifestyle characteristics, product planning, distribution planning, promotion planning, and price planning. PHILLIPS

Typically offered in Fall only

ARE 113 Principles of Salesmanship (3 credit hours)
"How To" course in selling. Understanding customer's behavior, establishing and maintaining customer rapport, and negotiating a sale. Developing sales skills through discussion, role playing and demonstrations. Emphasis on building self-confidence through selling exercises involving class participation, special assignments, and targeted presentations. WEEMS

Typically offered in Fall and Spring

ARE 114 Value Added Agriculture and Niche Marketing (3 credit hours)
Value Added Agriculture and Niche Marketing are ways to increase farm revenue without having to go off farm for employment. This course is designed to provide insights into the opportunities that are available to increase farm revenue, to see what other farms are currently doing with value added within the region, and to create a value added business plan for expanding farm offerings. Site visits are required components of this course. University transportation provided to all site visits. Student transportation (estimated at $30 per student and site visit (estimated at $7 each for 2 sites) fees apply.

Typically offered in Fall only

ARE 115 Agribusiness Accounting (3 credit hours)
Introduction to basic accounting principles and concepts applicable to an agribusiness firm. Exposure to journals, ledgers and financial statements. Topics of the accounting cycle, inventories, payrolls, accounts receivable, income taxes and the potential use of computers. RUSS

Typically offered in Fall, Spring, and Summer

ARE 121 Agricultural Finance (3 credit hours)
Agricultural Finance teaches students introductory concepts for financial management decisions in agricultural/farm businesses. Topics include building a financial control process, developing risk management strategies, and analyzing investment opportunities. Emphasis is on developing skills necessary to create a financial business plan.

Restriction: AGI Only
Typically offered in Fall, Spring, and Summer

ARE 132 Management of Personnel (3 credit hours)
Personnel problems of recruiting, selecting, training, paying, and motivating employees of an agribusiness firm. Improving organizational effectiveness, functioning of a production supervisor, resolution of conflicts and leadership development. PHILLIPS

Typically offered in Fall and Spring
ARE 133 Agricultural & Environmental Policy (3 credit hours)
History of agricultural and environmental policy, policy formation, agricultural programs, effects of agricultural production on the environment, benefits and costs of agricultural and environmental policy, state of the environment, environmental regulations and their enforcement, optimal level of pollution, incentive-based environmental regulation, outlook for agricultural and environmental policy, and the sustainability of agriculture and of the environment. RUSS

Typically offered in Fall, Spring, and Summer

ARE 141 Personal Financial Management (3 credit hours)
Economic analysis of personal decisions related to consumer purchases, time value of money, taxes, financial risk management, investment strategies, retirement planning and estate planning. Relationship of an individual’s life cycle to budgeting and financial goals. Background information on wise use of credit, home purchase, life insurance, property insurance, health insurance and investment fundamentals. PHILLIPS

Typically offered in Spring only

ARE 194 International Agribusiness Management Study Abroad (1-6 credit hours)
This course is designed to maximize student potential for success by developing a globally and multi-culturally competent agricultural and agribusiness workforce. This course addresses these issues by providing opportunities for students to study abroad in various locations around the world, with different destinations offered each academic year. Credit hours are variable based on length or travel and classroom instruction pre- and post-travel consistent with NCSU policies and practices. Course may be repeated for credit to visit different destinations only. Significant expenses for travel are involved. Please see the instructor for specific program details.

Typically offered in Spring and Summer

ARE 201/ARE 201A Introduction to Agricultural & Resource Economics (3 credit hours)
Introduction to economic principles of marginal benefits and costs with application to consumer and producer decisions. Functions of market exchange systems in determining prices and quantities and creation of wealth. Property rights and opportunities for exchange. Role of government in dealing with agricultural and resource problems. Macroeconomic analysis including inflation, unemployment, money and banking system. Credit will not be given for both ARE 201 and either EC 201 or EC 205.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

ARE 201/ARE 201A Introduction to Agricultural & Resource Economics (3 credit hours)
Introduction to economic principles of marginal benefits and costs with application to consumer and producer decisions. Functions of market exchange systems in determining prices and quantities and creation of wealth. Property rights and opportunities for exchange. Role of government in dealing with agricultural and resource problems. Macroeconomic analysis including inflation, unemployment, money and banking system. Credit will not be given for both ARE 201 and either EC 201 or EC 205.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

ARE 215 Small Business Accounting (3 credit hours)

Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall, Spring, and Summer

ARE 260 Marketing and Risk Management in the Pork Industry (1 credit hours)
A comprehensive overview of structure and trends in markets and marketing options available in the swine industry. Management of market risk with hedging or other contracts.

Prerequisite: ANS 150
Typically offered in Spring only

ARE 270 Principles of Agribusiness Entrepreneurship (3 credit hours)
Principles of Agribusiness Entrepreneurship is the first course of three in the Agribusiness Entrepreneurship course sequence. It teaches students the applied entrepreneurship skills needed to identify and create an opportunity in agribusiness and how to

Corequisite: ARE 201
Typically offered in Fall and Spring

ARE 290 Professional Development in Agricultural Business Management (3 credit hours)
This course focuses on establishing professional development foundations for incoming students in Agricultural Business Management. The material emphasizes on diversity in the field and workplace, career exploration, and preparation for internship and work applications. Topics include self-reflection, goal-setting, professional development, resume building, job shadowing, and identity exploration from local, global, and workplace perspectives. Non-scheduled class time for field trips or out-of-class activities are required one day per semester for this class. If transportation will pose a problem for a student, the department will provide transportation. This course is restricted to students in the Agricultural Business Management major or admission by departmental approval.

Restriction: Agricultural Business Management major or departmental approval.
Typically offered in Fall, Spring, and Summer

ARE 295 Special Topics in Agricultural & Resource Economics (200 Level) (1-6 credit hours)
An offering of new freshman to sophomore-level courses on trial basis with topics varying based on offerings. Repetition with different course content acceptable up to 4 times and for a total of 12 units.

Typically offered in Fall, Spring, and Summer
ARE 301/EC 301 Intermediate Microeconomics (3 credit hours)
Functioning of the market economy, role of prices in determining the allocation of resources, the functioning of the firm in the economy, forces governing the production and consumption of economic goods.
Prerequisite: MA 121 or MA 131 or MA 141 and EC 201 or EC 205 or ARE 201
Typically offered in Fall, Spring, and Summer

ARE 303 Farm Management (3 credit hours)
Analytical and planning techniques for making business decisions centered around farm business applications. Economic principles and management concepts such as budgeting, accounting, finance credit, investment analysis, business organization, risk, and taxes as related to practical problems of operating a farm business.
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall and Spring

ARE 304 Agribusiness Management (3 credit hours)
Management decision-making by food, fiber, horticulture, and forestry firms. Emphasis on current agribusiness topics such as information utilization, strategic planning, organization structures, competitor intelligence, pricing, leadership, crisis management, ethics, and human resource management. Business communications, agribusiness case studies, and a computerized management simulation game.
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall, Spring, and Summer

ARE 306 Agricultural Law (3 credit hours)
Legal principles of practical importance in an agricultural setting: the court system; tort, contract and real and personal property law; legal aspects of organizing an agribusiness; environmental and labor regulations affecting agriculture; income and estate taxation of agriculture. Credit for both ARE 306 and BUS 307 is not allowed
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall, Spring, and Summer

ARE 309 Environmental Law & Economic Policy (3 credit hours)
Current federal and state environmental laws and regulations and their common law foundations. Relationship of the law and its regulatory mechanisms to economic policy issues: externalities, pollution taxes, incentives, permit trading, and cost-benefit analysis. Major environmental topics including water and wetlands, solid and hazardous wastes, pesticides, clean air, endangered species and nuisance actions. Overview of the legal system.
Prerequisite: ARE 201 or EC 201 or EC 205
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

ARE 311 Agricultural Markets (3 credit hours)
Agricultural marketing system and economic forces affecting its structure and efficiency. Public policy issues affecting agricultural markets. Emphasis on the analysis of current sources of agricultural market information. Marketing and storage problems
Prerequisite: ARE 201 or EC 201 or EC 205
GEP Social Sciences
Typically offered in Fall only

ARE 312 Agribusiness Marketing (3 credit hours)
Application of marketing and economic principles to decision making in contemporary agribusiness firms. Marketing strategies, marketing research and information, segmentation and targeting, marketing mix, and market plans within food, fiber, natural resource, and production input industries. Professional selling skills and knowledge. Off-campus field experience and visiting lecturers from the agribusiness industry.
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall, Spring, and Summer

ARE 321 Agricultural Financial Management (3 credit hours)
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Spring only

ARE 323 Agribusiness Finance (3 credit hours)
ARE 323 teaches the history of monetary systems, the development of business finance tools and banking, and detailed creation and use of business financial statements, including Income Statements, Balance Sheets, and Statements of Cash Flow, within the context of the agribusiness industry. Two Finance courses are offered in the Agribusiness Management Major: ARE 321 - Agricultural Financial Management, which focuses on the history of finance in agriculture and financial planning for farmers and similar independent agricultural enterprises; and ARE 323 - Agribusiness Finance, which focuses on finance for larger agribusinesses and for managers of agribusiness divisions in larger organizations.
Prerequisites: (ARE 201 or EC 201) and (ACC 200 or ACC 210 or equivalent Introductory Accounting Course)
Typically offered in Fall, Spring, and Summer

ARE 332 Human Resource Management for Agribusiness (3 credit hours)
General introduction to human resource management in agribusinesses. Skills for agribusiness owners for efficient productivity from employees in a legal and ethical manner. Topics on labor economics, human resource legislation, employee planning and recruitment, and migrant labor issues. Emphasis on techniques for training, motivating, leading, and disciplining employees.
Prerequisite: ARE 201 or EC 201 or EC 205
Typically offered in Fall, Spring, and Summer

ARE 336/EC 336 Introduction to Resource and Environmental Economics (3 credit hours)
Application of basic economic tools to understand and evaluate environmental/resource policies. Concepts such as property rights, non-market goods, allocation over time, externalities, and public goods. Current policy issues such as global climate change, evaluating natural resource damages from oil spills, reducing the costs of regulations, protecting estuaries, and dealing with non-point source pollution.
Prerequisite: ARE 201 or EC 201 or EC 205
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring
ARE 345 Global Agribusiness Management (3 credit hours)
Global trade is the largest growth area in American agribusiness, and knowledge of international agribusiness markets is one of the primary qualifications desired from college graduates entering the workforce. This course provides detailed knowledge of the six major regions for agribusiness trade worldwide, to prepare students to understand, speak intelligently about, and capitalize on opportunities for NC and US agribusiness products in the global marketplace. Students will be required to provide their own transportation to local markets and incidental expenses for meals representative of the six major regions connected with class assignments. Please see the Instructor for details.
Prerequisite: EC 201 or EC 205 or ARE 201
GEP Global Knowledge
Typically offered in Spring only

ARE 370 Agribusiness New Venture Development (3 credit hours)
Agribusiness New Venture Development is the second course of three in the Agribusiness Entrepreneurship course sequence. It teaches students how to develop a new venture idea into a business model. Students learn how to collect and interpret data needed
Prerequisite: ARE 270
Typically offered in Fall and Spring

ARE 395 Special Topics in Agricultural and Resource Economics (300 level) (1-6 credit hours)
An offering of new junior-level courses on trial basis with topics varying based on offerings. Repetition with different course content acceptable up to 4 times and total of 12 units.
Typically offered in Fall, Spring, and Summer

ARE 404 Advanced Agribusiness Management (3 credit hours)
An advanced course in business planning that integrates the risk and uncertainty associated with production, marketing, and financial management strategies of agribusiness firms. Focuses on the fundamental components required to develop a strategic business plan and design a viable business strategy in the context of the firm’s market and its internal environment. Special attention is given to the application of economic theory and analysis to business decision-making processes. 80% of enrollment is restricted to Agricultural & Resource Economics students with the remaining 20% open for all other majors.
Prerequisite: (ARE 303 or ARE 304), ARE 321, and (ARE 311 or ARE 312)

ARE 412 Advanced Agribusiness Marketing (3 credit hours)
ARE provides opportunities for undergraduates to gain experience with the practical application of Marketing principles with real and fictitious Agribusiness products through two courses taken on campus: ARE 412 and ARE 413. These opportunities are provided to students that are specifically interested in pursuing a Marketing or Sales position after graduation, especially when an internship is not an option. The practical applications often require two semesters (one full academic year) to complete, so student involved in projects are encouraged to take ARE 412 in the Fall and ARE 413 in the Spring. Projects very each year.
Prerequisite: ARE/EC 201 or EC 205; Pre- or Co-requisite: ARE 312 or BUS 360
Typically offered in Fall only

ARE 413 Applied Agribusiness Marketing (3 credit hours)
ARE provides opportunities for undergraduates to gain experience with the practical application of Marketing principles with real and fictitious agribusiness products through two courses taken on campus, ARE 412 and ARE 413. These opportunities are provided to students that are specifically interested in pursuing a Marketing or Sales position after graduation, especially when an internship is not an option. The practical applications often require two semesters (one full academic year) to complete, so students involved in projects are encouraged to take ARE 412 in the Fall, and ARE 413 in the Spring. Projects vary each year. This course is an elective for ABM, BBM, and related CALS majors. Departmental approval required to enroll in course.
Prerequisite: ARE 201/EC 201 or EC 205, ARE 312, ARE 412
Typically offered in Spring only

ARE 415 Introduction to Commodity Futures Markets (3 credit hours)
An economic introduction to futures and options contracts and exchanges, with primary focus on agricultural and natural resource commodities.
Prerequisites: ARE 201 or EC 201 or EC 205 or equivalent
Typically offered in Spring only

ARE 420 Taxation in Agriculture, Production, and Agribusiness (3 credit hours)
Students will explore the effect of various tax obligations on farms and rural agribusinesses. Topics of discussion include income taxation, both federal and state, Social Security taxation, property taxation, sales and use taxation, and estate and gift taxation.
Prerequisites: ARE 215 or ARE 303 or ARE 304 or ARE 321
Typically offered in Spring only

ARE 425 Contracts and Organizations in Agriculture (3 credit hours)
This course deals with agricultural contracts and organizational structures in agriculture and food industries. The covered material relies on the economic theory to explain observed empirical phenomena. The approach also relies on the use case studies of different contractual arrangements observed in the U.S. agriculture. The content delivery consists of instructor's lectures, guest lectures and students' presentations. Grading is based on exams, presentations and a class project.
Prerequisite: ARE/EC 301 or equivalent or instructor's permission
Typically offered in Fall only

ARE 433 U.S. Agricultural Policy (3 credit hours)
Government economic policies and programs affecting agricultural inputs and farm products. Analysis of the rationale, objectives, and major types of agricultural programs and their effects on resource allocation and income distribution within agriculture and between agriculture and the rest of the economy.
Prerequisite: ARE(EC) 301
GEP Social Sciences
Typically offered in Fall and Spring
ARE 444 Ethics in Agribusiness (3 credit hours)
Ethical behavior is a crucial issue in American business, especially after numerous ethical lapses over the past decade, and for agribusiness given claims of marketing unhealthy foods, development of genetically-modified organisms, hiring of undocumented workers, and consolidation into industrial production facilities. Students are taught ethical theories and frameworks, used to discuss general ethical questions such as death, theft, and lying, followed by the more specific agribusiness issues mentioned above. Students will formulate their own opinions about these issues, recognize and understand the opinions of others, and be able to accurately and adequately communicate those opinions.

Typically offered in Fall and Spring

ARE 448 International Agricultural Trade (3 credit hours)
Study of the economic forces that drive international trade in agriculture, food, and natural resources. Economic principles, analytical techniques, and empirical analysis are used to explain international trade and foreign direct investment in the global marketplace.

Prerequisites: ARE 201 or EC 201 or EC 205 or equivalent. Typically offered in Fall only

ARE 455 Agribusiness Analytics (3 credit hours)
Agribusiness Analytics provides an overview and involved application of analysis and common analytical methods in the agricultural industry. Emphasis on methods to predict, evaluate, and otherwise inform agribusiness decision makers.

Prerequisites: ST/BUS 350 or ST 311 Typically offered in Fall only

ARE 470 Agribusiness Entrepreneurship Clinical Skills Development (3 credit hours)
Agribusiness Entrepreneurship Clinical Skills Development is the third of three courses in the Agribusiness Entrepreneurship course sequence. This course teaches students the clinical skills needed to analyze questions faced by startups and other companies as they pursue opportunities in agribusiness. Students provide counseling to agribusiness developers in exchange for experience and an opportunity to build their business networks. Students will create and execute action plans with partner companies, conduct research, and develop a written analysis and recommendations for specific questions posed by the companies.

Prerequisite: ARE 270 and ARE 370 Typically offered in Fall and Spring

ARE 475 Food Policy (3 credit hours)
This course will provide students a theoretical basis and empirical tools to examine U.S. federal, state, and local food policies. Applications covered will explore contemporary food policy issues such nutrition assistance programs; regulations governing food safety, food transport and food trade; alternatives to the conventional food system (i.e. local foods, urban farming); health and nutritional labeling and claims; and the quickly evolving policy and legal environment affecting food adulteration, food fraud, and national food defense.

Prerequisites: ARE 301 or EC 201 Typically offered in Fall, Spring, and Summer

ARE 490 Career Seminar in Agriculture & Resource Economics (1 credit hours)
Planning and preparing for career choices. Resume writing, networking, interviewing, personality characteristics, and job searching. Visits with employer representatives. Employer expectations and career opportunities. Researching firms and employment opportunities. Oral and written presentations.

Prerequisite: Sophomore standing Typically offered in Spring only

ARE 492 External Learning Experience (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

Prerequisite: Sophomore standing Typically offered in Fall, Spring, and Summer

ARE 493 Special Problems/Research Exploration (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: ARE Sophomore standing Typically offered in Fall, Spring, and Summer

ARE 494 Agribusiness Study Abroad (1-6 credit hours)
Global trade is the largest growth area in American agribusiness, and knowledge of international agribusiness markets is a primary qualification desired from college graduates entering the workforce. This course addresses these issues by providing opportunities for students to study abroad in various locations around the world, with different destinations offered each academic year. Credit hours are variable based on length of travel and classroom instruction pre-and post-travel consistent with NCSU policies and practices. Course may be repeated for credit to visit different destinations only. Significant expenses for travel are involved. Please see the instructor for specific program details.

ARE 495 Special Topics in Agricultural and Resource Economics (1-6 credit hours)
Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis.

ARE 590 Special Topics in ARE (1-99 credit hours)
Special Topics in ARE
Agricultural Institute (AGI)

AGI 100 Enhancing Academic Success (1 credit hours)
This course is designed to introduce students to strategies for effective learning that will help them succeed at NC State University and in their future careers. Students will have the unique opportunity to participate in a class format that focuses on

Typically offered in Fall and Spring

AGI 101 Introduction to the Agricultural Institute (1 credit hours)
Introduction to the collegiate experience; academic skills of successful students; curricula of the Agricultural Institute; career opportunities of graduates; introduction to computers.

Requisite: Agricultural Institute Only
Typically offered in Fall and Spring

AGI 120 Spanish For AG Stu (3 credit hours)
This is an introductory conversational Spanish course specifically designed for agricultural students. The main goal of this course is to give students some basic grammatical and communication skills so that they will be able to interact with Spanish speaking people.

Requisite: Agricultural Institute Only
Typically offered in Fall and Spring

AGI 191 Professional Development (1 credit hours)
Professional Development is designed to introduce students to various skills (as identified by current research) that employers feel are important for prospective employers to have. This course will provide students the opportunity to develop and practice these skills.

Typically offered in Fall, Spring, and Summer

AGI 192 AGI External Learning Experience (1-3 credit hours)
Learning experience in one of the six majors in the Agricultural Institute that utilizes facilities and resources external to the campus. Students can choose from multiple external learning experiences. Students who complete an external learning experience.

Requisite: Agricultural Institute Only and AGI 191
Typically offered in Fall, Spring, and Summer

AGI 193 AGI Special Problems and On-campus Learning (1-6 credit hours)
Learning experience in one of the eight majors in the Agricultural Institute that utilizes facilities and resources on the campus. (Contact with the project supervisor must be initiated by student and approved by the faculty adviser and the Director of

Requisite: Agricultural Institute Only
Typically offered in Fall, Spring, and Summer

AGI 194 International Learning Experience in AGI (1-6 credit hours)
Course offered as needed for international learning experiences in the Agricultural Institute involving international travel and immersion in an international culture. A written report is required and student must identify a faculty member to work with

Requisite: Agricultural Institute Only
Typically offered in Spring only

AGI 195 Special Topics in the Agricultural Institute (1-4 credit hours)
Timely topical courses or experimental course offerings in the Agricultural Institute.

Requisite: Agricultural Institute Only
Typically offered in Fall, Spring, and Summer

Agriculture and Life Sciences (ALS)

ALS 103 Freshman Transitions and Diversity in Agriculture & Life Sciences (1 credit hours)
Introduction to scope and objectives of university education. Overview of curricula, academic requirements, and career opportunities in agriculture and life sciences. Overview of campus resources and support services. Discussion of expectations for academic and career success including professionalism, diversity, and inclusiveness. Restricted to CALS majors of freshman or sophomore status. Students will not receive credit for both ALS 103 and ALS 303.

Prerequisite: CALS Majors with less than 30 Credit Hours
GEP U.S. Diversity
Typically offered in Fall and Spring

ALS 110 Academic and Career Skills Seminar (1 credit hours)
Students learn about the career decision-making process through the integration of self-knowledge. Emphasis is placed on Agriculture and Life Sciences careers. Students assess interests, values, skills and personal strengths while learning about a variety of campus and career resources.

Prerequisite: Ag and Life Science Majors
Typically offered in Fall and Spring

ALS 303 Transfer Transitions and Diversity in Agriculture & Life Sciences (1 credit hours)
Introduction to scope and objectives of university education. Overview of curricula, academic requirements, and career opportunities in agriculture and life sciences. Overview of campus resources and support services. Discussion of expectations for academic and career success including professionalism, diversity, and inclusiveness. Restricted to CALS majors with 30 or more credit hours completed. Students will not receive credit for both ALS 103 and ALS 303.

R: CALS Majors >30 credits
GEP U.S. Diversity
Typically offered in Fall and Spring

ALS 398 Agriculture and Life Sciences Honors Seminar (2 credit hours)
A seminar/discussion honors course with emphasis on a team approach to scientific research into topics that link science with issues in society; exposure to leadership skills and bioethics; requirement of detailed written or oral reports; career develop

Prerequisite: Enrollment by invitation for sophomores or juniors in CALS with GPA 3.35 or higher.
Typically offered in Spring only
Animal Science (ANS)

ANS 101 Introduction to Livestock and Poultry Industries (3 credit hours)
General introduction to nutrition, reproduction, breeding, management and description of marketing channels of animals and poultry. Equates live animal and carcass characteristics with market specifications. Factors of pre- and post-slaughter treatment are related to the shelf life of fresh and processed meats. MCCRAW/GREGORY
Requisite: Agricultural Institute Only
Typically offered in Fall only

ANS 102 Animal Feeds and Nutrition (3 credit hours)
Basics of animal nutrition and feeding. Identification and classification of common feedstuffs, including relative nutritional value for livestock and poultry. General nutrition and changes in requirements as influenced by production and the animal’s life cycle. Applied aspects of feeding and nutrition of livestock and poultry. Agricultural Institute Students Only (Class= 01 or 02).
Requisite: Agricultural Institute Only
Typically offered in Fall only

ANS 103 Beef Production (3 credit hours)
Genetics, reproduction, nutrition, animal health, forage management and marketing channels as related to beef cattle enterprises.
Requisite: Agricultural Institute Only
Typically offered in Fall only

ANS 104 Swine Production (4 credit hours)
Management principles associated with swine production. Primary emphasis on interactions of health, equipment, nutrition, reproduction and genetics during nursery, finishing, farrowing and breeding phases of production. Management of farrowing, finishing and farrow to finish operations. Emphasis on management kills, computer applications and economics.
Requisite: Agricultural Institute Only
Typically offered in Fall only

ANS 105 Introduction to Companion Animal Science (3 credit hours)
Companion animals are often considered family members. This course surveys the variation available in companion animals (dog breeds, cat breeds, fish, reptiles, amphibians, rabbits, pet pigs, ferrets, hamsters, gerbils, mice, rats, birds & newer pets such as hedgehogs, prairie dogs & sugar gliders) and then examines related human and animal issues in more depth. Biological explanations are stressed for understanding disease states and normal behaviors of companion animals. These explanations are discussed from the point of view of problem behaviors in the average home housing these animals. This course will help educate the students about companion animals so that both the animals and their human families will be happier and more productive members of society. ANS 105 will enable students to pick the pet or specific breed that is best for them so that pets and owners stay together. Restricted to Freshmen and Sophomores.
Restriction: Freshmen & Sophomores only
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer
ANS 110 Introduction to Equine Science (3 credit hours)
Introduction to Equine Science is a course designed for Freshmen and Sophomores of any major. There are no pre-requisites for this course. We will discuss terminology, impact of horses on history and society, breeds, uses, management, genetics, reproduction, health, nutrition, behavior, and business aspects of the horse industry. Restricted to Freshmen and Sophomores.

Prerequisite: Freshman standing or Sophomore standing
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

ANS 150 Introduction to Animal Science (3 credit hours)
Introduction to the principles and physiology of animal management, the contributions of animals and animal products to humanity, the application of science to animal production, and issues regarding animal production. The course includes biological aspects of animal science such as animal behavior, anatomical and physiological aspects of reproduction and nutrition, animal breeding and genetics, and human/animal interactions. Normal management and production techniques [including proper terminology] as well as social issues and current events related to livestock, equines, and companion mammals are discussed. Prerequisite: None. Course is 3 credits. Class meets Monday, Wednesday, and Friday 8:30 to 9:20 am in Fall and Spring. Internet only during the Summer. Fall semesters are restricted to new incoming Animal Science Freshmen. Open to all students in Spring and Summer.

Typically offered in Fall, Spring, and Summer

ANS 151 Introduction to Animal Science Lab (1 credit hours)
Hands-on experience and demonstrations with livestock and horses; identification of common management equipment and knowledge of proper use; animal tracts, organs, skulls, feeds, breeds, and other animal-related items or topics. The lecture (ANS 150) must be taken concurrently or have been passed previously with a C-minus or higher. This lab course is restricted to the following majors: Animal Science, Ag Extension, Ag Science, and Ag Education. Transportation is provided to the off-campus labs, and students will be returned to campus prior to the end of the scheduled lab period.

Corequisite: ANS 150; R: Animal Science or Ag Extension or Ag Science or Ag Education majors
Typically offered in Fall and Spring

ANS 201 Techniques of Animal Care (2 credit hours)
A laboratory course in the applied management of beef cattle, dairy cattle, equine, swine and small ruminants with required participatory assignments of common techniques utilized in livestock production. These techniques include but are not limited to castration, animal ID, and hoof trimming. Most of course will be held at the various Teaching Educational Units and will be held outdoors. Therefore, students should arrive for the course dressed appropriately for the lab activities and weather conditions of each day. Students will be working with animals, which comes with an inherent risk of injury. Students will be instructed on safety measures at the beginning of the semester and before each lab. Transportation will be provided to the scheduled course meetings but students will be required to provide their own transportation to the Teaching Educational Units for required assignments outside of class time.

Prerequisite: ANS 150 and ANS 151 (all ANS Majors) or ANS 101 (Ag Institute Livestock, Poultry Mgmt Program; Restriction: Junior or Senior Animal Science majors
Typically offered in Fall and Spring

ANS 205 Physiology of Domestic Animals (3 credit hours)
This course is designed to introduce students to mammalian physiology (structure and function) with emphasis on livestock species. Students will gain a basic understanding of body systems including circulatory, muscular, skeletal, digestive, and reproductive systems and functions of those systems with relevance to the whole animal and maintenance of homeostasis.

Prerequisite: (BIO 181 or BIO 183) and Sophomore standing
Typically offered in Fall, Spring, and Summer

ANS 206 Anatomy of Domestic Animals Lab (1 credit hours)
This lab course is designed for Animal Science majors to take with the ANS 205 lectures (Physiology of Domestic Animals). Students will learn to identify major anatomical and cellular structures from domestic animal (livestock) specimens through examin

Corequisite: ANS 205
Typically offered in Fall and Spring

ANS 208/PB 208/AEE 208 Agricultural Biotechnology: Issues and Implications (3 credit hours)
Trends and issues of agricultural biotechnology in today’s society are addressed while covering the basic biological science behind the technology. Applications of and policy issues associated with plant, animal, and environmental biotechnology used in the agricultural industry are examined from an interdisciplinary approach.

Prerequisite: (BIO 105 or BIO 115 or BIO 181 or BIO 183) GEP Interdisciplinary Perspectives
Typically offered in Spring and Summer

ANS 215/HS 215 Agricultural Genetics (3 credit hours)
To provide an introduction to the science of genetics as applied to agriculture. Emphasis is given to qualitative and quantitative genetics. By the end of this course, students should be able to apply genetic concepts to efficiently solve problems and make predictions necessary for “real-life” agricultural situations.

Prerequisite: BIO 183 or equivalent or instructor's consent
GEP Natural Sciences
Typically offered in Fall only

ANS 220 Reproductive Physiology (3 credit hours)
Biological processes in reproduction and lactation with emphasis on domestic mammals such as cattle, sheep, horses, swine, dogs, and cats. Environmental and genetic factors that affect these processes. Identification, evaluation and solutions of problems in these physiological areas.

Prerequisite: ANS 205 or BIO 250 or ZO 250
Typically offered in Fall and Spring

ANS 221 Reproductive Physiology Lab (1 credit hours)
ANS 221 is a laboratory course that introduces students to the application of principles of reproduction and lactation in domestic mammals. Students must have either completed or concurrently be enrolled in ANS 220. This course is restricted to Animal Science majors (SAS, IAS).

Corequisite of ANS 220
Typically offered in Fall and Spring
ANS 225 Principles of Animal Nutrition (3 credit hours)
This online Principles of Animal Nutrition course is designed for non-Animal Science majors and off-campus students. It includes: feed classification, gastrointestinal tract anatomy of domestic mammals, nutrients and their functions, digestion and metabolism, feed regulations, and feeding/nutrition of cattle, small ruminants, horses, swine, poultry, dogs, cats, and rabbits. For on-campus students, ANS 225 counts toward the Animal Science minor but only counts as a Free Elective for Animal Science majors.

Typically offered in Summer only

ANS 230 Animal Nutrition (3 credit hours)
Introduction to nutrition, digestion, and absorption in domestic mammals. Major nutrient classes and their functions in the body, feed classification and chemical analysis, feed processing, and nutrient requirements.

Prerequisite: ANS 150 or BIO 183; ANS 205 is also recommended.
Typically offered in Fall and Spring

ANS 231 Animal Nutrition Lab (1 credit hours)
ANS 231 is a laboratory course that introduces students to the application of principles of nutrition and applied feeding of domestic mammals. Students must have either completed or concurrently be enrolled in ANS 230. This course is restricted to Animal Science Majors (SAS, IAS).

Corequisite: ANS 230
Typically offered in Fall and Spring

ANS 240/ANS 240A Livestock Merchandising (3 credit hours)
This course is designed to acquaint students with different methods for merchandising livestock and with strategies for adding value to products produced from livestock. Students will learn new ways to promote a farming operation. Required visits to Ani

Prerequisite: ANS 150; Restrictive Statement: Students must be Juniors or Seniors
Typically offered in Spring only

ANS 240A/ANS 240 Livestock Merchandising (3 credit hours)
This course is designed to acquaint students with different methods for merchandising livestock and with strategies for adding value to products produced from livestock. Students will learn new ways to promote a farming operation. Required visits to Ani

Prerequisite: ANS 150; Restrictive Statement: Students must be Juniors or Seniors
Typically offered in Spring only

ANS 260 Basic Swine Science (2 credit hours)
Basic disciplines and concepts involved in swine production including: industry structure, trends and statistics; production phases and buildings; genetic improvement; reproduction; nutrition; health and biosecurity; nutrient management; marketing, meat quality, and career opportunities in the swine industry.

Restriction: Non-ANS (Animal Science) students only. ANS students cannot take this course for credit.
Typically offered in Spring only

ANS 261 Swine Health and Biosecurity (1 credit hours)
Introduction and basic overview of the immune system, swine disease transmission and pathobiology, standard biosecurity protocols, identification of disease in pigs, basic treatment administration, and disease prevention.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring only

ANS 262 Swine Breeding and Gestation Management (1 credit hours)
Management principles associated with breeding and gestation in swine. Emphasis on reproductive anatomy and physiology of boars and sows, development of replacement animals, semen production and evaluation, artificial insemination, and use of reproductive records. Extensive use of reproductive case studies.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring only

ANS 263 Farrowing Management (1 credit hours)
Advanced integration and application of factors important in the proper care and management of swine during farrowing and lactation.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring and Summer

ANS 264 Swine Nursery and Finishing Management (1 credit hours)
Overview of the critical management, housing, and financial considerations relevant to the successful operation of a swine nursery, grow-finish, or wean to finish enterprise.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring and Summer

ANS 265 Contemporary Issues in the Swine Industry (1 credit hours)
Overview of current issues affecting pork production in the United States, including, but not limited to: environment, Swine welfare and profitability/market issues. Development of skills to promote animal agriculture when dealing with the media and general public.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring only

ANS 266 Swine Environment Management (1 credit hours)
Course includes response of swine to thermal environment ventilation system design and analysis, heating and cooling, systems and examples of various designs for all phases of production. Troubleshooting and energy analysis will be included as well.

Prerequisite: ANS 150 or equivalent
Typically offered in Fall only

ANS 267 Swine Manure and Nutrient Management (1 credit hours)
Course includes manure production rates, manure handling systems, storage and manure management planning for land applications. Some odor mitigation technologies will be covered.

Prerequisite: ANS 150 or equivalent
Typically offered in Spring only
ANS 268 Employee Management for the Swine Industry (1 credit hours)
Effective employee management in swine production units. Principles, policies, and practices related to hiring, development and retention of employees, as well as fundamental organizational management.
Prerequisite: ANS 150 or equivalent
Typically offered in Fall only

ANS 269 Internship in the Swine Industry (1 credit hours)
Experiential learning in the swine industry through opportunities that provide hands-on experience and exposure to the scope of pork enterprises. Students can expect to apply principles and practices already learned, and add practical experience to their skill sets and knowledge base. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: ANS 150 or equivalent
Typically offered in Summer only

ANS 270 Pork Export Markets from a Swine Production Perspective (1 credit hours)
Introduction to global markets; cultural preferences and customs associated with the global swine industry. International trade regulations and potential impact of foreign animal diseases and bioterrorism affecting the U.S. swine industry.
Prerequisite: ANS 150 or equivalent
Typically offered in Summer only

ANS 271 Swine Nutrition (1 credit hours)
Principles involved with developing and implementing a swine feeding program, including fundamentals of feeding pigs, understanding nutrients used in pig diets, factors affecting nutrient recommendations, feeding systems for pigs, feed ingredients, and formulation of swine diets.

"Restriction: Restricted to non-ANS (Animal Science) students. ANS students cannot take the course for credit."
Typically offered in Fall only

ANS 281 Professional Development of PreVeterinary Track Students (1 credit hours)
This course introduces PreVeterinary track students to the scope of the veterinary profession and to current issues affecting veterinary professionals. The course will help students gain an understanding of the professional requirement of the veterinary profession.
Prerequisite: ZO 160 or BIO 125 or BIO 181 or BIO 183
Typically offered in Spring only

ANS 290 Professional Development for Animal Science Careers (2 credit hours)
This course will teach students how to navigate the career decision-making process to make an informed decision and discuss career options in the field of Animal Science. The course will also help students evaluate and develop their professional compete.
Animal Science Majors Only
Typically offered in Fall and Spring

ANS 303 Principles of Equine Evaluation (2 credit hours)
Students will learn about and apply methods for evaluating conformation and function of performance and halter horses, soundness, breed standards, rules and regulations for evaluation, selection, and performance. Guest lecturers and field trips.
Prerequisite: ANS 150 or ANS 110
Typically offered in Spring only

ANS 304 Dairy Cattle Evaluation (2 credit hours)
The first half of this course covers basic aspects of dairy cattle breeds, dairy character, form and function including type traits and linear scoring of dairy cattle, interpreting and using judging scorecards, comparing/evaluating dairy cattle, and placing animals in a class. The second half of the course develops the student's ability to correctly evaluate dairy cattle classes, but more importantly to support their opinions through oral communication.
Prerequisite: ANS 150
Typically offered in Spring only

ANS 309 Livestock Evaluation (3 credit hours)
Students will be exposed to basic concepts associated with growth, development and value determination of livestock. Familiarization with official USDA grading standards for cattle, sheep, swine and goats is emphasized. Introduction to judging terminology, placing classes of livestock and justification through oral reasons.
Prerequisite: ANS 150
Typically offered in Fall only

ANS 322/FS 322/PO 322 Muscle Foods and Eggs (3 credit hours)
Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processed meat items.
Prerequisite: ZO 160, BIO 181 or BIO 183
Typically offered in Fall only

ANS 324/FS 324 Milk and Dairy Products (3 credit hours)
Introduction to the manufacture of dairy products. Dairy processing procedures from the farm, through the dairy plant, and to the consumer are studied. The course consists of 15 learning modules, three exams, and a project.
Prerequisite: BIO 181 or 183, CH 101
Typically offered in Fall only

ANS 330 Laboratory Animal Science (3 credit hours)
A sophomore to senior level course designed to cover the basics of laboratory animal science, a specialty dealing with the use of vertebrate animal species in intensive research. Some topics to be covered are: husbandry, facility management, animal health and welfare, diagnostics, surgical area management, research methods and administrative duties. Students will use the material for studying for the certification as a Laboratory Animal Technician via the American Association For Laboratory Animal Science (AALAS). A separate fee is required for certification; this fee is not covered by tuition for ANS 330. Must hold sophomore standing or higher.
Typically offered in Spring only
ANS 395 Animal Science Study Abroad (1-6 credit hours)
This course provides an international perspective on animal management, conservation and various animal-related industries by allowing students to study abroad in various locations around the world, with different destinations offered each academic year. Credit hours are variable based on length of travel and classroom instruction pre- and post-travel consistent with NCSU policies and practices. Course may be repeated for credit to visit different destinations only. Significant expenses for travel are involved. Please consult with the instructor or the Study Abroad Office for specific program details.

GEP Global Knowledge
Typically offered in Fall, Spring, and Summer

ANS 400 Companion Animal Management (3 credit hours)
Anatomy, physiology, nutrition, genetics, and health of companion animals including cats, dogs, rabbits, rats, mice, reptiles, amphibians, and fish. Problem solving and enterprise management skills in laboratories.
Prerequisite: ANS 105 and Junior standing
Typically offered in Spring only

ANS 402 Beef Cattle Management (3 credit hours)
ANS 402 integrates technical information from nutrition, reproduction, genetics, physiology, and animal welfare into management decisions that will enhance a beef cattle operation. Students will engage in beef cattle and environmental management and varied communication formats to explore relationships between sectors of the beef industry from cow-calf to the consumer.
Prerequisite: ANS 150, Junior standing
Typically offered in Spring only

ANS 403 Swine Management (3 credit hours)
Management principles associated with swine production. Emphasis on interactions of health, equipment, nutrition, reproduction and genetics during nursery, finishing, farrowing and breeding phases of production. Waste management practices and alternatives, development of marketing strategies and economic evaluation of management practices.
Prerequisite: ANS 150; Restrictive Statement: Students must be Juniors or Seniors
Typically offered in Fall only

ANS 404 Dairy Cattle Management (3 credit hours)
In ANS 404, students will develop a better understanding of dairy cattle management with an emphasis on the impact of decisions on productivity, health, profitability, and the future of the dairy enterprise.
Prerequisite: ANS 150, Junior standing
Typically offered in Spring only

ANS 408 Small Ruminant Management (3 credit hours)
Principles and practices of production, management, and marketing of sheep and goats. Role of genetics, nutrition, reproduction and animal health. Hands-on experience and field trips during labs.
Prerequisite: ANS 150, Junior standing
Typically offered in Fall only

ANS 410 Equine Breeding Farm Management (3 credit hours)
Equine anatomy, physiology, nutrition, genetics and health. Laboratory emphasis on reproductive management, breeding, problem solving, and management skills. Field trips required.
Prerequisite: ANS 110 and Junior standing
Typically offered in Spring only

ANS 411 Management of Growing and Performance Horses (3 credit hours)
This course is an overview of scientific applications used in management of growing and performance horses. Topics include: nutrition and feeding, disease prevention, exercise conditioning, and methods of evaluation and selection. Students required to provide their own transportation to labs. Must hold junior or senior standing.
Prerequisite: ANS 110
Typically offered in Fall only

ANS 415/NTR 415/PO 415/PO 515/NTR 515/ANS 515 Comparative Nutrition (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.
Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

ANS 425/FM 425/PO 425/NTR 525/FM 525/ANS 525/PO 525/NTR 425 Feed Manufacturing Technology (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.
Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

ANS 440/ANS 540 Animal Genetic Improvement (3 credit hours)
Modern evaluation and selection procedures for domestic animals; selection goals, estimation of breeding values and performance testing; their impact on genetic changes.
Prerequisite: (ANS/HS 215 or GN 311) and (ST 311 or ST/BUS 350) and Junior standing
Typically offered in Fall and Summer

ANS 452/ANS 552/PHY 552/PHY 452 Comparative Reproductive Physiology and Biotechnology (3 credit hours)
Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies and ethical issues associated with the application of reproductive biotechnologies. Credit
Prerequisite: ANS 220
Typically offered in Fall only

ANS 453/ANS 540 Animal Genetic Improvement (3 credit hours)
Modern evaluation and selection procedures for domestic animals; selection goals, estimation of breeding values and performance testing; their impact on genetic changes.
Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

ANS 452/ANS 552/PHY 552/PHY 452 Comparative Reproductive Physiology and Biotechnology (3 credit hours)
Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies and ethical issues associated with the application of reproductive biotechnologies. Credit
Prerequisite: ANS 220
Typically offered in Fall only

ANS 453/ANS 553 Physiology and Genetics of Growth and Development (3 credit hours)
Introduction to the basic concepts of growth with emphasis on domestic mammals. Growth of the major classes of animal tissues and regulation by endogenous and exogenous factors. Relationship to efficiency of animal production. Credit will not be given.
Typically offered in Fall only
ANS 454/NTR 454/ANS 554 Lactation, Milk and Nutrition (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.
Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421
Typically offered in Spring only

ANS 480 Judging Team (1 credit hours)
Students practice judging techniques for livestock, horses, or dairy animals, including ranking animals and providing oral reasons to defend the rankings. Students meet weekly with a coach to practice locally and will also travel to compete in one or two regional or national competitions. Each team (livestock, horse, dairy) is expected to raise funds to finance the trips. Students earn 1 credit for being on a team, and can earn up to 3 credits of Free Elective for ANS 480 by serving on the judging team for different species. Field trips that last several days are required. Departmental Approval Required. Course may be taken up to 3 times (once per species).
Prerequisite: ANS 303 or ANS 304 or ANS 309
Typically offered in Fall only

ANS 492 Professional Internship Experience in the Animal Sciences (1-3 credit hours)
This course provides an opportunity for students to gain experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Department of Animal Science prior to the start of the experience. To gain approval, a student must submit the completed ANS 492 contract and have it approved by his/her experience supervisor, academic advisor and the ANS 492 coordinator. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.
Typically offered in Fall, Spring, and Summer

ANS 493 Research Experience in the Animal Sciences (1-3 credit hours)
This course provides an opportunity for students to gain real-world experience in a scientific research program. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Department of Animal Science prior to the start of the experience. To gain approval, a student must submit the completed ANS 493 contract and have it approved by his/her research supervisor, academic advisor and the ANS 493 coordinator. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.
Typically offered in Fall, Spring, and Summer

ANS 494 Teaching Experience in the Animal Sciences (1-3 credit hours)
This course provides an opportunity for students to gain experience with some aspect of teaching, including: leading or facilitating lessons, producing educational resources, or education research. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Animal Science Department prior to the start of the experience. To gain approval, a student must submit the completed ANS 494 contract and have it approved by his/her research supervisor, academic advisor and the ANS 494 coordinator. If the experience involves education research, the research mentor is encouraged to require a research paper or poster presentation as part of the work expectations when appropriate. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.
Typically offered in Fall, Spring, and Summer

ANS 495 Special Topics in Animal Science (1-3 credit hours)
Offered as needed to present material not normally available in regular course offerings or for offering of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

ANS 515/ANS 415/NTR 415/PO 415/PO 515/NTR 515 Comparative Nutrition (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.
Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

ANS 525/PO 525/NTR 425/ANS 425/FM 425/PO 425/NTR 525/ FM 525 Feed Manufacturing Technology (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.
Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

ANS 530 Advanced Applied Animal Reproduction (3 credit hours)
Current reproductive management techniques for each of the major mammalian livestock species. Enable students to develop reproductive decision making skills. Must hold graduate status.
Prerequisite: ANS 220
Typically offered in Spring only

ANS 531 Advanced Applied Animal Reproduction Lab (1 credit hours)
Practical experience in routine reproductive management techniques discussed in ANS 530. Must hold graduate status.
Prerequisite: ANS 220, Corequisite: ANS 530
Typically offered in Spring only
**ANS 540/ANS 440 Animal Genetic Improvement** (3 credit hours)
Modern evaluation and selection procedures for domestic animals; selection goals, estimation of breeding values and performance testing; their impact on genetic changes.

Prerequisite: (ANS/HS 215 or GN 311) and (ST 311 or ST/BUS 350) and Junior standing

Typically offered in Fall and Summer

**ANS 550/NTR 550 Applied Ruminant Nutrition** (3 credit hours)
Applied concepts in ruminant nutrition for the practicing agricultural professional. Protein, energy, vitamin and mineral nutrition in relation to the nutritional needs and practical feeding of beef cattle, dairy cattle, sheep, and goats. New developments in feeding systems, feed additives and the prevention and treatment of metabolic disorders. Emphasis on solving problems in case studies. Permission given to undergraduates

Prerequisite: ANS 230 or ANS(NTR,PO) 415. Permission given to undergraduates

Typically offered in Fall only

**ANS 552/PHY 552/PHY 452/ANS 452 Comparative Reproductive Physiology and Biotechnology** (3 credit hours)
Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies and ethical issues associated with the application of reproductive biotechnologies. Credit

Prerequisite: ANS 220

Typically offered in Fall only

**ANS 553/ANS 453 Physiology and Genetics of Growth and Development** (3 credit hours)
Introduction to the basic concepts of growth with emphasis on domestic mammals. Growth of the major classes of animal tissues and regulation by endogenous and exogenous factors. Relationship to efficiency of animal production. Credit will not be given

Typically offered in Fall only

**ANS 554/ANS 454/NTR 454 Lactation, Milk and Nutrition** (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.

Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421

Typically offered in Spring only

**ANS 561/NTR 561 Equine Nutrition** (3 credit hours)
This course explores concepts in equine nutrition including digestive physiology of horses, nutrient requirements for different classes of horses and feed management. Ration evaluation and balancing, as well as problem solving will be a core component to this course.

Prerequisite:NTR 500 or NTR/FS 501 or NTR/PO 515

Typically offered in Spring only

**ANS 565/NTR 565 Advanced Canine and Feline Nutrition** (3 credit hours)
This course is about the advanced principles of nutrition within canines and felines. The course focuses on the unique gastrointestinal tracts for the two species as well as their specific nutrient requirements and how the animal industry addresses them

Restriction: Graduate Student or Senior with 3.35 GPA; Prerequisite: 400-level Nutrition Course

Typically offered in Fall only

**ANS 571/BCH 571 Regulation of Metabolism** (3 credit hours)
Study of hormonal, enzymatic and molecular-genetic regulation of carbohydrate and lipid metabolism; emphasis on mammalian species.

Prerequisite: BCH 451, GN 311, a course in physiology, cell biology

Typically offered in Fall only

**ANS 575 Current Topics in Genomics and Proteomics in Animal Science** (3 credit hours)
The objective of this course is to provide students with an integrated exposure to the major current concepts in genomics and proteomics. Genomic and proteomic methods will be covered at a level that will allow students to read and comprehend articles.

Prerequisite: ANS 215 or GN 411

Typically offered in Spring only

**ANS 590 Topical Problems in Animal Science** (1-3 credit hours)
Selection or assignment of special problems in various phases of animal science.

Typically offered in Fall and Spring

**ANS 601 Animal Science Seminar** (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

**ANS 603 Reproductive Physiology Seminar** (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

**ANS 604 Animal Breeding and Genetics Seminar** (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

**ANS 610 Topical Problems in Animal Science** (1-6 credit hours)
Selection or assignment of special problems in various phases of animal science.

Typically offered in Fall, Spring, and Summer

**ANS 641 Practicum in Animal Science** (1-3 credit hours)

Typically offered in Fall and Spring

**ANS 685 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student

Typically offered in Fall and Spring
ANS 690 Master's Exam (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ANS 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ANS 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ANS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

ANS 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ANS 701 NTR 701 Protein and Amino Acid Metabolism (3 credit hours)
Study of protein and amino acid metabolism, regulation, dietary requirements and techniques for their investigation in human and other animals.
Prerequisite: BCH 453, ZO 421, a 400-level nutrition course
Typically offered in Spring only

ANS 702 PHY 702 Reproductive Physiology of Mammals (3 credit hours)
Survey of reproductive strategies among vertebrates; in-depth coverage of mammalian reproductive physiology; gametogenesis, fertilization, embryonic and fetal development, parturition, puberty, neuroendocrine control mechanisms in male and female mammals.
Prerequisite: ZO 421
Typically offered in Fall and Spring

ANS 708 GN 708 Genetics of Animal Improvement (3 credit hours)
Emphasis on the utilization of basic principles of population and quantitative genetics in animal improvement. Factors affecting genic and genotypic frequencies and methods of estimating genetic and nongenetic variance, heritabilities and breeding values. The roles of mating systems and selection procedures in producing superior genetic populations.
Prerequisite: GN 311 and ST 512
Typically offered in Spring only

ANS 709 Energy Metabolism (3 credit hours)
Relationship of biochemical and physiological events within cell, tissue, organ and system with nutrient needs as sources of energy for productive animal life. Digestion, absorption and metabolism of energy sources. Processes of energy transformations within the body in relation to energetics, biological oxidation, anabolic and catabolic systems, metabolic control, partitioning and efficiency.
Prerequisite: BCH 553

ANS 713 GN 713 Quantitative Genetics and Breeding (3 credit hours)
Quantitative and population genetic theory of breeding problems; partitioning of genetic variance, maternal effects, genotype by environment interaction and genetic correlation; selection indexes; design and analysis of selection experiments; marker-assisted selection.
Prerequisite: GN 509, ST 512
Typically offered in Fall only

ANS 726 FOR 726 CS 726 Advanced Topics In Quantitative Genetics and Breeding (3 credit hours)
Advanced topics in quantitative genetics pertinent to population improvement for quantitative and categorical traits with special applications to plant and animal breeding. DNA markers - phenotype associations. The theory and application of linear mixed models, BLUP and genomic selection using maximum likelihood and Bayesian approaches. Pedigree and construction of genomic relationships matrices from DNA markers and application in breeding.
Prerequisite: ST 511, Corequisite: ST 512
Typically offered in Spring only

ANS 780 PHY 780 Mammalian Endocrinology (3 credit hours)
Mammalian endocrine system with emphasis on ontogeny and anatomy of key organs; synthesis and action of hormones. Role of hormones in regulation of physiological processes such as metabolism, exocrine function, digestion, ion balance, behavior, lactation, growth and reproduction.
Prerequisite: BCH 451, ZO 421

ANS 790 Advanced Special Topics in Animal Science (1-6 credit hours)
Selection or assignment of advanced special problems in various disciplines of animal science.
Prerequisite: Graduate Standing
Typically offered in Fall and Spring

ANS 803 Reproductive Physiology Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

ANS 804 Animal Breeding and Genetics Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

ANS 810 Topical Problems in Animal Science (1-6 credit hours)
Selection or assignment of special problems in various phases of animal science.
Typically offered in Fall, Spring, and Summer
ANT 251 Physical Anthropology (3 credit hours)  

GEP Social Sciences  
Typically offered in Fall and Spring

ANT 252 Cultural Anthropology (3 credit hours)  
Comparative study of contemporary human culture, social institutions and processes that influence behavior. The range of human cultural variation shown throughout the world, including the student's own cultural system.

GEP Global Knowledge, GEP Social Sciences  
Typically offered in Fall, Spring, and Summer

ANT 253 Unearthing the Past: Introduction to World Archaeology (3 credit hours)  
World-wide survey of origins of human society, technology and culture in Old Stone Age, and origins of agriculture, cities, and civilizations of the Bronze and Iron Age in Europe, Asia, Africa, and pre-Columbian Middle and South America.

GEP Global Knowledge, GEP Social Sciences  
Typically offered in Fall and Spring

ANT 254 Language and Culture (3 credit hours)  
Focus among the aspects of human language and between aspects of language and culture. Topics such as: descriptive and comparative linguistics, structuralism, language and thought, sociolinguistics, bilingualism, culture change and linguistic changes.

GEP Social Sciences, GEP U.S. Diversity  
Typically offered in Fall, Spring, and Summer

ANT 261/SOC 261 Technology in Society and Culture (3 credit hours)  
Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks in U.S. and non-U.S. societies associated with technological innovations. Special attention to the role of scientists and engineers in socio-cultural change. Topical case studies apply course concepts and principles. Core sociological and anthropological concepts, methods, theories.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences  
Typically offered in Fall, Spring, and Summer

ANT 295 Special Topics in Anthropology (1-3 credit hours)  
Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

ANT 310 Native Peoples and Cultures of North America (3 credit hours)  
Native North American peoples and cultures including Eskimos and Aleuts. Theories of origin and selected prehistoric cultural manifestations. People and cultures at the time of European contact and post-contact cultural change. Contemporary problems.

Prerequisite: ANT 252 or HI 365  
GEP Social Sciences, GEP U.S. Diversity  
Typically offered in Fall and Summer

ANT 315 The Aztecs, Maya, and Their Predecessors: Archaeology of Mesoamerica (3 credit hours)  
This course introduces the peoples and cultures of Mesoamerica from prehistoric times to the Colonial period. Themes include the peopling of the New World, the development of agriculture and social inequality, and the rise of states and empires. Covers the cultures of the Olmec, Maya, Zapotec, and Aztec as well as the ongoing importance of these cultures for the people of Mexico and Central America. Introduces primary archaeological and ethnohistoric sources and the anthropological approach to understanding people and cultures through their material remains.

Prerequisite: 3 credits of 200-level Anthropology, or HI 215, or HI 216  
GEP Global Knowledge, GEP Social Sciences  
Typically offered in Fall only
ANT 325  Andean South America  (3 credit hours)
The societies, cultures, politics, economics and ecology of the Andean countries of South America (Peru, Bolivia, Ecuador, Chile, Colombia). Special attention is paid to the development of pre-Columbian Andean societies.
Prerequisite: ANT 252 or HI 215 or HI 216
GEP Global Knowledge, GEP Social Sciences
Typically offered in Spring only

ANT 330  Peoples and Cultures of Africa  (3 credit hours)
African peoples and cultures, especially in sub-Saharan Africa; past and present social patterns of indigenous African populations from a cross-cultural perspective.
Prerequisite: ANT 252 or HI 275 or HI 276
GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

ANT 345  Anthropology of the Middle East  (3 credit hours)
An introduction to the anthropology of Middle Eastern societies. Themes include religion and secularism, gender and sexuality, national identity and the state, memory and commemoration, violence and conflict, youth culture, and popular uprisings.
GEP Global Knowledge, GEP Social Sciences
Typically offered in Spring only

ANT 346  Peoples and Cultures of Southeast Asia  (3 credit hours)
Southeast Asian peoples and cultures; past and present social patterns of selected mainland and insular Southeast Asian peoples; culture change; relations between minorities and dominant ethnic groups; development of nationalism.
Prerequisite: ANT 252
Typically offered in Fall only

ANT 351/FLJ 351  Contemporary Culture in Japan  (3 credit hours)
Introduction to basic aspects of cultural practices in Japanese society, including education, work life, family relationships, everyday religious practices, aesthetic traditions, national identity, and gender. Students will develop an understanding of the interrelationships between language and culture.
Prerequisite: FLJ 101
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ANT 354  Peoples and Cultures of the Pacific  (3 credit hours)
The Pacific Ocean contains thousands of inhabited islands. This course examines the millions of people and thousands of societies that live in the Pacific and its three subregional areas Melanesia, Micronesia and Polynesia. Course topics include the Pacific environment, peopling of the Pacific, regional cultural variation, social organization, Exchange systems, politics, conflict, modernization, globalization and global warming in the Pacific region.
Prerequisite: ANT 252
Typically offered in Spring only

ANT 370  Introduction to Forensic Anthropology  (3 credit hours)
Provides a broad overview of forensic anthropology, an applied field of biological anthropology. Students will apply the science of biological anthropology to the legal process and humanitarian arena. Students will identify skeletal remains to determine age, sex, ancestry, stature, and unique features of a decedent. Course will address general identification techniques, but proficiency is not expected.
GEP Social Sciences
Typically offered in Fall and Spring

ANT 371  Human Variation  (3 credit hours)
Survey of basic principles of population genetics with emphasis on mechanisms that shape human biological variation. Geographic variation. Analysis of laws of heredity exhibited in modern human populations via microevolution and adaptation. Historical
Prerequisite: ANT 251

ANT 374  Disease and Society  (3 credit hours)
Survey of diseases that affect human beings and human societies past and present. Analysis of how diseases affect societies with different economies (gathering/hunting, pastoral, agricultural, industrial) and of different social complexity. Impact of diseases on human evolution.
Prerequisite: ANT 251 or ANT 252

ANT 389  Fundamentals of Archaeological Research  (3 credit hours)
Overview of the objectives, field strategies, basics of laboratory analysis, and interpretative approaches to the archaeological record. Analysis and classification of lithics, shell, bone, ceramics, metal, soils, and perishable materials.
Prerequisite: ANT 253 or Instructor Permission
Typically offered in Summer only

ANT 395  Special Topics in Anthropology  (1-3 credit hours)
Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

ANT 411/ANT 511  Overview of Anthropological Theory  (3 credit hours)
A detailed introduction to anthropological theory, interpretive styles and research techniques of major nineteenth and twentieth century anthropologists working within the analytic frameworks of their times, positions espoused by anthropologists in contemporary debates concerning the discipline's future. Students cannot receive credit for both ANT 411 and ANT 511.
Prerequisite: 3 credits of 200-level Anthropology

ANT 412/ANT 512  Applied Anthropology  (3 credit hours)
History, aims, methods and ethics of applied anthropology. Anthropological practice in government, industry, community development, education, and medicine. Analysis of consequences of development programs for culture change. Credit cannot be given for both 412 and 512.
Typically offered in Spring only
ANT 416/ANT 516  Research Methods in Cultural Anthropology  (3 credit hours)
A systematic overview of cultural anthropological research methods including designing research projects, research techniques, field work methods, and cross-cultural comparison. Reviews relevant ethical questions and anthropologists’ reports of their own field work.
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330, 345, 346, 351, or 354
Typically offered in Summer only

ANT 419  Ethnographic Field Methods  (3 credit hours)
Ethnographic research methods as part of a summer field school abroad. Topics: research design, participant observation, field note writing, interviewing, sampling, coding, computers in ethnographic research, analysis and ethics.
Prerequisite: Six hours of cultural anthropology
Typically offered in Summer only

ANT 421/ANT 521  Human Osteology  (3 credit hours)
Survey of all the bones of the human skeleton from an anthropological perspective, including their names, important features useful in recognizing fragmentary specimens from an archaeological context, and techniques for determining the side of the body they come from. Skeletal development and its relationship to skeletal abnormalities. Issues relating to the study of archaeological skeletons.
Prerequisite: ANT 251 and any ANT 300 Level
Typically offered in Fall only

ANT 422/ANT 522  Forensic Anthropology Crime Scene Investigation Field Methods  (3 credit hours)
Introduction to the most commonly utilized field and crime scene recovery methods for human remains including probing, gridding, mapping, excavation, and evidence collection. Students are responsible for transportation to the mock crime scene located on Centennial Campus. Students may not receive credit for both ANT 422 and ANT 522.
Typically offered in Summer only

ANT 424/ANT 524  Bioarchaeology  (3 credit hours)
Survey of approaches used by bioarchaeologists to understand past lifeways through the study of excavated human remains, and the theories that inform those approaches. Analysis and critique of the ways in which bioarchaeologists use skeletal and mortuary data to reconstruct health and disease patterns, mortality rates, diet, degree of interpersonal violence, and social structure among humans from the distant past.
Prerequisite: ANT 421
Typically offered in Spring only

ANT 427  Bioarchaeological Fieldwork  (3 credit hours)
An introduction to the bioarchaeology of the local region, and an overview of the objectives, field strategies, ad laboratory methods used by bioarchaeologists to prepare and study human remains from archaeological cemeteries. Includes laboratory work on field osteology and processing of skeletal remains. Provides an understanding of how bioarchaeologists proceed from excavation of osteological remains to preparation and analysis. Course is offered as part of an NCSU Study Abroad Program. All costs associated with the course, except for textbooks, are paid via the Study Abroad Program fee.
Prerequisite: ANT 421
Typically offered in Summer only

ANT 428/ANT 528  Human Paleopathology  (3 credit hours)
Survey of diseases that manifest on the human skeleton. Analysis and identification of these diseases from a clinical perspective through all life stages from radiographic analysis, macroscopic analysis, and photographic analysis.
Prerequisite: ANT 251
Typically offered in Spring only

ANT 431/ANT 531  Tourism, Culture and Anthropology  (3 credit hours)
Anthropological approach to tourism studies with emphasis on cross-cultural aspects of international tourism. Attention to impact of mass tourism as compared to alternative tourism; environmental and economic impact of tourism; impact of international
Prerequisite: Three hours of cultural anthropology
Typically offered in Fall and Summer

ANT 433/ANT 533  Anthropology of Ecotourism and Heritage Conservation  (3 credit hours)
Introduction to how cultures and societies view, utilize, interpret and conserve environmental and cultural heritage resources; includes examination of theory and concepts of place, identity, sacred heritage, ecotourism, wildlife management as well as the cultural politics and practices of environmentalist and heritage management. Some limited travel to NC heritage sites required at student expense.
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Spring only

ANT 444/WGS 444/ANT 544/WGS 544  Cross-Cultural Perspectives on Women  (3 credit hours)
Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women’s statuses and roles. Effect of gender on social position
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Spring only

ANT 450/ANT 550  Culture, Ecology, and Sustainable Living  (3 credit hours)
Examines the myriad ways that culture serves to mediate the human-environmental equation. Focus is given to different belief systems, subsistence strategies, technological achievements, and policy formulations. Topics covered include cultural ecology, gender and the environment, land tenure, development, ethnosciencen and cognitive ecology, subsistence and social organization, historical and political ecology, environmentalism, and environmental policy issues.
Prerequisite: One of the following: ANT 310, 325, 330 or 346

ANT 460/ANT 560  Urban Anthropology  (3 credit hours)
Anthropological study of cities. Examination of cross-cultural patterns of behavior in urban areas and adaptive strategies that urban dwellers employ. Introduction to major theoretical and methodological approaches relevant to an understanding of conte
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Fall only
ANT 461/ANT 561 Wealth, Poverty and International Aid (3 credit hours)
Examines notions of wealth and poverty in a variety of cultural settings, as well as ideas of whether and how people categorized as poor or rich might alter their status. These findings are applied to case studies of current international aid organizations that carry out poverty relief.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

ANT 464/ANT 564 Anthropology of Religion (3 credit hours)
Examination of various anthropological perspectives on the role of religion in social life, and discussion of theoretical and methodological issues pertaining to the study of ritual and belief.

Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Spring only

ANT 471/IS 471/IS 571/ANT 571 Understanding Latino Migration (3 credit hours)
This collaborative, hands-on class examines what ultimately drives migration and how families, communities, and policy-makers respond to migration in ways that can keep the process going. Focusing on emigration from Mexico, Guatemala, Honduras, and El Salvador, the course reviews the historical foundation for today's migration with attention to migration to North Carolina.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Summer only

ANT 475/ANT 575 Environmental Archaeology (3 credit hours)
Archaeological investigation of human-environmental interactions and human impacts on ancient environments. Focuses on the causes of environmental change (climate, human activity) and the implications for understanding human nature, predicting future problems, and addressing current crises. Topics include reconstructing paleoclimates, the extinction of megafauna, anthropogenic landscapes, environmental degradation and the collapse of ancient states, sustainability and the Anthropocene.

Prerequisites: ANT 253 and one 300-level anthropology course
Typically offered in Fall and Spring

ANT 483/ANT 583 Theories of Archaeological Research (3 credit hours)
Covers the theories that inform archaeological research in the effort to locate and interpret material evidence about past human activities. Topics include the history of archaeology, theories of archaeological practice and interpretation, ethics, and working with stakeholders. Relies on case studies and major syntheses and critiques of current theoretical debates. Cases focus on the origins of social complexity, human-environmental interactions, and critical perspectives on inequality, race, class, gender, and ethnicity. Students may not receive credit for both ANT 483 and ANT 583.

Prerequisite: ANT 251 or 253 and 3 credit 300-level ANT
Typically offered in Fall only

ANT 495 Special Topics in Anthropology (3 credit hours)
Detailed investigation of a topic in anthropology. Topic and mode of study determined by faculty member(s).

ANT 496 Anthropology Internship (6 credit hours)
Supervised observation and experience in work settings appropriate to anthropological perspectives. Study of the relationships between internship setting and relevant anthropological theory, methods and research. Weekly seminars, individual conferences and an integrative report. Students are responsible for arranging their own transportation to internship sites. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: ANT 412, ANT 416; Senior standing in Anthropology (B.A.)
Typically offered in Fall and Spring

ANT 498 Independent Study in Anthropology (1-6 credit hours)
Independent study of a topic in anthropology. Topic and mode of study determined by faculty member(s) and student(s). Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: Six hours of ANT
Typically offered in Fall, Spring, and Summer

ANT 501 Proseminar: Introduction to Graduate Studies in Anthropology (3 credit hours)
Introduction to anthropological research process; introduction to anthropology faculty; research proposal design; career planning; professional development; campus resources.

R: Anthropology Graduate students
Typically offered in Fall only

ANT 511/ANT 411 Overview of Anthropological Theory (3 credit hours)
A detailed introduction to anthropological theory, interpretive styles and research techniques of major nineteenth and twentieth century anthropologists working within the analytic frameworks of their times, positions espoused by anthropologists in contemporary debates concerning the discipline's future. Students cannot receive credit for both ANT 411 and ANT 511.

Prerequisite: ANT 252 and ANT 310 or ANT 325 or ANT 330 or ANT 345 or ANT 346 or ANT 354
Typically offered in Fall only

ANT 512/ANT 412 Applied Anthropology (3 credit hours)
History, aims, methods and ethics of applied anthropology. Anthropological practice in government, industry, community development, education, and medicine. Analysis of consequences of development programs for culture change. Credit cannot be given for both 412 and 512.

Typically offered in Spring only

ANT 516/ANT 416 Research Methods in Cultural Anthropology (3 credit hours)
A systematic overview of cultural anthropological research methods including designing research projects, research techniques, field work methods, and cross-cultural comparison. Reviews relevant ethical questions and anthropologists' reports of their own field work.

Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330, 345, 346, 351, or 354
Typically offered in Fall only
ANT 521/ANT 421 Human Osteology (3 credit hours)
Survey of all the bones of the human skeleton from an anthropological perspective, including their names, important features useful in recognizing fragmentary specimens from an archaeological context, and techniques for determining the side of the body they come from. Skeletal development and its relationship to skeletal abnormalities. Issues relating to the study of archaeological skeletons.
Prerequisite: ANT 251 and any ANT 300 Level
Typically offered in Fall only

ANT 522/ANT 422 Forensic Anthropology Crime Scene Investigation Field Methods (3 credit hours)
Introduction to the most commonly utilized field and crime scene recovery methods for human remains including probing, gridding, mapping, excavation, and evidence collection. Students are responsible for transportation to the mock crime scene located on Centennial Campus. Students may not receive credit for both ANT 422 and ANT 522.
Typically offered in Summer only

ANT 524/ANT 424 Bioarchaeology (3 credit hours)
Survey of approaches used by bioarchaeologists to understand past lifeways through the study of excavated human remains, and the theories that inform these approaches. Analysis and critique of the ways in which bioarchaeologists use skeletal and mortuary data to reconstruct health and disease patterns, mortality rates, diet, degree of interpersonal violence, and social structure among humans from the distant past.
Prerequisite: ANT 421
Typically offered in Spring only

ANT 528/ANT 428 Human Paleopathology (3 credit hours)
Survey of diseases that manifest on the human skeleton. Analysis and identification of these diseases from a clinical perspective through all life stages from radiographic analysis, macroscopic analysis, and photographic analysis.
Prerequisite: ANT 251
Typically offered in Spring only

ANT 529 Advanced Methods in Forensic Anthropology (4 credit hours)
Advanced methods in forensic anthropology—an applied field of biological anthropology. Application of the science of biological anthropology to the medicolegal process. Identification of skeletal remains to determine age, sex, ancestry, stature, and unique features of a decedent. Analysis of human skeletal remains. Identification techniques addressed and proficiency expected. Students must provide their own transportation to the laboratory site.
Prerequisite: Graduate Standing
Typically offered in Spring only

ANT 531/ANT 431 Tourism, Culture and Anthropology (3 credit hours)
Anthropological approach to tourism studies with emphasis on cross-cultural aspects of international tourism. Attention to impact of mass tourism as compared to alternative tourism; environmental and economic impact of tourism; impact of international
Prerequisite: Three hours of cultural anthropology
Typically offered in Fall and Summer

ANT 533/ANT 433 Anthropology of Ecotourism and Heritage Conservation (3 credit hours)
Introduction to how cultures and societies view, utilize, interpret, manage and conserve environmental and cultural heritage resources; includes examination of theory and concepts of place, identity, sacred heritage, ecotourism, wildlife management as well as the cultural politics and practices of environmentalist and heritage management. Some limited travel to NC heritage sites required at student expense.
Prerequisite: ANT 252
Typically offered in Spring only

ANT 544/WGS 544/ANT 444/WGS 444 Cross-Cultural Perspectives on Women (3 credit hours)
Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women's statuses and roles. Effect of gender on social position
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Spring only

ANT 550/ANT 450 Culture, Ecology, and Sustainable Living (3 credit hours)
Examines the myriad ways that culture serves to mediate the human-environmental equation. Focus is given to different belief systems, subsistence strategies, technological achievements, and policy formulations. Topics covered include cultural ecology, gender and the environment, land tenure, development, ethnoscience and cognitive ecology, subsistence and social organization, historical and political ecology, environmentalism, and environmental policy issues.
Prerequisite: One of the following: ANT 310, 325, 330 or 346

ANT 560/ANT 460 Urban Anthropology (3 credit hours)
Anthropological study of cities. Examination of cross-cultural patterns of behavior in urban areas and adaptive strategies that urban dwellers employ. Introduction to major theoretical and methodological approaches relevant to an understanding of contemporary urban life.
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Fall only

ANT 561/ANT 461 Wealth, Poverty and International Aid (3 credit hours)
Examines notions of wealth and poverty in a variety of cultural settings, as well as ideas of whether and how people categorized as poor or rich might alter their status. These findings are applied to case studies of current international aid organizations that carry out poverty relief.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

ANT 564/ANT 464 Anthropology of Religion (3 credit hours)
Examination of various anthropological perspectives on the role of religion in social life, and discussion of theoretical and methodological issues pertaining to the study of ritual and belief.
Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346
Typically offered in Spring only
ANT 571/ANT 471/IS 471/IS 571 Understanding Latino Migration (3 credit hours)
This collaborative, hands-on class examines what ultimately drives migration and how families, communities, and policy-makers respond to migration in ways that can keep the process going. Focusing on emigration from Mexico, Guatemala, Honduras, and El Salvador, the course reviews the historical foundation for today's migration with attention to migration to North Carolina.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Summer only

ANT 575/ANT 475 Environmental Archaeology (3 credit hours)
Archaeological investigation of human-environmental interactions and human impacts on ancient environments. Focuses on the causes of environmental change (climate, human activity) and the implications for understanding human nature, predicting future problems, and addressing current crises. Topics include reconstructing paleoclimate, the extinction of megafauna, anthropogenic landscapes, environmental degradation and the collapse of ancient states, sustainability and the Anthropocene.

Prerequisites: ANT 253 and one 300-level anthropology course
Typically offered in Fall and Spring

ANT 583/ANT 483 Theories of Archaeological Research (3 credit hours)
Covers the theories that inform archaeological research in the effort to locate and interpret material evidence about past human activities. Topics include the history of archaeology, theories of archaeological practice and interpretation, ethics, and working with stakeholders. Relies on case studies and major syntheses and critiques of current theoretical debates. Cases focus on the origins of social complexity, human-environmental interactions, and critical perspectives on inequality, race, class, gender, and ethnicity. Students may not receive credit for both ANT 483 and ANT 583.

Prerequisite: ANT 251 or 253 and 3 cred 300-level ANT
Typically offered in Fall only

ANT 585 Skeletal Biology in Anthropology (3 credit hours)
Skeletal biology is the study of human skeletal remains; understanding past populations' demographics, health and disease, physical activity, diet, and biological relatedness to other groups, past and present. Must hold graduate standing.

ANT 587/HI 587 Cultural Resource Management (3 credit hours)
Theoretical and practical overview of U.S. federal and state laws, institutions, and practices related to the inventory, evaluation, preservation, protection, and overall management of cultural resources; history and philosophical bases of Cultural Resource Management (CRM); professional ethics; indigenous and other stakeholder interests in CRM; and comparative national regulations outside the U.S. and the international heritage management and organizations. Graduate standing in history required.

Typically offered in Spring only

ANT 595 Special Topics in Anthropology (1-6 credit hours)
In depth exploration of specialized topics in Anthropology. Also used to test and develop new courses.

Prerequisite: Graduate Standing

ANT 598 Independent Study in ANT (1-3 credit hours)
Independent study of a topic in anthropology. Topic and mode of study determined by faculty member(s) and student(s).

Typically offered in Fall, Spring, and Summer

ANT 610 Special Topics in Anthropology (1-6 credit hours)
Provision for in-depth investigation of some particular topic in anthropology. Reflection of current student needs and interests through variations in course content and mode of study. Determination of topics by faculty member(s) and student.

ANT 693 Masters Supervised Research (1-9 credit hours)
Instruction in research, and research under the mentorship of a member of the Graduate Faculty. Restricted to Masters Students in Anthropology.

Prerequisite: Graduate Standing
Typically offered in Fall, Spring, and Summer

ANT 695 Masters Research (1-9 credit hours)
Thesis research conducted under the supervision of student's thesis committee chair or other graduate faculty member. Restricted to Masters Students in Anthropology.

Prerequisite: Graduate Standing
Typically offered in Fall, Spring, and Summer

ANT 696 Summer Thesis Res (1 credit hours)
Typically offered in Summer only

ANT 699 Masters Thesis Preparation (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, and other requirements for the masters degree, and are writing and defending their thesis. Restricted to Masters Students in Anthropology.

Prerequisite: Graduate Standing
Typically offered in Fall, Spring, and Summer

ANT 810 Special Topics in Anthropology (1-6 credit hours)
Provision for in-depth investigation of some particular topic in anthropology. Reflection of current student needs and interests through variations in course content and mode of study. Determination of topics by faculty member(s) and student.

Typically offered in Fall, Spring, and Summer

Applied Ecology (AEC)

AEC 295 Special Topics in Applied Ecology (1-3 credit hours)
Special topics and experimental offerings in Applied Ecology including developmental courses offered on a trial basis. Intended for students at an intermediate level of training in Biological Sciences.

Prerequisite: BIO 181
Typically offered in Fall, Spring, and Summer

AEC 360/PB 360 Ecology (4 credit hours)
The science of ecology, including factors which control distribution and population dynamics of organisms, structure and function of biological communities, and energy flow and nutrient cycling in ecosystems; contrasts among the major biomes; and principles governing ecological responses to global climatic and other environmental changes.

Prerequisite: C- or better in BIO 181
Typically offered in Spring only
**AEC 424 Marine Fisheries Ecology** (3 credit hours)
This course covers the life history, stock concept, fishing gears, stock assessment approaches, fish-habitat relationships, socio-economics, and management of marine fishes. Several field trips to state and federal agency laboratories and fish houses/docks are used to emphasize fish sampling, biological sample processing, and gear design. This course is part of the semester at CMAST program and requires students to be on site in Morehead City, NC.
Prerequisite: BIO 181
Typically offered in Spring only

**AEC 441 Biology of Fishes** (3 credit hours)
Behavior, evolution, physiology and ecology of fishes, emphasizing their adaptations for life in streams, lakes, and oceans.
"Corequisite: AEC 442 Biology of Fishes Laboratory"
Typically offered in Fall only

**AEC 442 Biology of Fishes Laboratory** (1 credit hour)
Field and laboratory exercises with the common fish species and communities of North Carolina. Field trips to local streams and lakes plus weekend trips to coastal, estuarine, and mountain habitats.
Corequisite: AEC 441
Typically offered in Fall only

**AEC 460 Field Ecology and Methods** (4 credit hours)
Field Ecology and Methods will expose senior students with interests in Ecology and Evolution to the diverse field approaches used to address ecological questions. The course considers and implements a variety of field approaches ranging from microcosm to global scale.
Prerequisite: C- or better in ST 311 and BIO 360
Typically offered in Fall only

**AEC 493 Internal Learning Experience in Applied Ecology** (1-3 credit hours)
Internal learning experience in applied ecology within an academic framework with facilities and resources on or off campus. Contact and arrangements with prospective supervisors must be done by the student. Prior approval by faculty advisor and minor coordina
Prerequisite: BIO 181 (Variable, depending on instructor)
Typically offered in Fall, Spring, and Summer

**AEC 495 Advanced Special Topics in Applied Ecology** (1-3 credit hours)
Special topics and experimental offerings in Applied Ecology including developmental courses offered on a trial basis. Intended for students at an advanced level of training in Biological Sciences.
Prerequisite: BIO 181
Typically offered in Fall, Spring, and Summer
Typically offered in Fall only

**AEC 501 Ornithology (4 credit hours)**
The biology of birds. Lecture topics include evolution, functional morphology, physiology, ecology and behavior. Field and museum laboratories emphasize particular aspects of morphology, ecology and behavior, as well as taxonomy and identification. One coastal weekend field trip required.

Prerequisite: BIO 181, BIO 183, and (BIO 250 or BIO/PB 360)

**AEC 502 Introduction to Biological Research (2 credit hours)**
The course provides a philosophical background for the field of ecology, then transitions to practical aspects of the field including a focus on grant proposal development, how to read and review papers and grant proposals, and how to give a presentation at a scientific meeting. A series of outside speakers will provide a broad perspective on the resources and opportunities available for graduate students at North Carolina State University. An emphasis will be placed on peer collaboration and feedback, developing professional relationships that will be important throughout the graduate tenor of this cohort of students.

Typically offered in Fall only

**AEC 503 Foundations of Ecology (2 credit hours)**
This course covers major concepts, themes, and theories in ecology, including population, community and ecosystem ecology, and evolutionary ecology. Students are introduced to the core skill of critically evaluating scientific papers. The format of the course is readings from the primary literature and student-lead discussions. This course is focused toward first- and second-year graduate students, especially those in preparation for their preliminary exam.

Prerequisite: Graduate standing

Typically offered in Spring only

**AEC 509/ENT 509 Biology of Aquatic Insects (3 credit hours)**
Life history descriptions and identification of aquatic insects. Emphasis on behavioral and physiological adaptations to diverse habitats and the role of insects in aquatic ecosystem function and as indicators of water quality. The course includes 3-4 Saturday collecting trips to a local pond and streams in the mountains, piedmont and coastal plain. Collecting trips are not required, but are strongly encouraged.

Typically offered in Spring only

**AEC 510 Machine Learning Approaches in Biological Sciences (2 credit hours)**
A wide range of high-throughput technologies are now being used to generate data to answer an ever-increasingly diverse set of questions about biological systems. The next great challenge is integrating data analysis in a systems biology approach that utilizes novel supervised machine learning methods, which accommodate heterogeneity of data, are robust to biological variation, and provide mechanistic insight. The course will not focus on detailed mathematical models, but instead on how these machine learning tools may be used to analyze biological data, in particular gene and protein expression.

Restriction: Graduate standing; Senior Undergraduates with permission from instructor

Typically offered in Fall only

**AEC 515/FW 515 Fish Physiology (3 credit hours)**
The biology of fishes: physiology, anatomy, endocrinology, behavior and genetics. Designed especially for graduate students in fisheries. Several trips to research laboratories taken.

Typically offered in Fall only

**AEC 519/AEC 419 Freshwater Ecology (4 credit hours)**
The course explores the structure and function of streams, lakes, and wetlands, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals and effects of pollution on organisms and water quality. The laboratory emphasizes modern, hands-on techniques for answering fundamental and applied questions. One local weekend field trip required. Credit in both AEC 419 and AEC 519 is not allowed.

Prerequisite: C- or better in BIO/PB 360

Typically offered in Fall only

**AEC 524 Advanced Fisheries Science (2 credit hours)**
This is a seminar style course where students and faculty discuss readings in advanced fisheries science. The course is offered to students at CMAST (live) and on main campus (using Zoom or related online meeting software). Transportation is not required.

Typically offered in Fall only

**AEC 528 Aquaculture (3 credit hours)**
Biological and general principles of aquaculture. Emphasis on the present status of aquaculture, species involved, techniques employed, and problems encountered. Discussion of recent advances in research and development and identification of areas of future research and development.

Prerequisite: BO 360 or ZO 260 or Graduate standing or Senior standing

Typically offered in Spring only

**AEC 558/W 587 Aquaculture Laboratory (1 credit hour)**
Methods and techniques of cultivating aquatic organisms. Field trips and reports on local hatcheries and facilities required. (Three to four overnight field trips taken on week days to coastal areas, state hatcheries, and private hatcheries; students responsible for shared room costs and their meals. Four field trips also taken on laboratory day within driving range of Raleigh.)

Prerequisite: BO 360 or ZO 260 or Graduate standing or Senior standing.

Corequisite: ZO 586

Typically offered in Spring only

**AEC 592 Special Topics in Applied Ecology (1-6 credit hours)**
Special Topics in Applied Ecology. Topics will vary.

Typically offered in Fall, Spring, and Summer

**AEC 624 Advanced Fisheries Science (2 credit hours)**
This is a seminar style course where students and faculty discuss readings in advanced fisheries science. The course is offered to students at CMAST (live) and on main campus (using Zoom or related online meeting software). Transportation is not required.

Typically offered in Fall only

**AEC 630 Special Topics in AEC (1-6 credit hours)**
Special Topics in AEC

Typically offered in Fall, Spring, and Summer

**AEC 710 Sampling Animal Populations (3 credit hours)**
Statistical methods applicable to sampling of wildlife populations, including capture-recapture, removal, change in ratio, quadrant and line transect sampling. Emphasis on model assumptions and study design.

Prerequisite: ST 512

Typically offered in Fall only
AEC 718  Community Ecology  (3 credit hours)
Animal community structure and function. Effects of competition, predation, coevolution and disturbance on community composition. Emphasis on ecological and evolutionary controversies from empirical and theoretical approaches.
Prerequisite: BO 360 or ZO 260, BO(ZO) 760; BO(ZO) 365
Typically offered in Spring only

AEC 726/FW 726 Quantitative Fisheries Management  (3 credit hours)
Current methods for assessment and management of exploited fish populations, including sampling methods, data analysis and modeling. A required research paper or project.
Typically offered in Fall only

AEC 756 Ecology Of Fishes  (3 credit hours)
Physiological ecology of fishes emphasizing energetics, production and adaptations to aquatic mediums. Ecological classification of fishes and theory of resource partitioning in freshwater, estuarine and marine realms.
Typically offered in Fall only

AEC 761 Conservation and Climate Science  (3 credit hours)
Conservation Science applies principles from ecology, genetics, and other biological disciplines and social sciences to the conservation of biological diversity. This course will train students in techniques in population ecology such as population viability analysis; community ecology and theories of biodiversity; and reserve selection algorithms. The course will also expose and trains students to understand climate science and using climate data for ecological studies. The class will examine threats to biodiversity such as habitat fragmentation and loss, climate change, and invasion by exotic species. These issues will be considered within the context of economic, social, and legal constraints. Graduate status or permission of instructor.
Typically offered in Fall only

AEC 770 Advanced Topics In Ecology I  (3 credit hours)
Development of subject matter in major fields of ecology through seminars and lectures and principles illustrated by laboratory exercises and field trips. Microenvironment, population biology, community ecology, ecosystems and nutrient cycling.
Typically offered in Spring only

Architecture (ARC)

ARC 140 Experiencing Architecture  (3 credit hours)
An introductory course intended to provide non-majors with a foundation in the basic concepts of architecture. Provides a general understanding of contemporary issues and theory in architecture, concerns about green architecture and sustainability, architecture practice and the role architecture plays in the design of cities.

GEP Visual and Performing Arts
Typically offered in Spring and Summer

ARC 141 Introduction to Architectural History  (3 credit hours)
World architectural history of sacred and secular buildings and buildings with emphasis before the modern era. For non-Architecture majors only. Does not count toward Architecture degrees.
R: For non-Architecture majors only.
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall and Spring

ARC 162 An Introduction to Architecture  (3 credit hours)
The purpose of architecture examined through its practices, theories and key principles. Lectures, projects, and readings expose students to the diverse world of ideas, creative work and practical considerations which make up the discipline of architecture.
Prerequisite: D 104 and BED-A students; Corequisite: D 105
Typically offered in Spring only

ARC 201 Architectural Design: Environment  (6 credit hours)
Investigation of the relationships between environment and built form. Solar orientation, topography, vegetation, and constructed context in relationship to user needs as parameters for justifying design proposals. Particular emphasis on architectural conventions of communication.
Prerequisite: D 105; BED-A students only; Corequisite: ARC 211
Typically offered in Fall only

ARC 202 Architectural Design: Form  (6 credit hours)
Investigation of relationships between idea and form. Composition and precedent as parameters for generating, developing, and justifying architectural form. Particular emphasis on electronic media in drawing and modeling.
Prerequisite: ARC 201 and BED-A students
Typically offered in Fall only

ARC 211 Natural Systems and Architecture  (3 credit hours)
Restricted to students in BEDA Program. Relationship between natural and architectural systems. Exploration of the implications of natural forces - sun, wind and daylight- on architecture. Energy-conscious architectural design and site planning strategies to fulfill thermal comfort requirements of people in designed environments.
Prerequisite: D 105
Typically offered in Fall only

ARC 232 Structures and Materials  (3 credit hours)
An introduction to construction materials and building structures. Explorations of materials’ properties, aesthetics, environmental impact, and performance. Quantitative and qualitative analysis of structural building elements. Course integrates lecture and laboratory. Off-campus field trips are included (students may need to coordinate transportation).
Typically offered in Spring only

ARC 241 History of World Architecture  (3 credit hours)
History of the built environment (buildings, urban planning, and associated arts) in western and non-western cultures, ranging from dawn of civilization to dawn of modern era, including high-style architecture, vernacular buildings, and traditional forms.
Typically offered in Fall only
ARC 242 History of Western Architecture (3 credit hours)
History of western architecture (including some landscape architecture and city planning) from the beginnings of the Renaissance in early 15th century to late 19th century in the United States.
Prerequisite: ARC 241 or Consent of Instructor
Typically offered in Spring only

ARC 251 Digital Representation (3 credit hours)
Project based methodological investigation of digital representation in architecture including: two- three- and four-dimensional media. Purchase of laptop and necessary software required.
Prerequisite: BED-A students or Master of Arch, Track 3 students
Typically offered in Spring only

ARC 289 Architectural Travel Study I (3 credit hours)
The study of cities, architectural sites, buildings, building complexes, and architectural elements conducted independently by students as part of a planned travel-study tour. Includes advance research and approval of proposed study topic and itinerary. Students will document study through sketches, analytical notations, and a summary paper. Departmental Approval Required
Prerequisite: ARC 141 and ARC 142
Typically offered in Fall and Spring

ARC 292 Special Topics in Architecture (1-3 credit hours)
Topics of current interest in Architecture. Normally used to develop new courses.
Typically offered in Fall, Spring, and Summer

ARC 301 Architectural Design: Tectonics (6 credit hours)
An introduction to the fundamentals of building systems on architectural design. Emphases on building assemblages, vertical-load structural systems, circulation, and passive heating, cooling, and ventilation. Particular emphasis on physical models. Limited to BED-A Students. Junior Standing. Students are required to purchase project materials.
Prerequisite: ARC 202 and ARC 211 and ARC 232; Co-requisite: ARC 331 and ARC 432
Typically offered in Fall only

ARC 302 Architectural Design: Technology (6 credit hours)
An investigation of building technical systems as fundamental elements of the design process with emphasis on lateral load resisting structural strategies, environmental control/energy, enclosure assembly detail, and their architectural implications. Particular emphasis on physical models. Restricted to BED-A students, Junior standing. Students are required to purchase materials for projects.
Prerequisite: ARC 301 and ARC 331 and ARC 432
Typically offered in Spring only

ARC 331 Architectural Structures I (3 credit hours)
Structural design process. Combined role of imposed loads and architectural function in shaping the form of the building. Interaction of elements in structural systems containing beams, columns, trusses, space frames, slabs, arches, vaults, domes, cables, cable networks, fabrics and diaphragms. Case studies emphasized.
Prerequisite: ARC 232
Typically offered in Fall only

ARC 332 Architectural Structures II (3 credit hours)
Prerequisite: ARC 331
Typically offered in Spring only

ARC 401 Architectural Design: Urban (6 credit hours)
An architectural design studio intended to explore and integrate design issues of all types within an urban environment. Emphasis will be placed on both formal and technical issues of urban sites including transportation and land use planning, phasing of projects over time, relationships to other structures, and the application of development codes, regulations, and urban design principles to the fabric of the city.
Prerequisite: ARC 302 and BED-A student
Typically offered in Fall only

ARC 402 Architectural Design: Advanced (6 credit hours)
Advanced architectural design studios in which projects of many types and scales are employed to investigate a range of educational, theoretical and professional studies. Particular emphasis on independent research and exploration of design issues and their implications as defined by faculty.
Prerequisite: ARC 401 and BED-A students
Typically offered in Spring and Summer

ARC 403 Architectural Design Fundamentals: Environment (6 credit hours)
An introductory architectural design studio for M. Arch, Track 3 students investigating the relationship between environment and built form. Solar orientation, climate, topography, vegetation, and constructed context in relationship to user needs as parameters for design proposals. Particular emphasis on design fundamentals and conventions of architectural communication.
Prerequisite: Masters of Architecture students; Co-requisite: ARC 211
Typically offered in Fall only

ARC 404 Architectural Design Fundamentals: Form (6 credit hours)
An introductory architectural design studio for M. Arch. Track 3 students investigating relationships between idea and form. Composition and precedent as parameters for generating, developing, and justifying architectural form. Particular emphasis on electronic media in drawing and modeling.
Prerequisite: Masters of Architecture Track 3 students; ARC 403; Co-requisite: ARC 251
Typically offered in Spring only

ARC 405 Architectural Design Fundamentals: Technology (6 credit hours)
An introductory architectural design studio for M. Arch. Track 3 students in which the technical systems of building - structure, environmental control/energy, materials, enclosure, and circulation; their fabrication and assembly; and their capacity to affect form and tectonic expression - are explored as fundamental elements of the design process. Particular emphasis on physical models.
Prerequisite: Master of Architecture students; ARC 404; Co-requisite: ARC 331 and ARC 432
Typically offered in Fall only
ARC 414 Environmental Control Systems (3 credit hours)
Studies in light, heat, moisture, air motion, and sound in architectural environments. Mechanical, electrical and/or electronic equipment for illumination, heating, cooling, ventilation, vertical transportation and communication in buildings. Water and waste, fire protection and safety, and acoustic systems in architecture.
Prerequisite: ARC 211
Typically offered in Spring only

ARC 432 Architectural Construction Systems (3 credit hours)
Building construction systems related to architectural design. Historical and current building practices. Implications for design and systems selection. Case studies. Field trips are required.
Prerequisite: ARC 232
Typically offered in Fall only

ARC 441 History of Contemporary Architecture (3 credit hours)
A survey and critical examination of modern architecture from its origins in 19th-century philosophy and technology to the most recent developments in world architecture.
Prerequisite: ARC 241, ARC 242; BED-A students, Bachelor of Architecture students, or Masters of Architecture students
Typically offered in Fall only

ARC 442 History of NC Architecture (3 credit hours)
Survey of NC Architecture from 17th-century settlement to World War II. Coverage of a wide range of building types and development patterns.
Prerequisite: ARC 241, ARC 242

ARC 450 Architectural Drawing (3 credit hours)
Introduction to hand drawing skills, techniques, and concepts necessary to use drawing for visual thinking (and visual communication) particularly in the development of design ideas and understanding of architecture. Restricted to Masters of Architecture Track III students.
Corequisite: ARC 451
Typically offered in Summer only

ARC 451 Digital Drawing and Modeling (3 credit hours)
Introductory course to digital communication tools as an integral part of the architectural design process. This course challenges students to develop diverse two and three-dimensional drawing and modeling skills through project-based exercises that engage various digital visualization and layout software. Purchase of laptop and necessary software required. Summer 5 week course. Restricted to Master of Architecture, Track III students.
Co-requisite: ARC 450
Typically offered in Spring and Summer

ARC 490 Architecture International Studio (6 credit hours)
Exploration of architectural problems and development of design solutions in an international setting. Studio projects focused on current conditions found in the host culture, profession, and community.
Prerequisite: ARC 302, Participation in off-campus program.
Typically offered in Fall only

ARC 492 Special Topics in Architecture (1-3 credit hours)
Topics of current interest in Architecture. Normally used to develop new courses.
Typically offered in Fall, Spring, and Summer

ARC 495 Independent Study in Architecture (1-3 credit hours)
Special projects in architecture developed under the direction of a faculty member on a tutorial basis. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by th
Prerequisite: BED-A students with Junior standing and a GPA greater than or equal to 3.0.
Typically offered in Fall, Spring, and Summer

ARC 500 Architectural Design: Professional Studio (6 credit hours)
A comprehensive and integrative architectural design studio for M.Arch students involving the execution of a project in sufficient depth to understand the opportunities and discipline resulting from the inclusion of building.
Prerequisite: M.Arch Track 1 and Track 3 student, ARC 405 or BEDA Degree (or equivalent)
Typically offered in Fall and Spring

ARC 501 Professional Architecture Studio I (6 credit hours)
Design studio investigations aimed at the development of an understanding of the major issues confronting the contemporary architect and at the expanding of problem solving abilities in architectural design.
Prerequisite: BEDA degree
Typically offered in Fall only

ARC 502 Professional Architecture Studio II (6 credit hours)
Design investigation aimed at the development of an understanding of the major issues confronting the contemporary architect and at the expanding of problem solving abilities in architectural design. This is an individualized, final project studio.
Prerequisite: ARC 501
Typically offered in Spring only

ARC 503 Advanced Architectural Design (Series) (6 credit hours)
Advanced studies in architectural design. Projects concerning various aspects of building design, urban design and community design in comprehensive and integrative manner.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ARC 520 Sustainable Architecture (3 credit hours)
This survey course provides students with a solid knowledge base in the numerous aspects of sustainable design touching not only upon strategies, but also various philosophies behind sustainability and the green building movement. This course examines the impact of the built environment on natural systems and questions what it truly means to build responsibly. Lectures, discussions, guest speakers, and field trips create a critical foundation for green building considerations to be references in design at a variety of scales. Restricted to M. Arch, B. Arch, and BEDA seniors. Non-architecture majors by instructor's permission.
Architecture or Environmental Design in Architecture Majors Only
Typically offered in Summer only
ARC 521 Daylighting and Passive Energy Systems for Architecture (3 credit hours)
An investigation of building energy systems and simulation techniques with emphases on thermal envelope, solar geometry, daylighting, passive heating & cooling, and building systems integration. The theoretical considerations will be accompanied by hands-on exercises using various simulation tools. Restricted to M.Arch, B.Arch, and BEDA Senior Students. Non-Architecture majors by instructor's permission.

Typically offered in Fall only

ARC 522 Building Energy Efficiency & Renewable Energy (3 credit hours)
This course will discuss and develop strategies for the design of sustainable buildings. The two primary topics addressed are: 1) energy efficiency and 2) renewable energy. The students will learn and discuss ways to improve energy efficiency in buildings. The renewable energy technologies, such as solar and geothermal, are explored to discuss the applicability of those in the building design.

Typically offered in Fall only

ARC 523 Building Energy Modeling and Simulation (3 credit hours)
This course deals with the fundamentals of building sciences in terms of energy systems. Energy modeling and simulation technologies are used to predict and analyze the energy performance of buildings. The students calculate the energy consumption of heating, cooling, lighting, and equipment by hand to understand the energy & thermal behavior of buildings and then compare and analyze them with those calculated by energy modeling and simulation programs.

Prerequisite: ARC 414

Typically offered in Fall only

ARC 524 Building Energy Optimization (3 credit hours)
This course introduces energy optimization technologies in buildings using computer simulation. The EnergyPlus program, a whole-building computational energy simulation tool developed by USDOE, is used. The maximum energy savings potential of Energy Efficiency Measures (EEMs) are identified and implemented for the energy optimization process. Students obtain a great deal of information about a building's potential for energy savings, well before the first brick is even laid.

Prerequisite: ARC 523

Typically offered in Spring only

ARC 525 Sustainability Over the Life of a Building (3 credit hours)
Focuses on strategies and metrics for "greening" existing buildings. Sustainability over the Life of a Building will explore the criteria and documentation needed to certify a building at NC State in the LEED for Existing Buildings: Operations and Maintenance (EBOM) rating system. This course will emphasize the importance of interdisciplinary work while working toward sustainability goals. Over the course of the semester, students will research various criteria and thresholds for the LEED EBOM system. Through this in-depth process, students will synthesize core knowledge about LEED credits to better understand opportunities for strategies in green buildings. Over the course of the semester, students will research various criteria in-depth which are needed for LEED Existing Building Certification, not only becoming familiar with the rating system itself, but also the foundation for each of the addressed LEED credits, as well as context for decisions made in the realm of green buildings.

This is a graduate-level seminar open to all NCSU master's degree students but can be open to advanced standing undergraduate students with instructors' approval. No prerequisites.

Typically offered in Spring only

ARC 526 Health and Sustainability in the Built Environment (3 credit hours)
Explores opportunities in the design and aligned fields for facilitating higher sustainability and health targets, associated thresholds, and certification achievements in the built environment. Building rating systems are reviewed that address categories such as social equity, carbon neutrality, material toxicity, nourishment, fitness, mind, justness, and more. Reaching beyond the standards of current green building practice and public policy, the class will explore methods and case studies using cutting-edge building certification frameworks to target carbon neutral, net-zero, and health-promotive design. Student teams will be working on specific projects with professional firms for their final projects.

This is a graduate-level seminar open to all NCSU master's degree students but can be open to advanced standing undergraduate students with instructors' approval. No prerequisites.

Typically offered in Spring only

ARC 530 Tectonics and Craft (3 credit hours)
Studies of construction and material form in architecture. Case studies of select examples of contemporary architecture that exemplify the technique and craft of modern construction. Analysis of functional, tectonic, and experiential aspects of building methods within the context of economics and culture. Examination of assembly as a determinant of building form.

Prerequisite: Architecture Majors, ARC 432

Typically offered in Fall only

ARC 534 Design of Architectural Details (3 credit hours)
Using detail patterns based on function, constructability, and aesthetics, students analyze existing successful building details, diagnose problems in existing buildings, and design details for their own projects. Restricted to Bachelors and Masters students in Architecture.

Typically offered in Spring only
ARC 535 Experiments in Architecture Prototypes (3 credit hours)
Examination of significant architecture prototypes of the Modern Movement. Seminar will investigate the effectiveness of prototypes in proposing solutions to technological, social, and environmental issues such as housing, education, and sustainability. Students will explore the possibilities of prototype design and construction in contemporary practice. Field trips required.
Prerequisite: ARC 232 or equivalent
Typically offered in Summer only

ARC 536 Materials for Design (3 credit hours)
Contemporary buildings that have insightfully integrated design intention and materials are analyzed using the case study method. Each student uses an iterative analytical process to probe deeply and specifically to find each building’s key lessons regarding materials. Key drawings and photographs will be graphically presented, with a narrative summarizing findings regarding the project’s general design intentions and its technical embodiment. Restricted to M. Arch or B. Arch Students.

ARC 537 Digital Materials Translations (3 credit hours)
This seminar combines architectural material research with instruction in advanced digital design software. Students will examine specific materials to determine attributes, and then use parametric, NURBS-based software, and CNC machinery to propose new material applications. The course is limited to College of Design students unless instructors grant permission.
Prerequisite: (ARC 251 or ARC 451 or equivalent) and (ARC 232 or equivalent)
Typically offered in Fall only

ARC 538 Manufacturing Architecture (3 credit hours)
Focuses on customized repetitive manufacturing for architecture components. Specifically includes repetitive processes that make repeated uses of tooling (e.g. molds, patterns, or jigs) to form components. We will investigate repetitive manufacturing processes and architectural case studies. Limited to MArch, BArch, and BED-A students, senior standing.
Prerequisite: Architecture Majors, ARC 432
Typically offered in Fall only

ARC 541 Architecture, Culture, and Meaning (3 credit hours)
This course focuses on architecture as a cultural artifact and provides an overview of the interrelationship of architectural form, organization, symbolism, use and meaning. A broad range of examples from a variety of cultures, religions, and historical periods are covered (including “non-Western”), illustrated by detailed case studies. Syncretic, holistic and homological approaches to understanding the meaning and significance of architecture are emphasized. Phenomenological and hermeneutical methods of interpretation are introduced and pertinent philosophical traditions discussed. Restricted to M.Arch., B.Arch., and BEDA seniors. Non-architecture majors by instructor's permission.
Typically offered in Fall only

ARC 542 Sacred Architecture (3 credit hours)
This course focuses on the meaning and cultural significance of sacred architecture, including its environmental and socio-political contexts, and doctrinal and liturgical influences. The course is structured according to the world's principal faiths and presented comparatively and holistically. There is a particular emphasis on the communicative roles of architecture and the symbolism and ritual use of sacred places. Contemporary theoretical methodologies are introduced and applied as means establish relevancy to contemporary issues and architectural design. Restricted to graduate students.
Typically offered in Fall only

ARC 543 Analysis of Precedent (3 credit hours)
Investigation of architectural elements, relationships and ordering ideas through comparative graphic analysis of buildings designed by architects. Emphasis on buildings as physical artifacts.
Prerequisite: Grad. standing
Typically offered in Spring only

ARC 544 American City Planning History (3 credit hours)
An examination of the history of American cities, their founding, plans, and development with emphasis on the colonial era to the late 19th century. Broad study of the larger historical trends in city planning balanced by readings focused on major cities (New York, Chicago, Los Angeles) and smaller ones (Savannah, New Orleans). Major issues include street patterns, parks, and public buildings and spaces; and the roles of government and private citizen groups. Restricted to graduate students in the MArch, seniors in the BArch, and seniors in the BEDA programs; or by permission of the instructor.
Prerequisite: ARC 241 and ARC 242 and ARC 441 or permission of instructor.
Typically offered in Fall only

ARC 545 Methods of Interpretation in Architectural History (3 credit hours)
This seminar surveys the materials, methods, and texts of architectural history as an analytical discipline of the built environment. A broad selection of readings will trace the evolution of the discipline and will position architectural history in relation to such fields as architecture, art history, urban and social history, anthropology, literature, cultural studies, urban planning, and architectural theory. The course is restricted to graduate students and serves as one of the alternate required courses for the Concentration in the History and Theory of Architecture.
P: ARC 241 and ARC 242 and ARC
Typically offered in Fall only
ARC 546 Theory of Building Types (3 credit hours)
Theoretical implications and practical applications of typology in architecture. Analysis and documentation of selected building types in their historical evolution. Graphic identification of type characteristics.
Prerequisite: Two ARC studios
Typically offered in Fall only

ARC 548 Vernacular Architecture (3 credit hours)
Readings in theories of vernacular architecture. Case studies of selected examples of vernacular architecture of the world: architectural analysis of utilitarian, tectonic, and perceptual aspects of buildings and urban fabrics against the background of place and culture. Examination of influences of various vernacular traditions on contemporary practice.
Prerequisite: M.Arch student without an undergraduate degree in architecture must have completed ARC 211,ARC 241,ARC 232
Typically offered in Spring only

ARC 551 The Practice of Architecture (3 credit hours)
A lecture course examination of the practice of architecture through a lecture course, with emphasis upon both normative and emerging procedures in the private architectural firm. Special attention upon the role and function of the practicing architect, legal and regulatory conditions, the nature of professional services, office management and project management processes.
Typically offered in Fall and Spring

ARC 562 Legal Issues in Architecture (3 credit hours)
The main principles of law affecting the profession of architecture as it is influenced by contracts, torts, agency, property, and environmental restrictions.
Prerequisite: Architecture Majors, ARC 561
Typically offered in Fall only

ARC 563 Public Interest Design Seminar: Case Studies and Current Issues (3 credit hours)
This course evaluates and appraises design in the public interest as a critical and growing element of design disciplines. We explore how design can positively contribute to the social, economic, and environmental well-being of US and global communities. We study current innovations and review successful examples of projects and practice. In addition to lectures by the professor, presentations are made by professionals and experts in public interest design.
The class is open to Architecture Graduate Students in the College of Design. Other NCSU students may enroll by permission of Instructor.
Typically offered in Spring only

ARC 570 Anatomy of the City (3 credit hours)
A morphological investigation of cities throughout urban history, with emphasis on formal principles of spatial organization. Part one: examination of the descriptive properties of cities in terms of interdisciplinary concepts and principles. Part two: examination of the organizational characteristics of urban space.
Typically offered in Fall only

ARC 571 Urban House (3 credit hours)
This seminar is intended to investigate the interrelationships between the form of housing and the demands of a rapidly changing society. Reference is made to the physical, economic, social, cultural, and economic factors that influence housing design.
Prerequisite: Graduate standing
Typically offered in Spring only

ARC 572 Regional Infrastructures (3 credit hours)
This seminar provides students with a solid knowledge base about current urban issues and design theory surrounding the contemporary networked metropolis. Through lectures, discussions, and workshops the course examines how infrastructural systems might be expanded in order to catalyze additional environmental, social, and economic processes. Students research specific infrastructural systems (conducting food, water, or energy) at a systems-defined regional scale to better understand the characteristics of 21st century American cities and speculate on new opportunities for architects and landscape architects to practice. Restricted to M. Arch, B. Arch, BEDA seniors, and M. LArch.
Restricted to: M. Arch, B. Arch, BEDA seniors, and M. LArch
Typically offered in Spring only

ARC 574 Place and Place Making (3 credit hours)
Examination of the definitions, concepts and emergent research findings useful in explaining the human sense of place through seminar-lecture course. Particular emphasis upon those physical aspects and relationships influencing this sense of place and affording some designer control.
Prerequisite: Graduate standing
Typically offered in Fall only

ARC 576 Community Design (3 credit hours)
Processes through which citizens shape and manage built environment. Strategic planning, visioning process, community action, and mediation will be discussed and illustrated with case study examples from architecture, landscape architecture and planning. Analysis and assessment from case studies of participation techniques such as charrette, study circles, and visual appraisal.
Typically offered in Fall only

ARC 577 Sustainable Communities (3 credit hours)
Typically offered in Fall only

ARC 581 Project Preparation Seminar (3 credit hours)
Quantitative and qualitative conditions, considerations and determinants as preparation for architectural design. Emphasis on research methods, data collection and interpretation, theoretical discourse, site analysis, programming and architectural precedent. Required enrollment in B.Arch.
Typically offered in Spring only

ARC 589 Architectural Travel Study II (3 credit hours)
Independent study while traveling. Submission of sketchbook/journal and paper upon return. Research on topic of concentration and approval of itinerary in advance required. Graphic documentation and critical evaluation of buildings and urban spaces. Requ
Typically offered in Fall, Spring, and Summer
ARC 590 Special Topics in Architecture (1-6 credit hours)
Topics of current interest by faculty in the Department of Architecture. Subjects under this number normally to test and develop new courses.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ARC 598 Final Project Studio In Architecture (6 credit hours)
Final project for graduate students supervised by members of their graduate advisory committee. Requires department approval.

Prerequisite: 18 hrs. of ARC 503 and ARC 697
Typically offered in Fall and Spring

ARC 610 Special Topics in Architecture (1-6 credit hours)
Special Topics in Architecture

ARC 630 Independent Study (1-3 credit hours)
Development of research and projects in various aspects of architecture under the direction of architecture faculty member on tutorial basis. Requires a faculty sponsor and departmental approval.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ARC 685 Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master’s student
Typically offered in Spring only

ARC 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master’s programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master’s exam, etc.

Prerequisite: Master’s student
Typically offered in Fall and Spring

ARC 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master’s programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master’s exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master’s student
Typically offered in Fall and Spring

ARC 696 Summer Thesis Res (1 credit hours)

ARC 697 Final Project Research in Architecture (1-6 credit hours)
Investigation of selected problems and projects in architecture of particular interest to graduate students under the direction of a faculty member on a tutorial basis. Credits and content vary to meet the scope of the project proposal.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ARC 896 Summer Dietres Res (1 credit hours)

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Art and Design (ADN)

ADN 111 Introduction to Two-Dimensional Design (3 credit hours)
An introduction to the fundamentals of design studies through two dimensional problems. The basic elements and concepts of design explored as abstract and applied problems through design issues. Provides non-design students an introduction to design principles.

Typically offered in Fall, Spring, and Summer

ADN 112 Introduction to Three-Dimensional Design (3 credit hours)
An introduction to the fundamentals of design studies through three-dimensional problems. The basic elements and concepts of design explored as abstract and applied problems through the design issue. Provides non-design students a working knowledge of design.

Typically offered in Fall and Spring

ADN 200/DS 200 A Survey of Design Studies (3 credit hours)
This course will introduce students to a variety of perspectives and lenses through which to examine and evaluate design in the world. Students will consider design studies through theory and criticism of design, as well as applied to business administration, museum studies, and environmental studies. In addition, students will be encouraged to find evidence of and define design studies in areas that are uniquely suited to their individual areas of interest. As an advised elective, this course is required for Design Studies majors who are sophomores in their major.

Typically offered in Fall only

ADN 202 Design Studio: Art & Design in Context (6 credit hours)
Emphasis on fundamental Art & Design visual language through investigative problem solving.

Prerequisite: D 104, D 105, or permission of department, ADN majors only
Typically offered in Spring only

ADN 203 Art + Design Sophomore Studio I (3 credit hours)
The Art + Design Sophomore Studio series includes four required courses of three-credit hours each to be completed in the sophomore year. ADN 202 and ADN 203 are offered in the fall semester. ADN 204 and ADN 205 are offered in the spring semester. The A

Prerequisite: ADN 201, or permission of department, ADN majors only
Typically offered in Fall only

ADN 204 Art + Design Sophomore Studio Spring (6 credit hours)
The Art + Design Sophomore Studio series includes two required courses of six-credit hours each to be completed in the sophomore year. ADN 202 is offered in the fall semester. ADN 204 is offered in the spring semester. The Art + Design Sophomore Studio

Typically offered in Spring only

ADN 212 Photography I (3 credit hours)
Introduction to the processes and visual skills necessary for the beginning photographer. Darkroom experimentation, pinhole camera, basic rudiments of camera use, film development and printing. Exploration of issues related to the quality of visual communication.

Typically offered in Fall and Spring
ADN 219 Digital Imaging I (3 credit hours)
Introduction to exploring, creating, and modifying images through the use of computers. Emphasis is on creativity, experimentation, and intuitive image-making using various computer techniques.

Prerequisite: D104 or ADN 111
Typically offered in Fall and Spring

ADN 220 Digital Illustration I (3 credit hours)
Hands-on exploration of digital drawing, painting, and image editing techniques with the use of pressure sensitive digital drawing tablets and image editing software; Development of ability to design and communicate convincing 3-dimensional forms and environments using 2D digital techniques with an emphasis on gesture, shape, volume, intuitive perspective, color, and light; Application of design process and research to generate images for visual concept development; Examination of relationships between historic and contemporary conventions for traditional and digital image-making.

Typically offered in Fall and Spring

ADN 221 Digital Illustration II (3 credit hours)
Hands-on exploration of digital drawings, painting, and image editing techniques with the use of pressure sensitive digital drawing tablets and image editing software; Development of ability to integrate multiple visual elements to illustrate narratives and create illusionistic environments. Emphasis shot design, linear perspective, light, color, texture, and atmosphere; Application of design process and research to generate images for visual concept development and mood; Examination of relationship between historic and contemporary illustration, compositing, and matte painting techniques.

Prerequisite: ADN 220
Typically offered in Fall and Spring

ADN 224 Digital Motion (3 credit hours)
Hands-on exploration of motion, animation principles, and keyframing strategies; Development of animated experiments and sequences that focus on convincing and exaggerated movement, physics, and acting; Introduction to range of key animation software and techniques. Restricted to Art and Design Majors Only

Typically offered in Spring only

ADN 225 Digital Sequential Imaging (3 credit hours)
Hands-on development of story-boards, story-reels, and animatics to plan and examine visual sequences; Development of freehand sketching techniques; Exploration of drawing and image-making as a tool for visual and conceptual development; Examination of traditional and contemporary visual storytelling techniques and conventions; Exploration of common strategies for developing narrative structure. Restricted to Art and Design Majors Only.

Typically offered in Fall only

ADN 273 Fibers Materials and Processes (3 credit hours)
Introduction to historical and contemporary hand processes used by the textile designer. Students will learn a variety of textile techniques utilizing traditional and experimental methods. Emphasis will be on technical exploration and development.

Prerequisite: ADN 111 or ADN 112 or D 105
Typically offered in Fall and Spring

ADN 274 Basic Woven and Constructed Textiles (3 credit hours)
Hands-on introduction to structures and techniques of hand weaving and related off-loom textile structures. Focus on basic hand weaving structures, including plain weave, twills and satins, acquired through threading the loom and weaving with a variety of materials. Off-loom techniques explore a variety of structures made with simple hand tools. Projects focus on materials choice; color experimentation and control; pattern manipulations; scale and balance; and the design process as applied to hand constructed textile artifacts.

Typically offered in Fall only

ADN 275 Survey of Fibers in Art and Design (3 credit hours)
This course introduces the student to the vast world of fibers within the Art-Design community and industry. Students will learn the basics of fiber construction and terminology and explore the specialties within the fiber world (including costume design, fashion, fiber art, textile design, etc.). College of Design students only.

Design Students Only
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall only

ADN 276 Soft Construction I: Sewing (3 credit hours)
Students will gain a fundamental understanding of traditional sewing and construction techniques using both hand and machine methods. Students may incur additional costs for project supplies. Please note that seats in this course are reserved for Colleg

Prerequisite: Design Majors
Typically offered in Fall only

ADN 281 Drawing I (3 credit hours)
A beginning descriptive drawing experience which teaches students to see, analyze, and transcribe observed subjects. The transcription incorporates formal drawing issues (line, form, texture) with traditional and contemporary material space exploration.

Prerequisite: Design Majors and Design Minors
Typically offered in Fall and Spring

ADN 288 History of Art + Design: 1918 to the Contemporary World (3 credit hours)
A survey of the History of Art and Design, 1918 to the present, focused on innovative work done in the areas of advertising, animation, comic books & graphic novels, fine arts, and emerging practices in the 21st Century, including Virtual Reality and User Experience design. Attention is paid to evolving definitions of visual culture and their critiques utilizing art historical frameworks to introduce students to methodological approaches in the field.

Typically offered in Spring only

ADN 292 Special Topics in Art + Design (1-3 credit hours)
Topics of current interest in the School of Design. Used to develop new courses.

Typically offered in Fall and Spring
ADN 311 Art + Design Laboratory I (3 credit hours)
Study of creative and contextual skills that relate to Art & Design areas of focus.
Prerequisite: ADN 111, ADN 112
Typically offered in Fall and Spring

ADN 312 Photography II (3 credit hours)
Continuation of an advanced level of the skills and techniques developed in Basic Photography. Purpose is to develop use of camera as a perceptual tool to increase awareness and sensitivity of visual imagery.
Prerequisite: ADN 212
Typically offered in Fall and Spring

ADN 319 Animation I (3 credit hours)
An intensive introduction to animation which integrates traditional hand generated animation, digital techniques and technology. Students will explore animation’s fundamental principles of linear formats, sequenced movement and time-based imaging.
Prerequisite: ADN 219
Typically offered in Fall and Spring

ADN 371 Soft Construction II: Sculptural Geometry (3 credit hours)
Students will learn advanced problem solving skills through the creation of the basic set of fashion patterns and the integration of design details. Students may incur additional costs for project related supplies. This course requires field trips as po
Prerequisite: Design Majors and Design Minors
Typically offered in Fall and Spring

ADN 372 Surface Embellishment (3 credit hours)
Hands-on experimentation with classic hand, machine, and digital stitching techniques on fabric; personal exploration of non-traditional materials and applications at different scales; and examination of historic and contemporary stitching through visits to the Gregg Museum and directed library and internet research.
Typically offered in Fall and Spring

ADN 373 Survey of the Fashion Industry and Design (3 credit hours)
Students will be introduced to the fashion industry, fashion history, creative process, behind the scenes, and presentation skills. Please note that 50% of seats are reserved for College of Design or Art + Design Minor (v) students only.
Typically offered in Spring only

ADN 384 Painting I (3 credit hours)
Introduction to the principles of painting through class projects that expose students to different painting materials and techniques. Students learn to build a stretcher, size and prime a canvas as well as other rigid painting surfaces. Acrylic and oil paint used; projects assigned and open themes.
Prerequisite: D 104 or both ADN 111 and ADN 112.
Typically offered in Fall only

ADN 386 Sculpture I (3 credit hours)
Studio course introducing basic concepts, materials, and processes of sculpture. Instruction incorporates both traditional and contemporary form generation with emphasis on developing formal perception and projection.
Prerequisite: D 104 or ADN 112.
Typically offered in Fall only

ADN 400 Design Studio (6 credit hours)
Studio offering Art & Design undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc..) as applies to the study of Art + Design.
Prerequisite: ADN majors only.
Typically offered in Fall and Spring

ADN 402 Senior Art + Design Studio (6 credit hours)
Advanced Design studio emphasizing the exploration of past, current and potential future technologies within Art + Design Department content areas. Students are expected to work independently, develop their own problem statements.
Prerequisite: Seven studios and ADN 219
Typically offered in Fall and Spring

ADN 411 Art + Design Laboratory II (3 credit hours)
Study of intermediate visual communication skills that relate to Art & Design areas of focus.
Prerequisite: D 105 or ADN 111 or ADN 112 or ADN 281
Typically offered in Fall and Spring

ADN 414 Color and Light (3 credit hours)
Physical and perceptual nature of color, color awareness, sensitivity and skills in visual communication with color as a designer’s tool.
Typically offered in Fall and Spring

ADN 415 Visualizing Narrative (3 credit hours)
This course will build upon previous knowledge in Art and Design through a focus on the basic historic, stylistic and compositional attributes of type to enhance storytelling in their work. *Main topics addressed in the course will cover the relationship between form and content to support pacing, transition, structure, voice, action and resolution for richer visual narratives. We will use both found text as well as stories that students create in the class to explore the many ways that type can enunciate the meaning, tone and spirit of a story. There are printing fees estimated at $100 associated with this
Prerequisites: (ADN 111 (2D) and ADN 219) OR PERMISSION OF THE INSTRUCTOR. Restricted to: JUNIOR AND ABOVE STANDING IN THE MAJOR, COLLEGE OF DESIGN STUDENTS ONLY
Typically offered in Fall and Spring

ADN 418 Contemporary Issues in Art and Design (3 credit hours)
Explore a range of issues about contemporary art and design ideologies. Concentration on selected readings which provide a platform for discussion of various ideas, approaches, perspectives and practices in the contemporary fields of art and design.
Prerequisite: DS 100 and DS 200 and ADN 202 and ADN 400; Requisite: Junior Standing in ADN or Design Studies
Typically offered in Fall and Spring
ADN 419 Creative Technology Studio I (3 credit hours)
Intensive hands-on investigation of the tools, techniques, and processes for the development of interactive multi-media projects. Media teams will emphasize shaping an idea into a well thought-out design that works as an interactive experience.
Prerequisite: D 105, ADN 219
typically offered in Fall and Spring

ADN 423 Digital Modeling (3 credit hours)
Hands on introduction to 3D digital modeling tools and techniques for artists and designers who want to expand their skill sets to include 3D practices. The course has applications in several disciplines including; animation, illustration, surface design, and concept development. Explores the use of surface textures, lighting, and compositing. Examines strategies for using 3D tools to create prototypes for physical objects, integrate 3D elements into 2D images, and create models for animation. Restricted to Art and Design Majors Only.
typically offered in Fall only

ADN 428 Art and Design: Theory and Practice (3 credit hours)
Conceptual basis for developing a personal philosophy regarding the practice of art and design. Theory based history of diverse cultures and forces of change; political, economic, religious, social, intellectual and philosophical as they affect the fields of art and design.
Prerequisite: Senior Level (6 studios), Art and Design Major
typically offered in Fall only

ADN 460 Creative Technology Studio II (6 credit hours)
An intensive study of advanced image-making processes, software, and various computer platforms used in the creation of multimedia. In a studio mode, students will place emphasis on creating interactive interface systems with audio and special effects.
Prerequisite: ADN 219 and ADN 400
typically offered in Fall and Summer

ADN 470 Fibers and Surface Design Studio (6 credit hours)
Practice of widely varying textile techniques with the solving of practical and conceptual design problems. Textile end products are designed and produced at full scale in appropriate materials. Focus includes weaving, knitting, printing and dyeing of fabrics, and a wide variety of fabric construction and embellishment processes. Textile history is an ongoing part of the study. Emphasis on synthesis of techniques and ideas.
Prerequisite: Grade of C- or better in (ADN 400 or ARC 202 or ID 202 or GD 202)
typically offered in Fall and Spring

ADN 472 Advanced Surface Design (3 credit hours)
Advanced problems in the design and production of hand-printed and pattern-dyed fabrics. Experimentation with advanced color application techniques. Exploration of pattern and image production on fabric and development of design abilities in textilemedi
Prerequisite: D 104, ADN 272
typically offered in Fall and Spring

ADN 473 Advanced Three-Dimensional Fibers Forms and Structures (3 credit hours)
Advanced explorations of three-dimensional textiles forms and structures including works small and large scale installations and sculptures, planar structures in space, and textiles that interact with interior or exterior architecture, the body, or public or site-specific spaces. Technical focus on construction, joining mixed materials, armatures, integration of found materials, and both traditional and experimental structures and applications. Use of hand and power tools.
Prerequisite: ADN 273 or equivalent
typically offered in Fall and Spring

ADN 474 Advanced Digital Hand Weaving (3 credit hours)
Introduction to use of the computer as a tool for designing, drafting, and hand weaving, using simple software packages. Hand weaving on 24-harness computer assisted looms, 8 harness hand looms, and TC-1 digital hand jacquard loom. 4 to 24 harness woven structures including twill, satin, shadow weave, double weave, woven shibori, dyed warps, and other weave structures. Focus on designing, technical skills, and solving technical problems.
typically offered in Fall and Spring

ADN 475/ADN 575 Pre-Industrial World Textiles (3 credit hours)
Research on and discussion of hand-made textiles of the world, introducing major textile traditions from Africa, Asia, Europe, North and South America. Focus on geographic and cultural contexts, developments in making, and design characteristics, including impact of 20th century fiber art movements. Seminar format.
Prerequisite: Sophomore standing
typically offered in Spring only

ADN 480 Intermediate Studio (6 credit hours)
Studio format offering upper level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.) through individual study in drawing, painting, sculpture, photography, or printmaking.
Prerequisite: Grade of C- or better in (ADN 400 or ARC 202 or ID 202 or GD 202)

ADN 481 Drawing II (3 credit hours)
An intermediate-level drawing course that further develops the designer's graphic, analytic, observational, and conceptual skills.
Prerequisite: ADN 281
typically offered in Fall and Spring

ADN 484 Painting II (3 credit hours)
An intermediate-level painting course that through slide lectures, class projects, and assigned readings exposes students to contemporary painting art movements. Special emphasis given to the formal and interpretative analysis of a painting. Acrylic and oil paint are used; Projects have assigned and open themes.
Prerequisite: D 105 or both ADN 111 and ADN 112.
typically offered in Fall and Spring

ADN 486 Sculpture II (3 credit hours)
An intermediate-level sculpture course that further develops the designer's analytic, observational, and conceptual skills.
Prerequisite: ADN 386
typically offered in Fall only
ADN 490 Art and Design International Studio (6 credit hours)  
Define Art and Design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary art forms. Focus on artifact making through direct studies. Taught off campus.  
Prerequisite: Junior standing, Design Majors, Approval Study Abroad  
Typically offered in Fall, Spring, and Summer  
ADN 491 Special Seminar in Art + Design (1-3 credit hours)  
Seminars on subjects of current interest in art + design.  
Typically offered in Fall and Spring  
ADN 492 Special Topics in Art + Design (1-3 credit hours)  
Topics of current interest in Design & Technology. Used to develop new courses.  
Typically offered in Fall and Spring  
ADN 493 Art and Design Senior Lecture (3 credit hours)  
ADN 493 is a capstone course for seniors in Art and Design. The course prepares and equips students with the necessary tools and communication skills to present themselves professionally as competent practitioners. Students are required to integrate t  
Prerequisite: ADN 219, ADN 281, completion of a 400 level studio;  
Corequisite: ADN 202 or ADN 400 or ADN 460 or ADN 470, or ADN 480  
Typically offered in Fall only  
ADN 494 Internship in Art + Design (1-6 credit hours)  
Supervised field experience in design offices, galleries, museums and other organizations. Maximum of 6 credit hours. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.  
Prerequisite: Junior standing; 3.0 GPA or better  
Typically offered in Fall, Spring, and Summer  
ADN 495 Independent Study in Art + Design (1-6 credit hours)  
Special projects in art and design developed under the direction of a faculty member on a tutorial basis. Maximum 6 credit hours. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Cour  
Prerequisite: Junior standing in Design with 3.0 in Design or better  
Typically offered in Fall and Spring  
ADN 496 The Business of Art and Design (3 credit hours)  
A distance education elective course (ADN & DS) that introduces students to the mechanics of gainfully applying their fine and applied arts and/or design education. The course is not discipline specific. The business of design, principles of branding, project management, entrepreneurship and business development are explored through case studies, virtual class forums, independent and group assignments, and assigned readings. The course engages students in the development and management of design business planning, models, and philosophies with emphasis on social responsibility. Through coursework, students foster interpersonal, group, and leadership competencies.  
Typically offered in Spring only  
ADN 500 Graduate Seminar I: Software, Platforms + Environments (3 credit hours)  
This course will introduce first semester Art + Design graduate students to historical and foundational theories of design and media studies—specifically related to platforms, environments, and networks—to better understand the myriad ways these ideas have impacted artistic and design-based practice.  
Restriction: Art + Design Graduate Students Only. Non-majors by permission of the instructor  
Typically offered in Fall only  
ADN 501 Graduate Seminar: Art + Design as Future Making (3 credit hours)  
This graduate-level Art +Design seminar looks at theories and methods that are impacting experimental media art in contemporary practice as well as how these contemporary practices might inform future art and design-making practices. Topics in the course expose students to a wide breadth of ideas, with the opportunity to dive more deeply into concepts that are personally and professionally intriguing. Topics include: speculative and participatory art + design; biomimicry; artificial intelligence; and technology and ethics. Methods include examining idea sources, process, documentation, critiquing, speaking, and writing about visual concepts.  
Restriction: Graduate Students in Art + Design or permission of the instructor. This is a requirement for all Master of Art + Design Students.  
Typically offered in Fall and Spring  
ADN 502 Advanced Visual Laboratory (3 credit hours)  
ADN 502 is a general title of Advanced Visual Laboratories under the supervision of an Art and Design faculty member to provide intensive experimental work in various phenomena and disciplines related to design.  
Typically offered in Fall and Spring  
ADN 503 Advanced Visual Laboratory (6 credit hours)  
Graduate Studio in Art and Design that introduces students to multiple modes of creating immersive and experiential narratives through platforms and methods such as animation and motion design, augmented reality, virtual reality, mixed reality and computational art and design.  
Restriction: Art + Design Graduate Student or permission of the instructor  
Typically offered in Fall only  
ADN 504 Graduate Studio I: Immersive and Experimental Narratives (6 credit hours)  
Graduate Studio in Art and Design that introduces students to multiple modes of creating immersive and experiential narratives through platforms and methods such as animation and motion design, augmented reality, virtual reality, mixed reality and computational art and design.  
Restriction: Art + Design Graduate Student or permission of the instructor  
Typically offered in Fall only  
ADN 505 Graduate Studio II: Exploring the HyperReal: Materiality, Reality and Speculation (6 credit hours)  
This graduate studio will explore elements of Speculative Design that use design fiction, future casting and critical design principles to examine the past, present and future of experimental design and media experiences. Students will explore different elements of materiality and how experiences are shaped by the tangible, haptic and immersive nature of technology and media.  
Typically offered in Spring only
ADN 570  Graduate Studio III: Final Project Definition  (6 credit hours)
This course will provide structure to the final project development for Master of Art + Design Students. Throughout the course, students will be working independently, with instructor guidance and mentorship to develop unique, novel projects that explore new forms of immersive narrative and interactive experiences and push technical boundaries and platforms. Guest lectures and workshops may be brought into the studio throughout the semester.
Restriction: Art + Design Graduate Student or permission of the instructor
Typically offered in Fall and Spring

ADN 571  Fibers and Surface Design Seminar  (3 credit hours)
Seminar on current professional issues in fibers and surface design, focusing on theory, history, critical analysis, and philosophy. Reading, discussion, presentations, research, and writing about contemporary and historical thought in the field.
Prerequisite: ADN 503
Typically offered in Spring only

ADN 575/ADN 475  Pre-Industrial World Textiles  (3 credit hours)
Research on and discussion of hand-made textiles of the world, introducing major textile traditions from Africa, Asia, Europe, North and South America. Focus on geographic and cultural contexts, developments in making, and design characteristics, including impact of 20th century fiber art movements. Seminar format.
Prerequisite: Sophomore standing
Typically offered in Spring only

ADN 581  Final Project Research  (3 credit hours)
Directed research to prepare background documentation for the final project, including historical and contemporary context, formation of project parameters, statement of goals, and documentation/project outline.
Typically offered in Fall and Spring

ADN 588  Final Project Studio  (6 credit hours)
Final studio project for graduate students in Art & Design, under the supervision of graduate advisory committee members.
Prerequisite: ADN 570(18cr) and ADN 581. Student in last semester of graduate enrollment
Typically offered in Fall and Spring

ADN 592  Graduate Art + Design Special Topics  (1-6 credit hours)
Topics of current interest to the program or concentration offered by faculty in the department of Art and Design. Subjects offered under this number are normally used to test and develop new courses.
Typically offered in Fall, Spring, and Summer

ADN 630  Independent Study in Art & Design  (1-3 credit hours)
Independent study in art and design under the supervision of a specific Art & Design faculty member. Restricted to graduate students in Art & Design with consent of the supervising faculty. May not be taken in the first semester of graduate study
Prerequisite: ADN 503; and ADN 570
Typically offered in Fall, Spring, and Summer

ADN 685  Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Spring only

ADN 688  Non-Thesis Masters Continuous Registration - Half Time Registration  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ADN 689  Non-Thesis Master Continuous Registration - Full Time Registration  (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall and Spring

Arts Studies (ARS)

ARS 251  The Arts of a World Capital: London  (3 credit hours)
Multidisciplinary course introducing students to the architecture and museums and the musical, dance, and theatrical performances of London. Historical and social context of these works of art. The infrastructure in London that makes its unusual artistic vitality and quality possible. Taught in London.
GEP Global Knowledge, GEP Humanities, GEP Visual and Performing Arts
Typically offered in Summer only

ARS 252  The Arts of Vienna 1900  (3 credit hours)
Interdisciplinary study of art, architecture, music and theater in turn-of-the-century Vienna and of the political and scientific thinking that surrounded these arts. Taught in Vienna.
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Summer only

ARS 257/STS 257  Technology in the Arts  (3 credit hours)
The interaction between technology and the arts with an emphasis on developments in Western art of the twentieth century. Historical and emerging issues include: sound and film recordings, the addition of sound to films, the impact of films and television on theater, the impact of radio, computer applications to music, the visual arts, and literature.
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring
ARS 258  Mathematics and Models in Music  (3 credit hours)  
Use of mathematics and models in the composition of western music of various time periods with an emphasis on the twentieth century. Critical analysis of trivial and non-trivial uses of mathematics; differentiation between mathematics as an analytical tool and mathematics as a compositional tool. Survey of models including geographical, grammatical, and graphic.  
Typically offered in Spring only

ARS 259  The Arts and Politics  (3 credit hours)  
Interactions between the arts and politics. Specific instances and types of political art from the past and the present. Patronage, censorship, propaganda, art in times of war, the artist's options and powers, aesthetics and criticism.  
GEP Visual and Performing Arts  
Typically offered in Fall only

ARS 306/MUS 306  Music Composition with Computers  (3 credit hours)  
Survey of the theory and history of computer music, compositional algorithms, digital synthesis techniques, composition of at least one computer music work -- a computer-assisted composition for traditional instruments, a piece for computer music on tape, a real-time piece, or a piece that combines tape and instrument(s).  
Prerequisite: Some knowledge of music or computer science (e.g. CSC 200)  
GEP Visual and Performing Arts  
Typically offered in Fall and Spring

ARS 346/AFS 346  Black Popular Culture  (3 credit hours)  
A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse. This class may be scheduled with a small percentage of seats held for IDS Students Only.  
GEP Humanities, GEP U.S. Diversity  
Typically offered in Fall, Spring, and Summer

ARS 351  Arts, Ideas and Values  (3 credit hours)  
An examination of the way works of art embody a particular understanding of what is real and what is worthwhile and shape their viewers' ideas and values. Case studies approach.  
GEP Visual and Performing Arts  
Typically offered in Spring only

ARS 353  Arts and Cross-Cultural Contacts  (3 credit hours)  
Study of works of art that allude to or combine two or more traditions. Examples from film, dance, music, theater and visual arts. Analysis of the role of the exotic in art. The role of arts of multiple traditions in inaugurating new artistic movements, such as Ming landscape painting. Impact of electronic media on contemporary multicultural arts, such as Nepali pop.  
GEP Global Knowledge, GEP Visual and Performing Arts  
Typically offered in Fall and Spring

ARS 354  The Arts and the Sacred  (3 credit hours)  
The support and critique of religion through the arts. Study of religious symbolism embodied in works of art from a number of traditions and genres. The interrelationship between art and religion, history, culture, spirituality, and ritual.  
GEP Global Knowledge, GEP Visual and Performing Arts  
Typically offered in Fall only

ARS 414  Interdisciplinary Arts Seminar  (3 credit hours)  
Creation and presentation of new interdisciplinary works of art. Theory and history of such works including discussion of mixed media, multimedia and intermedia. In-class presentations and critiques. Eventual presentation of finished works in appropriate venues. Additional expenses will be incurred for Arts Now Series events  
Typically offered in Fall only

ARS 494  Topics in Arts Studies  (3 credit hours)  
Multi-arts course focusing on selected works of art in various media, related by theme, place or date. Capstone course for students with an extensive background in one of the arts. Topics may vary.  
Prerequisite: Junior standing and 15 hours in either dance, design, film studies, music, theater, or visual arts.  
Typically offered in Fall and Spring

ARS 498  Independent Study in Arts Studies  (1-3 credit hours)  
Independent study or project directed by a faculty member in the student's area of interest. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student  
Prerequisite: Nine hours of course work in Arts Studies  
Typically offered in Fall, Spring, and Summer

Arts Village (AVS)

AVS 100  Arts Village Forum  (1 credit hours)  
Direct experience with multiple arts events at the university and across the Triangle area. Through pre- and post-event presentations, discussions, and written responses, students will gain a deepened awareness of a wide variety of artistic structures, meaning, interpretation, and values. Transportation to off-campus arts events will be provided. For Arts Village Students only.  
Typically offered in Fall and Spring
Biochemistry (BCH)

BCH 101/MB 101 Introduction to Microbiology and Biochemistry Laboratory Practices (3 credit hours)
Curricular bridge between high school and college for high school and transitional students. A “hands on” introduction to fundamentals in Microbiology and Biochemistry. Bacterial isolation, identification and growth using aseptic technique, microscopy, and metabolic analysis. Experiments with DNA isolation and analysis, protein isolation, and purification, and enzyme kinetics. Lectures and readings on background theory and applications of these techniques. Field trips to university and industry research laboratories. This course is part of the Summer College in Biotechnology and Life Sciences (SCIBLS) as well as other pre-college, transitional and early-college programs and is offered as a 4 week intensive course. Applicants should have completed high school courses in biology and chemistry. Students must have completed no more than 30 credit hours. Departmental approval is required for current NCSU students.

Typically offered in Summer only

BCH 103 Introduction to Biochemistry (1 credit hours)
Introduction to curriculum and career requirements for biochemistry and being a successful student at NCSU. Emphasis is placed on curricular requirements, interactions with faculty and students in the Department of Molecular and Structural Biochemistry, introduction to key resource programs on campus, exposure to research opportunities and ongoing career planning. Enrollment is limited to new or transfer Biochemistry majors with less than 45 hours.

Typically offered in Fall only

BCH 220 Role of Biotechnology in Society (3 credit hours)
Role of Biotechnology in Society is an introductory science course that takes a semi-technical look at the emerging role of biotechnology in human society. Expectations are that students will gain an appreciation for biotechnology and gain the ability

Prerequisite: BIO 181, CH 101
GEP Interdisciplinary Perspectives
Typically offered in Summer only

BCH 330 Physical Biochemistry (3 credit hours)
This course provides a descriptive survey of the concepts of physical chemistry with emphasis on their use in applications designed to characterize and manipulate biological molecules and systems. Topics are drawn from thermodynamics (bonding, protein folding energies, linkage, spectroscopic and differential scanning calorimetric binding measurements), kinetics (enzymatic catalysis, perturbation techniques), statistical mechanics (distributions, ensembles, molecular mechanical & dynamics calculations), electrochemistry, hydrodynamics (diffusion, friction, electrophoresis, viscosity, sedimentation, organism size and shape), quantum mechanics (wave functions operators, uncertainty principle, dipoles, orbitals and resonance energy coupling), and spectroscopy (absorbance and light scattering, fluorescence, nuclear and electronic paramagnetic resonance, MR imaging and x-ray diffraction).

P: (CH 201 or CH 203) and (BCH 351 or BCH 451) and (MA 231 or MA 242) and (PY 208 or PY 212)
Typically offered in Spring only

BCH 351 General Biochemistry (3 credit hours)
This course is an introduction to the basic principles of biochemistry. It emphasizes biochemical structures, properties, and functions, including enzyme kinetics and major metabolic processes. It can serve as a prerequisite for BCH 452 with permission of the department. This course is designed for those students who are not majoring in Biochemistry and do not require a more comprehensive introduction to biochemistry. It is not intended for graduate students. Credit is not allowed for both BCH 351 and BCH 451. Prerequisites CH 223 (or CH 227) and BIO 183 are required. CH 201 (or CH 203) is strongly recommended, but not required.

Prerequisite: CH 223 (or CH 227), BIO 183
Typically offered in Fall, Spring, and Summer

BCH 451 Principles of Biochemistry (4 credit hours)
Introduction to and survey of the fundamental principles of biochemistry, emphasizing the chemistry of living organisms, chemical structures, and interactions of and between biomolecules.

Prerequisite: CH 101 (or CH 103), CH 102 (or CH 104), CH 201 (or CH 203), CH 202 (or CH 204), CH 211 (or CH 225), CH 222 (or CH 226), CH 223 (or CH 227), CH 224 (or CH 228), and BIO 183
Typically offered in Fall, Spring, and Summer

BCH 452 Introductory Biochemistry Laboratory (2 credit hours)
Laboratory experiences in this course are designed to compliment the first semester undergraduate biochemistry course, BCH 451.

Basic skills to be mastered include the use of volumetric equipment, spectrophotometers, chromatography, and electrophoresis. You will also learn to assay small quantities of biological materials and analyze lab data. You will learn to manipulate biochemical materials from three of the four major subgroups: proteins, nucleic acids and carbohydrates. You will determine structural elements at a number of analytical levels and learn how to think about their functional capabilities. We will emphasize theoretical information, while discussing how the techniques work.

The explanations discuss how the techniques work. We focus on how consecutive methods are interconnected to form process chains.

P: CH 101 (or CH 103), CH 102 (or CH 104), CH 201 (or CH 203), CH 202 (or CH 204), CH 221 Organic Chemistry I (or CH 225), CH 222 (or CH 226), CH 223 (or CH 227), CH 224 (or CH 228), BIO 183 and BCH 451 (may serve as corequisite or prerequisite).
Typically offered in Fall and Spring

BCH 453/BCH 553 Biochemistry of Gene Expression (3 credit hours)
Credit is not allowed for both BCH 453 and BCH 553.

Prerequisite: BCH 451, Corequisite: GN 311, MB 351
Typically offered in Fall and Spring

BCH 454 Advanced Biochemistry Laboratory (4 credit hours)
Hands on experience with the techniques of molecular biology and protein purification. Cloning and expression of a eukaryotic gene in bacteria will be performed followed by purification of the eukaryotic gene product. Microanalysis of DNA, RNA and protein.

Prerequisite: BCH 451 & BCH 452; Corequisite: BCH 453
Typically offered in Fall and Spring
BCH 455/BCH 555  Proteins and Molecular Mechanisms  (3 credit hours)
Principles of protein structure and function, protein folding, enzymology, ligand binding, protein transport, and metabolic pathways.
Prerequisite: BCH 451, BCH 453/553
Typically offered in Fall and Spring

BCH 492  External Learning Experience  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

BCH 493  Special Problems in Biochemistry  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

BCH 495  Special Topics in Biochemistry  (1-5 credit hours)
Offered as needed to present materials not normally available in regular BCH departmental courses or for new BCH courses on a trial basis.
Prerequisite: Junior standing.
Typically offered in Fall, Spring, and Summer

BCH 552  Experimental Biochemistry  (3 credit hours)
An advanced laboratory to give students practical experiences in purification and quantitative characterization of enzymes and nucleic acids. Studies with carbohydrates and membrane lipids. Credit may be applied toward biotechnology minor.
Prerequisite: BCH 452:BCH 453
Typically offered in Fall and Spring

BCH 553/BCH 453  Biochemistry of Gene Expression  (3 credit hours)
Prerequisite: BCH 451, Corequisite: GN 311, MB 351
Typically offered in Fall and Spring

BCH 555/BCH 455  Proteins and Molecular Mechanisms  (3 credit hours)
Principles of protein structure and function, protein folding, enzymology, ligand binding, protein transport, and metabolic pathways.
Prerequisite: BCH 451, BCH 453/553
Typically offered in Fall and Spring

BCH 560  Molecular Biology for Teachers  (3 credit hours)
Introduction to molecular biology for teachers. Emphasis will be on developing basic laboratory skills applicable to middle or high school biology classes. Teachers will develop their own labs during the last week of class. This is an intensive three-week class, five hours per day. Students should have at least one biotechnology course before enrolling in this course. Prior secondary school teaching experience preferred.
Typically offered in Summer only

BCH 571/ANS 571  Regulation of Metabolism  (3 credit hours)
Study of hormonal, enzymatic and molecular-genetic regulation of carbohydrate and lipid metabolism; emphasis on mammalian species.
Prerequisite: BCH 451, GN 311, a course in physiology, cell biology
Typically offered in Fall only

BCH 590  Special Topics in Biochemistry  (1-6 credit hours)
The study of topics of special interest by small groups of students instructed by members of the faculty.
Prerequisite: BCH 451
Typically offered in Fall, Spring, and Summer

BCH 601  Macromolecular Structure  (1 credit hours)
Introduction to the current understanding and methods used for the study of structures, thermodynamics and conformational dynamics of proteins, nucleic acids and membranes.
Prerequisite: BCH 453 or BCH 553; a course in physical chemistry highly recommended
Typically offered in Fall only

BCH 610  Special Topics  (1-6 credit hours)
The study of topics of special interest by small groups of students instructed by members of the faculty.
Prerequisite: BCH 451
Typically offered in Fall, Spring, and Summer

BCH 615  Special Topics in Biochemistry  (1-6 credit hours)
Critical study of special problems and selected topics of current interest in biochemistry and related fields.
Prerequisite: Graduate standing in BCH
Typically offered in Fall, Spring, and Summer

BCH 670  Laboratory Rotations  (1 credit hours)
Performance of highly directed research by biochemistry students in one or more laboratories of student's choice prior to beginning thesis research. Each laboratory experience lasts 5 weeks and given 1 hr. of credit. No more than 4 credits earned in this course.
Prerequisite: BCH 451
Typically offered in Fall and Spring

BCH 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring
BCH 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirement of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Spring only

BCH 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BCH 695 Master's Thesis Research (1-9 credit hours)
Thesis research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BCH 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Spring only

BCH 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BCH 701 Macromolecular Structure (3 credit hours)
Introduction to the current understanding and methods used for the study of structures, thermodynamics and conformational dynamics of proteins, nucleic acids and membranes.
Prerequisite: BCH 453 or BCH 553; a course in physical chemistry highly recommended
Typically offered in Fall only

BCH 703 Macromolecular Synthesis and Regulation (3 credit hours)
Biochemistry of DNA replication, transcription, RNA processing and translation. Development of key concepts, techniques and applications relating to mechanisms and regulation of these processes by analysis of primary literature.
Prerequisite: BCH 453 or BCH 553
Typically offered in Fall only

BCH 705 Molecular Biology Of the Cell (3 credit hours)
Regulation of cellular processes, membrane structure and function, signal transduction, protein trafficking/sorting, secretion, photosynthesis and nitrogen fixation.
Prerequisite: BCH 701 or BCH 703
Typically offered in Spring only

BCH 710 Biological Scanning Electron Microscopy (2 credit hours)
On demand. Theory and application of scanning electron microscopy, including specimen preparation, microscope alignment and operation, performance evaluation, interpretation of problems and darkroom technique. (Limited to 8 students with prior approval of instructor.)
Prerequisite: Graduate standing with some biological background
Typically offered in Spring only

BCH 751 Biophysical Chemistry (3 credit hours)
Fundamental and practical aspects of biological macromolecular structure, thermodynamics, hydrodynamics, kinetics and spectroscopy with emphasis on mechanisms in functionally important structural transformations.
Prerequisite: BCH 451; one sem. of physical chemistry
Typically offered in Fall only

BCH 760 Protein Crystallography and Macromolecular Modeling (3 credit hours)
Basic principles and practice of protein crystallography and the application of molecular dynamics to evaluate structural models. The computer lab provides hands-on experience in structure determination, refinement, model building, and molecular dynamics using CHARMM.
Prerequisite: BCH 455 or BCH 555 or equivalent
Typically offered in Fall only

BCH 761/GN 761/PB 761 Advanced Molecular Biology Of the Cell (3 credit hours)
An advanced graduate class involving integrated approaches to complex biological questions at the molecular level, encompassing biochemistry, cell biology and molecular genetics. The course will focus on an important, current area of research in eukaryotic biology using the primary scientific literature, and will involve class discussions, oral presentations, and a written research proposal.
Typically offered in Spring only

BCH 763 Biochemistry Of Hormone Action (3 credit hours)
Study of well-defined models of steroid and protein hormone action via lectures, assigned readings and discussions. Students add breadth to the course and depth to their own understanding by searching the literature and writing or lecturing about a particular hormone of their own choosing.
Prerequisite: BCH 705 or GN 757
Typically offered in Spring only

BCH 768/GN 768 Nucleic Acids: Structure and Function (3 credit hours)
An advanced treatment involving integrated approaches to biological problems at the molecular level, encompassing biochemistry, cell biology and molecular genetics. Broad, multidisciplinary approaches to solving research problems in biology and the critical study of primary scientific literature, the development of a research proposal, oral presentations and class discussions.
Prerequisite: BCH 701 and 703
Typically offered in Spring only
BCH 770  Enzyme Kinetics and Mechanisms  (3 credit hours)
An advanced course in enzyme kinetics and mechanisms with particular emphasis on experimental design and interpretation. The first half of the course covers the derivation and application of single and multisubstrate kinetic equations, inhibition and pre-steady state kinetics. The second half of the course covers fundamental chemical and physical principles of enzyme catalysis and specificity.
Prerequisite: BCH 451 and BCH 455/555 or equivalent.
Typically offered in Spring only

BCH 801  Seminar in Biochemistry  (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

BCH 810  Special Topics  (1-6 credit hours)
The study of topics of special interest by small groups of students instructed by members of the faculty.
Prerequisite: BCH 451
Typically offered in Fall, Spring, and Summer

BCH 815  Advanced Special Topics  (1-6 credit hours)
Critical study of special problems and selected topics of current interest in biochemistry and related fields.
Prerequisite: Graduate standing in BCH
Typically offered in Spring only

BCH 870  Laboratory Rotations  (1 credit hours)
Performance of highly directed research by biochemistry students in one or more laboratories of student's choice prior to beginning thesis research. Each laboratory experience lasts 5 weeks and given 1 hr. of credit. No more than 4 credits earned in BCH
Prerequisite: BCH 451
Typically offered in Fall and Spring

BCH 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

BCH 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

BCH 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BCH 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BCH 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

BCH 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Biological and Agricultural Engineering (BAE)

BAE 100  Introduction to Biological Engineering  (1 credit hours)
Technical topics and career options in Biological Engineering with concentrations in Agricultural, Bioprocess, and Environmental Engineering are introduced. Information is provided about career services, internships, and study abroad and co-op opportunities in these areas. Students develop a plan of work.
Typically offered in Spring only

BAE 123  Light Equipment Technology  (3 credit hours)
Principles of operation and maintenance of powered turf, garden, and landscape equipment. Small engines, power transmission systems, equipment maintenance, and operator safety.
Requisite: Agricultural Institute Only
Typically offered in Spring only

BAE 133  Agricultural Tractors and Machinery  (4 credit hours)
Principles of tractor engines, power trains, and hydraulics. Tractor operation, service and testing. Machinery management involving tractor and implement selection based on power and field requirements and on economics of ownership and operation. Implements for crop production to include tillage, planting, chemicals and harvesting. Set-up, operation and maintenance of implements. Calibration of planting and chemical equipment. Tractor and machinery safety. VEAL
Requisite: Agricultural Institute Only
Typically offered in Fall only

BAE 200  Computer Methods in Biological Engineering  (2 credit hours)
Students develop computer-based problem solving techniques to solve introductory problems in Biological Engineering. Emphasis is on developing solution algorithms and implementing these with spreadsheets and computer programming.
Prerequisite: Grade of C or better in MA 141 and Corequisite: E 115
Typically offered in Fall and Summer
BAE 202 Introduction to Biological and Agricultural Engineering Methods (4 credit hours)
Introduction to experimental design methodology, basic engineering design and problem solving methodology for Biological Engineering. Visualization skills, computer-aided 3-D solid modeling of parts, 3-D assembly of solid part geometries, computation of mass properties, 2-D engineering drawings, engineering design process, safety, tools and fabrication processes and design, and hands-on shop fabrication of semester project.

Prerequisite: E 115
Typically offered in Spring only

BAE 203 Introduction to AutoCAD Civil 3D for Environmental & Ecological Engineers (2 credit hours)
Introduction to the use of AutoCAD Civil 3D for Environmental & Ecological Engineering applications. Basic drawing, managing survey data, surfaces, alignments, profiles, corridors, grading, pipe networks, plan production, GIS interface, GIS data types and sources, importing data, creation and export of objects in GIS formats. BE majors will be given priority in enrollment.

Prerequisite: BAE 200
Typically offered in Spring only

BAE 204 Introduction to Environmental and Ecological Engineering (2 credit hours)
Introduction to the principles and applications related to environmental and ecological engineering. Topics include watershed hydrology, nutrient cycling, sources of environmental pollution, and the impact to ecosystems. An overview of different methods employed in these two disciplines to remediate and protect natural resources. Special emphasis on how soil, water, microbial, and plant interactions occur in ecosystems and how they are used to develop treatment technologies.

Prerequisite: BAE 200 and (BIO 181 or BIO 183); Corequisite: BAE 203 and SSC 200
Typically offered in Spring only

BAE 302 Transport Phenomena (3 credit hours)
Theory and application of heat and mass transfer in biological, food, and agricultural systems. Topics include fluid flow, conduction, convection, radiation, psychrometrics, and refrigeration.

Prerequisite: MAE 201 and MA 341 and Corequisite: BAE 200 and MAE 208 and CE 282 or MAE 308
Typically offered in Fall and Summer

BAE 305 Biological Engineering Circuits (4 credit hours)
Fundamentals of analog and digital circuit analysis and design as applied to biological engineering instrumentation systems. Analysis and design of AC and DC circuits using Ohms and Kirchhoff's laws, the node voltage method, Th,venin and Norton's theorem, Laplace Transforms, resistance, capacitance, inductance, operational amplifiers, and frequency response, analog filter design, diode, transistors, biological signal acquisition, binary math and logical operators, digital circuit design, circuit simulation tools and techniques. Laboratory exercises supplement the topics presented in class lectures.

Prerequisite: MA 242, PY 208
Typically offered in Fall only

BAE 321 Bioprocessing Engineering Fundamentals (3 credit hours)
For Engineering and non-Engineering students interested in processing, biotechnology and related disciplines, it is important to have an understanding of the basic principles behind process analysis, design and scale up. This course will provide an introduction to the interdisciplinary approach and engineering concepts behind the development of useful food, chemical, energy, nutraceutical and pharmaceutical products through transformation of biological materials (bioprocessing). Some of the relevant topics covered include the fundamentals behind units, dimensions and engineering properties, stoichiometry, data analysis and statistics, mass and energy balances, rheology, mixing, heat and mass transfer, reaction kinetics and unit operations.

“Corequisite: MAE 201”
Typically offered in Fall only

BAE 322 Introduction to Food Process Engineering (3 credit hours)
Introductory principles and practices of handling and preserving food products. Coverage includes the design and analysis of handling systems for discrete and continuous flow material handling systems, the selection and specification of automatic controls, food preservation principles and considerations relevant to the design of food handling systems, and the principles and practices of drying and storing grain.

Prerequisite: BAE 302; MAE 308 or CE 282; MAE 301 or CHE 315
Typically offered in Spring only

BAE 325 Introductory Geomatics (3 credit hours)
Theory and practice of plane and satellite-based surveying. Includes distance measurement, differential leveling, profile leveling, topographic surveying, and record keeping. Introduction to tapes, levels, total stations, surveying software, the global positioning system, GPS receivers and methods (stand-alone, DGPS, RTK), data collection, data processing, and applications.

Prerequisite: Junior standing
Typically offered in Fall only

BAE 361 Analytical Methods in Engineering Design (3 credit hours)
Engineering problem solving through studies of topics in engineering design. Analysis of linkages, analysis and design of machine structures and components, analysis and design of power transmission components, three-dimensional modeling, and finite element analysis.

Prerequisite: BAE 202 and MAE 208 and MA 341 and Corequisite: CE 225 or MAE 214
Typically offered in Spring only

BAE 371 Fundamentals of Hydrology for Engineers (3 credit hours)
Hydrology and erosion principles. Designing structures and selecting practices to control land runoff, erosion, sediment pollution and flooding.

Prerequisite: BAE 200 and BAE 203; Corequisite: SSC 200 and CE 282 or MAE 308
Typically offered in Fall and Summer
BAE 376  **Watershed Assessment and Water Quality Protection**  (3 credit hours)
Application of methods to describe and protect quality. Identification of water quality problems based on physical, chemical, and biological species and intended use. Water quality sampling equipment, and sample collection strategies and methods. Macroinvertebrate sampling and interpretation. Presentation of water quality data and information. Identification of structural and non-structural best management practices (BMPs) to mitigate degradation of watersheds and ecological systems.

"Corequisite: ST 370"
Typically offered in **Spring only**

BAE 401/BAE 501  **Sensors and Controls**  (3 credit hours)
Basic concepts of sensors and controls for biological systems. Study of transducers and circuits utilized in biological and agricultural engineering applications. Demonstration of concepts of error, accuracy and precision, linearity and other instrument characteristics by electronic models. Provision of hands-on experience for reinforcing lecture concepts in laboratories. Credit will not be given for both BAE 401 and BAE 501.

Prerequisite: BAE 305
Typically offered in **Spring only**

BAE 425/BAE 525  **Industrial Microbiology and Bioprocessing**  (3 credit hours)
Introduction to the structure and functions of microbial cells and their cultivation and utilization in Biological engineering processes. Topics covered include Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels, industrial chemicals, food additives and food products such as beer, wine, cheese and yogurt; Microbial biomass production, Introduction to environmental biotechnology including wastewater treatment and bioremediation. Field trip is an essential educational component of the course and is are required. Credit will not be given for both BAE 425 and BAE 525.

Prerequisite: Junior or higher standing in CALS or COE; MB 351
Typically offered in **Spring only**

BAE 435/BAE 535  **Precision Agriculture Technology**  (3 credit hours)
Overview of technology available for implementation of a comprehensive precision agriculture program. Topics include computers, GPS, sensors, mechanized soil sampling, variable rate control system, yield monitors, and postharvest processing controls. Applications of precision agriculture in crop planning, tillage, planting, chemical applications, harvesting and postharvest processing. Credit may not be received for BAE 435 and BAE 535.

Prerequisite: Junior standing or Senior standing
Typically offered in **Spring only**

BAE 451  **Engineering Design I**  (2 credit hours)
Design concepts of engineering problems are reviewed, including objectives, specifications, manufacturing, prior art and analysis. Reverse engineering, national and international standards, quality control, intellectual law and engineering ethics are covered. Team projects from agricultural, bio-processing and environmental/ecological engineering are executed through problem definition, proposal development, design, and testing. Field trips are required.

Prerequisite: (CE 225 or MAE 214) and (BAE 202 or BAE 203) and BAE 302 and BAE 401 and either (BAE 321 or BAE 322 or BAE 361 or BAE 371) Restrictive Statement: Must be within 36 credit hours of completing the BE degree.
Typically offered in **Fall only**

BAE 452  **Engineering Design II**  (2 credit hours)
Continuation of BAE 451; Project analysis, design, scheduling, construction, tests, presentations and reports. Teamwork development, soft skills and the function of engineering design in society are covered. Field trips are required.

Prerequisite: BAE 451; Restrictive Statement: Must be within 36 hours of completing the BE degree.
Typically offered in **Spring only**

BAE 462  **Machinery Design and Applications**  (3 credit hours)
Machinery design for effective use of energy and labor in agricultural production. Engine cycles, power transmission, hydraulics, traction, combined stresses, finite element analysis, computer-aided-engineering, and engineering economics. Machinery design of agricultural field equipment and other agricultural machinery systems.

Prerequisite: BAE 361
Typically offered in **Fall only**

BAE 472/BAE 572  **Irrigation and Drainage**  (3 credit hours)
Design, management and evaluation of irrigation and drainage systems; concepts and processes of system design. Credit will not be given for both BAE 472 and BAE 572.

Prerequisite: BAE 371
Typically offered in **Fall only**

BAE 473/BAE 573/SSC 573/SSC 473  **Introduction to Hydrologic and Water Quality Modeling**  (3 credit hours)
Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic and water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.

Prerequisite: BAE 371
Typically offered in **Fall only**
BAE 474  Principles and Applications of Ecological Engineering  (3 credit hours)
Governing principles of ecological engineering and the advanced biological, chemical, and physical conditions that determine the design of biological systems. Emphasis on 1) stream and wetland ecosystem restoration and 2) natural treatment systems for groundwater, stormwater, and wastewater such as riparian buffers, bioretention cells, and stormwater wetlands. A class field trip is required during non-scheduled time.
Prerequisite: BAE 203 and BAE 204 and BAE 371 and at least one of the following, MB 351 or PB 321 or PB 360 or SSC 332; Corequisite: BAE 451
Typically offered in Spring only

BAE 478/BAE 578  Agricultural Waste Management  (3 credit hours)
This course covers principles of managing, handling, treating and applying animal and poultry manures and organic byproducts from an engineering perspective. Topics include waste characterization, descriptions of systems and technology, land application principles, preparation of waste management plans, biochemical/biological processes, and potential impacts to the environment. Assignments include homework, quizzes, projects, and discussion that emphasize problem solving and analysis.
Prerequisite: AEC/PB 360 or PB 321 or SSC 332 or MB 351
Typically offered in Fall only

BAE 481  Structures & Environment  (3 credit hours)
Principles of environmental control and structural analysis are combined with biological principles for the design of structures. Topics include structural analysis, load estimation, material selection, fasteners, physiological reactions of animals and plants to their environment, applications of heat transfer and psychrometrics in calculating ventilation requirements, heating or cooling loads.
Prerequisite: BAE 302; CE 225 or MAE 314
Typically offered in Spring only

BAE 488  Postharvest Engineering  (3 credit hours)
An introduction to the engineering aspects of the proper postharvest handling of fresh produce. Topics addressed include cleaning, grading, sorting, cooling, storing, packaging, transport, and marketing. Issues relating to food safety will be integrated throughout all the course content. A class field trip is required during non-scheduled time.
Prerequisite: BAE 302 or MAE 310
Typically offered in Spring only

BAE 492  External Learning Experience  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

BAE 493  Special Problems in Biological and Agricultural Engineering  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

BAE 495  Special Topics in Biological and Agricultural Engineering  (1-3 credit hours)
Offered as needed for presenting material not normally available in regular BAE departmental courses or for new BAE courses on a trial basis.
Typically offered in Fall, Spring, and Summer

BAE 501/BAE 401  Sensors and Controls  (3 credit hours)
Basic concepts of sensors and controls for biological systems. Study of transducers and circuits utilized in biological and agricultural engineering applications. Demonstration of concepts of error, accuracy and precision, linearity and other instrument characteristics by electronic models. Provision of hands-on experience for reinforcing lecture concepts in laboratories. Credit will not be given for both BAE 401 and BAE 501.
Prerequisite: BAE 305
Typically offered in Spring only

BAE 502  Instrumentation for Hydrologic Applications  (3 credit hours)
Basic theory of instruments and measurements. Physical parameters of interest, available methods and sensors for assessment. Sensor characteristics. Dataloggers and sensor-datalogger communications. Data transfer, management, and processing. Emphasis on hydrologic and water quality research applications. Course offered by Distance Education only.
Prerequisite: MA 341, BAE 401 or ECE 331, ST 370 or ST 511
Typically offered in Spring only

BAE 525/BAE 425  Industrial Microbiology and Bioprocessing  (3 credit hours)
Introduction to the structure and functions of microbial cells and their cultivation and utilization in Biological engineering processes. Topics covered include Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels, industrial chemicals, food additives and food products such as beer, wine, cheese and yogurt, Microbial biomass production, Introduction to environmental biotechnology including wastewater treatment and bioremediation. Field trip is an essential educational component of the course and is are required. Credit will not be given for both BAE 425 and BAE 525.
Prerequisite: Junior or higher standing in CALS or COE; MB 351
Typically offered in Spring only
**BAE 528 Biomass to Renewable Energy Processes** (3 credit hours)

This course will introduce fundamental principles and practical applications of biomass-to-renewable energy processes, including anaerobic digestion of organic wastes for biogas and hydrogen production, bioethanol production from starch and lignocellulosic materials, biodiesel production from plant oils, and thermoconversion of biomass and waste materials. Restricted to engineering seniors and graduate standing in COE, CALS, PAMS or CNR.

Prerequisite: Introductory Organic Chemistry or Biochemistry
Typically offered in Fall only

**BAE 535/BAE 435 Precision Agriculture Technology** (3 credit hours)

Overview of technology available for implementation of a comprehensive precision agriculture program. Topics include computers, GPS, sensors, mechanized soil sampling, variable rate control system, yield monitors, and postharvest processing controls. Applications of precision agriculture in crop planning, tillage, planting, chemical applications, harvesting and postharvest processing. Credit may not be received for BAE 435 and BAE 535.

Prerequisite: Junior standing or Senior standing
Typically offered in Spring only

**BAE 536 GIS Applications in Precision Agriculture** (1 credit hours)

Exploration of geographic information systems (GIS) and its applications in precision agriculture. Topics will include file structure and formatting, interfacing with precision agriculture equipment, georeferencing maps, merging and clipping farm data, data field calculations, designing management zones, variable rate prescriptions, and basic data analysis.

Prerequisite: GIS 410 or GIS 510 or BAE 435 or BAE 535
Typically offered in Spring only

**BAE 540 Aerosol Science and Engineering** (3 credit hours)

This course will prepare students to identify agricultural air pollutants and their sources, understand the on-farm and off-farm impacts of these pollutants, measure these pollutants, characterize and model the fate of these pollutants, and select and/or design cost-effective remediation measures. This course is restricted to seniors in engineering and MEAS, and graduate students in CALS, PAMS, and CNR.

Prerequisite: MA 341
Typically offered in Spring only

**BAE 556 Environmental and Agricultural Analytics and Modeling** (3 credit hours)

This course provides students with a fundamental and practical understanding of data science and modeling approaches for environmental and agricultural systems analysis. The course is organized into three modules: (1) data retrieval, management, documentation, and visualization; (2) process-based modeling; and (3) data mining through statistical analysis and machine learning. Rather than develop a strong knowledge base in a specific methodology, students will gain broad and introductory understanding of a range of contemporary quantitative approaches and learn to think critically about the use of data analytics and models.

Prerequisite: Introductory statistics (e.g. ST 515) and experience coding in R (e.g. BAE 555)
Typically offered in Spring only

**BAE 575 Design of Structural Stormwater Best Management Practices** (3 credit hours)

The design of structural stormwater Best Management Practices (BMPs) used in the urban and suburban environments is reviewed, including stormwater wetlands, bio-retention areas, sand filters, innovative wet ponds, green roofs, permeable pavement, and reinforced grass swales. The course is application oriented and includes a pair of field trips.

Prerequisite: BAE 471 or CE 383
Typically offered in Spring only
BAE 576 Watershed Monitoring and Assessment (3 credit hours)
Water measurement and structure sizing. Identification of water quality problems and water quality variable selection. Monitoring design, water quality sampling equipment, and sample collection and analysis. Statistical analysis and presentation of water quality data.
Prerequisite: AES323 (SCS323/BAE323) or BAE471 or FOR429 (NR420) or CE586, and ST311 or ST361 or ST511
Typically offered in Fall only

BAE 577 Wetlands Design and Restoration (3 credit hours)
Fundamental understanding of hydrology, soils and ecology of natural wetland systems will be developed to serve as the basis for designing wetland systems for water treatment and restoring degraded natural wetland systems. Stormwater and wastewater treatment wetland design and implementation concepts will be emphasized. Wetland restoration will also be studied with emphasis on current wetland regulations, design, and implementation techniques. Engineered wetland concepts will be supplemented with relevant case studies. Basic understanding of biology, soils, hydrology, and soil and water engineering is required.
Typically offered in Spring only

BAE 578/BAE 478 Agricultural Waste Management (3 credit hours)
This course covers principles of managing, handling, treating and applying animal and poultry manures and organic byproducts from an engineering perspective. Topics include waste characterization, descriptions of systems and technology, land application principles, preparation of waste management plans, biochemical/biological processes, and potential impacts to the environment. Assignments include homework, quizzes, projects, and discussion that emphasize problem solving and analysis.
Prerequisite: AEC/PB 360 or PB 321 or SSC 332 or MB 351
Typically offered in Fall only

BAE 580 Introduction to Land and Water Engineering (3 credit hours)
This distance course introduces students to concepts of the hydrologic cycle, water quality, precipitation, evapotranspiration, infiltration, watershed delineation, surface runoff and open channel flow. Students will apply these concepts to an engineering design problem. This course is designed for non-engineering distance graduate students and lifelong education students and students from engineering disciplines outside of BAE. It will not substitute for BAE 471. The course is only open to students with senior standing or higher.
Prerequisite: MA 241
Typically offered in Fall only

BAE 581 Open Channel Hydraulics for Natural Systems (3 credit hours)
Theory and applications of hydraulics to open channels with an emphasis on natural streams and rivers. Course will introduce and develop principles of flow regimes (subcritical/critical/supercritical), and types (uniform flow, gradually varied and rapidly varied flow). Application will include hydraulics of flow measuring devices, step-backwater analysis and rating curve development, and flood studies using hydraulic models. A lab-scale flume will be used to illustrate concepts. Laptops will be used in class to learn and apply HEC-RAS (water surface profiles model). CE 382 or equivalent required. CE 381 recommended.
Prerequisite: CE 282 or equivalent. CE 381 recommended.
Typically offered in Fall only

BAE 582 Risk and Failure Assessment of Stream Restoration Structures (1 credit hours)
This course defines uncertainty and risk pertaining to stream restoration structures and identifies and quantifies sources of such. Students will review various in-stream structures and, using an example study of the rock cross vane as a guide, will investigate a structure of their choice applying the concepts of risk and uncertainty. Modules include: Introduction to structures and definitions; Types and modes of failure; Uncertainty in Stream Restoration Design; Probability of failures, cost of failures; and Failure modes and effects.
Prerequisite: CE 382 or MAE 308 or equivalent
Typically offered in Spring only

BAE 583 Stream Corridor 3 Es: Ecohydraulics, Engineering and Ethics (3 credit hours)
Overview of stream ecological and functional processes that structure stream corridors. Explore human interactions with streams including stream restoration structures and watershed scale practices that impact hydraulic, hydrologic, chemical, sedimentary and biotic functions. Discuss failure and risk analysis, policy and rights, and ethical use of our freshwater resources. As we move from a microscopic study of stream benthos to global-scale water concerns, students will develop a fluency in communicating human impacts on streams. Independent visits by students to a local stream required.
Restriction: Graduate or Senior Standing
Typically offered in Spring only

BAE 584 Introduction to Fluvial Geomorphology (3 credit hours)
This distance course provides an introduction to applied fluvial geomorphology as it relates to natural physical stream processes. Students will learn about watershed hydrology, stream gage data analysis, bankfull stage identification, hydraulic geometry relationships, stream channel assessment and classification, stream stability and channel evolution.
Prerequisite: BAE 471 or BAE 580
Typically offered in Fall only

BAE 585 Integrating AutoCAD Civil 3D and GIS (1 credit hours)
Basics of the AutoCAD Civil 3D user interface, drawing tools, importing and handling of survey data, generation of surfaces. GIS data sources and formats. Accessing and using GIS data for Civil 3D design purposes. Creation of GIS objects within Civil 3D and exporting to GIS formats.
Typically offered in Fall only

BAE 587 Biogeochemical processes for Ecological engineering and Environmental Sciences (3 credit hours)
The course provides the advanced theoretical knowledge of biogeochemical processes at play in man-made and natural filter systems, such as wetlands and other buffer systems, alleviating common pollutants associated with non-point source pollution, both in rural and suburban watersheds. Particular emphasis is put on the fate of excess nitrogen in these systems. This emphasis serves as a model for describing ecological engineering principles and quantifying processes at play for all pollutants. 20 students max. This course puts together biological, chemical, biochemical, and hydrological knowledge in one ensemble. Minimum proficiency in each of these is necessary to be able to follow the class with ease.
Typically offered in Fall only
BAE 590 Special Problems (1-6 credit hours)
Selection of a subject by each student on which to do research and write
a technical report on the results. The individual may choose a subject
pertaining to his or her particular interest in any area of study in biological
and agricultural engineering.
Prerequisite: Senior standing or Graduate standing in Biological and
Agricultural Engineering

Typically offered in Fall only

BAE 591 Master's Research Methods I (1 credit hours)
This is the first in a series of research methods courses for MS students
majoring in Biological and Agricultural Engineering. Students will develop
research questions to be answered by their thesis project and produce a
literature review focusing on those questions. Students will also observe
formal seminar presentations, providing critiques and participating in
discussions of proper seminar delivery. This course is restricted to MS
students majoring in BAE.

Typically offered in Fall only

BAE 592 Master's Research Methods II (1 credit hours)
This is the second in a series of research methods courses for MS
students majoring in Biological and Agricultural Engineering. Students
will develop a research proposal for their thesis work and will present the
proposal in a final seminar. This course
Prerequisite: BAE 591
Typically offered in Spring only

BAE 593 Introduction to Research Communications (1 credit
hours)
This course introduces graduate students to the process of reading,
analyzing, and communicating, in writing and multiple presentation
formats, the findings of scientific literature searches. Students will
progress from superficial reading to critical analysis of literature and
will present their analyses in written, poster, presentation, and video
formats. Related issues in research and professional communication will
be discussed.
Prerequisite: Graduate Students in BAE Only
Typically offered in Fall only

BAE 610 Special Topics (1-6 credit hours)
A study of topics in the special fields of interest of graduate students
under the direction of the graduate faculty.
Prerequisite: Graduate standing
Typically offered in Fall only

BAE 620 Special Problems (1-6 credit hours)
Selection of a subject by each student on which to do research and write
a technical report on the results. The individual may choose a subject
pertaining to his or her particular interest in any area of study in biological
and agricultural engineering.
Prerequisite: Senior standing or Graduate standing in Biological and
Agricultural Engineering
Typically offered in Fall and Spring

BAE 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the
student in planning for the teaching assignment, observe and provide
feedback to the student during the teaching assignment, and evaluate the
student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall only

BAE 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all
other requirements of the degree except preparing for and taking the final
master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BAE 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member
of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall only

BAE 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Summer only

BAE 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.
Prerequisite: Master's student
Typically offered in Fall and Spring

BAE 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-
time enrollment for the master's degree and are writing and defending
their thesis.
Prerequisite: Master's student
Typically offered in Fall and Spring

BAE 771/SSC 771 Theory Of Drainage--Saturated Flow (3 credit
hours)
Discussion of physical concepts and properties of fluids and porous
media in relation to soil-water movement. Derivation and discussion of
the fundamental laws and equations governing saturated flow in porous
media. Analysis of mathematical solutions of
Prerequisite: MA 301
Typically offered in Fall only

BAE 785/FS 785 Food Rheology (3 credit hours)
Principles and methods for measuring rheological properties. Theories of
elastic, viscous, viscoelastic and viscoplastic behavior and relationships
to food texture and commodity damage during harvest, handling and
processing. Influence of time, composition and processing.
Prerequisite: FS 231 or MAE 314
Typically offered in Fall only

BAE 790 Special Topics (1-6 credit hours)
Special topics in BAE.
BAE 791 Doctoral Research Methods I (1 credit hours)
This is the first in a series of research methods courses for PhD students majoring in Biological and Agricultural Engineering. Students will develop PhD level research questions to be answered in their dissertation project and will produce a PhD level literature review on those questions. Students will also observe seminars, providing critiques and discussions of proper seminar delivery. This course is restricted to PhD students majoring in BAE

Typically offered in Fall only

BAE 792 Doctoral Research Methods II (1 credit hours)
This is the second in a series of research methods for PhD students majoring in Biological and Agricultural Engineering. Students will develop a research proposal appropriate for their dissertation project and will present the proposal in both a pract

Prerequisite: BAE 791
Typically offered in Spring only

BAE 801 Seminar (1 credit hours)
Elaboration of subject areas, techniques and methods peculiar to professional interest through presentations of personal and published works; opportunity for students to present and critically defend ideas, concepts and inferences. Discussions to point up analytical solutions and analogies between problems in biological and agricultural engineering and other technologies, and to present relationship of biological and agricultural engineering to socio-economic enterprise.

Prerequisite: Graduate standing in BAE
Typically offered in Fall and Spring

BAE 810 Special Topics (1-6 credit hours)
A study of topics in the special fields of interest of graduate students under the direction of the graduate faculty.

Typically offered in Fall only

BAE 820 Special Problems (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in biological and agricultural engineering.

Prerequisite: Senior standing or Graduate standing in Biological and Agricultural Engineering
Typically offered in Fall and Spring

BAE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

BAE 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BAE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

BAE 895 Doctoral Dissertation Research (1 credit hours)
Dissertation research

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BAE 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

BAE 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertation.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

### Biological Sciences (BIO)

**BIO 105 Biology in the Modern World** (3 credit hours)
Concepts in biology taught from the perspective of civically engaging issues or problems. Themes and topics of wide interest, such as climate change, stem cells and cloning, antibiotic resistance, evolution, and human health. Lecture and the corresponding laboratory are designed to deepen an appreciation for the connections between science and "real-world" issues. For non-science majors. Students cannot receive credit for both BIO 105 and (BIO 181 or BIO 183).

**GEP Natural Sciences**
Typically offered in Fall, Spring, and Summer

**BIO 106 Biology in the Modern World Laboratory** (1 credit hours)
Laboratory experience in biological principles to complement BIO 105. For non-science students. Students may not receive credit for both BIO 106 and (BIO 181 or BIO 183).

Corequisite: BIO 105; May not receive credit for both BIO 106 and (BIO 181 or BIO 183)

**GEP Natural Sciences**
Typically offered in Fall, Spring, and Summer

**BIO 140 Survey of Animal Diversity** (3 credit hours)
Classification and phylogeny of animals; patterns of diversification in body design and relationship between body design and the environment; study of selected animal assemblages. Students may not receive credit for both BIO 140 and (BIO 350 or BIO 402)

**GEP Natural Sciences**
Typically offered in Fall only
BIO 141 Animal Diversity Laboratory (1 credit hours)
Observation of living animals, dissections of preserved specimens, and microscopy; emphasis on classification of animals, patterns of diversification in body design, and relationship between body design and the environment. Students may not receive credit for both BIO 141 and BIO 350 or BIO 402 or BIO 403 or ZO 150.
Prerequisite: BIO 140
GEP Natural Sciences
Typically offered in Fall only

BIO 165 Introduction to Environmental Research (5 credit hours)
Introduction to environmental research is a hands-on learning experience for incoming freshmen interested in pursuing scientific research. The course introduces students to scientific methods and research through active participation in research on an environmental problem involving chemicals of environmental concern. Students will explore a topic in this field through guided readings, field samplings, and lab experimentation. Restricted to incoming freshmen who have been accepted into the HHMI RISE program. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
GEP Interdisciplinary Perspectives
Typically offered in Summer only

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity (4 credit hours)
Introduction to ecology, evolution, and biodiversity within the context of structure and function including the adaptive strategies that organisms use to manage the everyday challenges of life. Emphasis on interactions of organisms with their environments, evolutionary change and role of natural selection in the evolution of life forms. Builds a foundation for understanding how science works, how to think critically and communicate scientifically.
X: Cannot receive credit for both BIO 181 and BIO 105 or BIO 106.
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

BIO 183 Introductory Biology: Cellular and Molecular Biology (4 credit hours)
Basic concepts and principles of molecular, cellular, and developmental biology. Emphasis is placed on the physical basis of life, on the molecular mechanisms that guide evolution, on the cell as the fundamental unit of life, and on the mechanisms involved in the development of multicellular organisms. The course promotes the development of crucial scientific skills including critical thinking, problem solving, design of experiments, and effective oral and written scientific communication. Students cannot receive credit for both BIO 183 and (BIO 105 or BIO 106).
Prerequisite: BIO 181 or CH 101
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

BIO 227 Understanding Structural Diversity through Biological Illustration (3 credit hours)
Biological concepts of diversity and anatomy taught through direct observation and illustrative techniques. Lecture topics include plant ID and structure, microscopic life forms, animal anatomy and identification. Laboratory work emphasizes close observation of structures and comparative anatomy as well as illustrative techniques to produce accurate drawings of specimens. Students will be required to provide their own transportation for one field trip.
GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Spring only

BIO 230 The Science of Studying Dinosaurs (3 credit hours)
This course introduces students to the scientific method as applied to the study of dinosaurs and the world in which they lived. Because we cannot directly observe dinosaurs, estimating biological features such as running speed, growth rates, and reproductive and other physiological strategies presents challenges. We will examine a range of biological concepts (including cellular biology and physiology, functional morphology and biomechanics, evolutionary relationships, and paleoecology), as well as geological concepts (such as sedimentology, radiometric dating, plate tectonics, and the geologic time scale) as they apply to dinosaurs as living organisms. An understanding of biology at the introductory college level will be assumed.
Prerequisite: C- or better in BIO 181 or BIO 183 or BIO 105
GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall only

BIO 240 Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems (4 credit hours)
BIO 240 provides an introduction to the anatomy and physiology of the nervous, skeletal, muscular, and digestive systems. Fundamental principles addressed throughout the course include (1) maintenance and regulation of homeostasis, (2) communication and control processes throughout the body, (3) integration and interdependence across organ systems, (4) structure-function relationships, and (5) anatomical and physiological adaptation. Together, BIO 240 and BIO 245 provide a strong foundation in human anatomy and physiology (through both lecture and lab) for students preparing for a variety of health-related professions.
Prerequisite: C- or better in BIO 183; Cannot receive credit for both this course and BIO 212 or BIO 421
Typically offered in Fall, Spring, and Summer

BIO 245 Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems (4 credit hours)
BIO 245 provides an introduction to the anatomy and physiology of the endocrine, cardiovascular, respiratory, and renal systems. Fundamental principles addressed throughout the course include (1) maintenance and regulation of homeostasis, (2) communication and control processes throughout the body, (3) integration and interdependence across organ systems, (4) structure-function relationships, and (5) anatomical and physiological adaptation. Together, BIO 240 and BIO 245 provide a strong foundation in human anatomy and physiology (through both lecture and lab) for students preparing for a variety of health-related professions.
Prerequisite: C- or better in BIO 183; Cannot receive credit for both this course and BIO 212 or BIO 421
Typically offered in Fall and Spring
BIO 267 Research in the Life Sciences I: Research Skills (3 credit hours)
This course is designed to help first year students learn basic skills associated with scientific research. Class structure is interactive and relies on group collaboration for most projects. Students will become confident in reading and analyzing scientific literature, communicating scientific principles, compiling a poster presentation, presenting at scientific conferences, and attending local scientific symposia as well as practicing some basic laboratory techniques. The 2-semester Research PackTrack Program (BIO 267 and 269) is designed to prepare undergraduates for an original research experience in a scientific laboratory. A B- or better in BIO 267 is required to take BIO 269. Students in BIO 267 are required to attending one research symposium outside of regular class time. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: C- or better in BIO 181 and Corequisite: BIO 183
Typically offered in Fall and Spring

BIO 269 Research in the Life Sciences II: Guided Research (3 credit hours)
This course is designed to provide students with a laboratory framework for conducting original research and (together with BIO 267) preparation to move on to conducting research in a scientific laboratory. Students will explore the binding characteristics of bacterially expressed estrogen receptor genes by generating their own research goals, writing research proposals, conducting original independent research, and presenting their findings in at least one poster symposium. This course is the second part of the Research PackTrack program, and students in this course will have earned a B- or better in the first course (BIO 267). Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: C- or better in BIO 183 and B- or better in BIO 267
Typically offered in Fall and Spring

BIO 301 Quantitative Approaches to Biological Problems (3 credit hours)
This course serves as an introduction to the use of mathematical, statistical and computational models and tools for understanding biology at the molecular, population, ecological and evolutionary scales. We will use discrete and continuous mathematics to model disease spread, ecological competition and biochemical systems. We explore the effect of random events in biochemistry and learn how to model such randomness in a statistical framework. We will also use computation tools to analyze genetic data and write a short computer program that simulates the change in allele frequencies in a population in time due to random effects. All course topics will involve hands-on computational exercises, but no prior experience in these tools and methods is expected.
Prerequisite: BIO 181 and MA 131 or MA 141 (or equivalents).
Typically offered in Spring only

BIO 315 General Parasitology (3 credit hours)
General principles of parasitic symbiosis. Emphasis on life cycles, epidemiology, and pathology of major parasites of humans and domestic animals.
Prerequisite: C- or better in BIO 181 and BIO 183
Typically offered in Fall and Summer

BIO 325 Paleontological Field Methods (4 credit hours)
Understanding the history of life is not possible without first and foremost unearthing it. Discovering, collecting, and conserving fossil specimens for research is a time- and labor-intensive endeavor that requires hands-on training in the field. This course provides introductions to the evolution of life; Mesozoic biodiversity, biostratigraphy, and biogeography; vertebrate skeletal anatomy; stratigraphic and sedimentary concepts; and geomorphology. The course also covers paleontological research methods, including: specimen data collection, conservation, and preparation; topographic and geologic maps; GPS techniques; prospecting and excavation of fossil localities; and taphonomic indicators. Field work in Utah; additional costs involved.
Prerequisite: BIO 120 or BIO 181 or BIO 330
Typically offered in Summer only

BIO 330 Evolutionary Biology (3 credit hours)
Principles and patterns of organic evolution. Topics will include the origin of life, patterns of genetic variation, adaptations, natural selection, and the formation of species, the relationship between micro and macroevolution, and the importance of evolution to humans and medicine.
Prerequisite: C- or better in BIO 181 and BIO 183
Typically offered in Summer only

BIO 361 Developmental Biology (3 credit hours)
In this course students will discover the amazing journey that cells must take to get from an egg to an embryo, form a mature adult, and reproduce in order to continue the life cycle. Students will relate science to everyday life using developmental biology as a forum to integrate many aspects of biology from the molecules in single cells to the complete organism and how it is influenced by evolution and the environment. Cannot receive credit for both BIO 361 and GN 434.
Prerequisite: C- or better in BIO 183
Typically offered in Spring only

BIO 370 Developmental Anatomy of the Vertebrates (3 credit hours)
An integrated study of the functional anatomy, phylogeny, and embryonic development of organ systems in vertebrate animals.
Prerequisite: C- or better in BIO 181 or BIO 140
Typically offered in Spring only

BIO 375 Developmental Anatomy Laboratory (2 credit hours)
A hands-on study of embryonic development and organ systems in vertebrate animals, utilizing microscopic examination of living and preserved embryos, demonstrations of skeletons and mammalian organs, and dissections of preserved shark, salamander, and mink.
Prerequisite: C- or better in BIO 181 or BIO 140
Typically offered in Spring only

BIO 405 Functional Histology (3 credit hours)
Offered only as a distance education course via the internet. Functional Histology describes the cellular structure of tissues and organs. Human organs are emphasized, with brief consideration given to variation in other mammals. Tissue and organ structure is related to function, including examples of malfunction (histopathology). The course is especially appropriate for students planning a career in veterinary science, medicine, or allied health fields. Offered by distance education only.
Prerequisite: C- or better in BIO 183
Typically offered in Summer only
**BIO 414** Cell Biology (3 credit hours)
The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.
Prerequisite: C- or better in BIO 183 and (CH 221 or CH 225)
Typically offered in Spring only

**BIO 416** Cancer Cell Biology (3 credit hours)
Cancer cells are defective and yet they survive and often thrive despite having these defects. We will explore changes in tumor cells as they transition from normal cells - looking at disrupted growth signaling and cell death pathways, alterations in cell motility patterns and the induction of changes in other cells. Current research and treatments will be discussed. A focus will be on problem solving and critical thinking skills as we integrate case studies as well as primary and review literature into the course. This course will involve lecture, discussion, and group activities. Students will be expected to do assigned reading prior to coming to class, make presentations or lead discussions, analyze data, and design experiments.
Prerequisite: C- or better in BIO 183 and GN 311.
P: C- or better in BIO 183 and GN 311. JR or SR standing; Students may not earn credit for both BIO/PB 414 and BIO 416.
Typically offered in Fall only

**BIO 418** Cell Biology Research Lab (2 credit hours)
BIO 418 is a laboratory course that emphasizes collaborative, inquiry-based learning through research. Students will design and implement experiments to explore mechanisms relating to cellular growth, metabolism, cell signaling pathways, environmental toxins, and/or intrinsic and extrinsic apoptotic processes in various cell lines. This course will include primary literature analysis, experimental design and implementation, maintenance of lab notebooks, data analysis, discussions, and presentations.
Prerequisite: C- or better in BIO 183 and GN 311. JR or SR standing
Typically offered in Fall and Spring

**BIO 424** Endocrinology (3 credit hours)
This course will explore the function of hormones and bioactive compounds in regulating animal physiology and homeostasis. Topics will include a study of hormones and their mechanism of actions in regulating various biological processes including development and growth; reproduction; feeding; digestion and metabolism; ion and water balance; stress and immunity; and sex determination. The methods used to study hormones and their physiological functions will also be addressed. 80% of enrollment is restricted to Biological Sciences and Zoology students with the remaining 20% open for all other majors.
Prerequisite: C- or better in BIO 250 or BIO 212 or BIO 240 or BIO 245
Typically offered in Fall, Spring, and Summer

**BIO 432** Evolutionary Medicine (3 credit hours)
This course introduces the rapidly emerging field of evolutionary medicine as one approach to appreciating evolution as a unifying principle of biology. The primary goal is for students to better understand the evolutionary nature of many issues connect
R: Junior or Senior standing; Prerequisite: C- or better in BIO 181 or BIO 183 or GN 311.
Typically offered in Spring only

**BIO 434** Hormones and Behavior (3 credit hours)
This course will focus on the field of behavioral neuroendocrinology, which explores mechanisms by which hormones affect and are affected by behavior. The course will use highly interactive lectures and discussions of material from the primary literature (seminal papers and recent exciting contributions). Student participation in class discussions and in-class assignments will be critical components of the learning process.
Prerequisite: C- or better in BIO 212 or BIO 250 or (ANS 205 & ANS 206) or BIO 240 or BIO 245
Typically offered in Spring only

**BIO 440** The Human Animal: An Evolutionary Perspective (3 credit hours)
An in-depth look at the evolution of a wide range of human behaviors, and some aspects of physiology as well. We will critically explore the perceptions we hold of ourselves and the research that has sought to lend new insights into the fundamental bases of human behavior. New uses of evolutionary theory, including the field of evolutionary psychology, will be examined using a comparative approach and careful readings from primary and secondary literature in evolutionary biology and psychology. Classes will be largely discussion based.
Prerequisite: C- or better in one of the following: BIO 317, BIO/PB 330, BIO 410, PSY 406, or PSY 416
GEP U.S. Diversity
Typically offered in Spring only

**BIO 444** The Biology of Love and Sex (3 credit hours)
The need to find and seduce a mate is one of the most powerful forces in biology. In this course, we will examine the biological factors that contribute to love and sex. We will adopt a broad evolutionarily-based perspective, examining a variety of strategies in both human and animal systems. Our readings and discussions will cover current hypotheses and experimental methodologies spanning genetics, neuroscience, and endocrinology.
Prerequisite: C- or better in two of the following: BIO 330, BIO 410, BIO 424, BIO 488, GN 311; R: Junior or Senior Standing
Typically offered in Spring only

**BIO 481** Senior Capstone Project (1 credit hour)
This course provides students an opportunity to integrate and apply knowledge and skills gained from their major studies in addressing an important challenge or problem that they identify. Emphasis will be placed on (1) reflections on the value of experiences outside of the classroom, (2) using discipline-specific knowledge and approaches from both biology and from the second disciplinary area that they chose to study within the B.A. in Biological Sciences, and (3) peer- and self-critiques based on the intellectual standards of critical and creative thinking. Restricted to seniors who will graduate with a B.A. in Biological Sciences. 17BIOBA majors only.
Typically offered in Fall, Spring, and Summer
**BIO 482** Capstone Course in Molecular, Cellular, and Developmental Biology (3 credit hours)

Typical problems in molecular, cellular, and developmental biology. BIO 482 provides a challenging opportunity for students to integrate and apply knowledge and skills gained from their major studies. Emphasis will be placed on collaborative learning and on effective, professional communication. Topics and instructors will vary from semester to semester. Priority will initially be given to seniors in the MCD curriculum; other students with the necessary prerequisites will be admitted on a space available basis.

Prerequisite: C- or better in BIO 361, BIO/PB 414, and one of the following: BCH 351 or BCH 451 or BIT 410 or GN 311.

*Typically offered in Fall and Spring*

**BIO 483** Capstone Course in Integrative Physiology and Neurobiology (3 credit hours)

Typical problems in integrative physiology and neurobiology. BIO 483 provides a challenging opportunity for students to integrate and apply knowledge and skills gained from their major studies. Emphasis will be placed on collaborative learning and on effective, professional communication. Topics and instructors will vary from semester to semester. Priority will initially be given to seniors in the HB curriculum; other students with the necessary prerequisites will be admitted on a space available basis.

Prerequisite: C- or better in BIO 424, BIO 488, and one of the following: BIO/PB 414 or BCH 351 or BCH 451 or GN 311 or ST 311.

*Typically offered in Fall and Spring*

**BIO 484** Capstone Course in Human Biology (3 credit hours)

Typical problems in human biology. BIO 484 provides a challenging opportunity for students to integrate and apply knowledge and skills gained from their major studies. Emphasis will be placed on collaborative learning and on effective, professional communication. Topics and instructors will vary from semester to semester. Priority will initially be given to seniors in the HB curriculum; other students with the necessary prerequisites will be admitted on a space available basis.

Prerequisite: C- or better in BIO 421, MB 351 and one of the following: BCH 351 or BCH 451 or GN 311 or ST 311.

*Typically offered in Fall and Spring*

**BIO 485** Capstone Course in Ecology, Evolution, and Conservation Biology (3 credit hours)

Typical problems in ecology, evolution, and conservation biology. BIO 485 provides a challenging opportunity for students to integrate and apply knowledge and skills gained from their major studies. Emphasis will be placed on collaborative learning and on effective, professional communication. Topics and instructors will vary from semester to semester. Priority will initially be given to seniors in the EEC curriculum; other students with the necessary prerequisites will be admitted on a space available basis.

Prerequisite: C- or better in BIO/PB 330, BIO/PB 360, and one of the following: BIO 460 or GN 311 or NR 406 or ST 311.

*Typically offered in Fall and Spring*

**BIO 488/BIO 588** Neurobiology (3 credit hours)

Overview of the neurosciences, with a focus on fundamental principles in the function, structure, and development of the nervous system. Topics include neuroanatomy, electrical signaling, synaptic transmission, sensory and motor systems, neural development, neural plasticity, and complex brain functions. Multiple levels of analysis, from molecular to behavioral, with an emphasis on the mammalian nervous system. Motivated students who do not meet listed prerequisite can contact the instructor for permission to take the course.

Prerequisite: C- or better in BIO 250 or BIO 212 or BIO 240 or BIO 245 or permission of instructor

*Typically offered in Fall only*

**BIO 498** Honors Project Part I (3 credit hours)

Together, BIO 498 and BIO 499 provide a two-semester sequence for honors projects conducted by students in good standing in an honors program within the Department of Biological Sciences. Before enrollment in BIO 498, students (1) identify a project in consultation with a faculty member, (2) work with that mentor to complete a contract describing the expectations for their work together in BIO 498, and (3) have the contract approved by the honors program coordinator. The approved contract will describe the specific requirements and expectations of the BIO 498 experience. Enrollment only by permission of the honors program director.

*Typically offered in Fall, Spring, and Summer*

**BIO 499** Honors Project Part II (3 credit hours)

Together, BIO 498 and BIO 499 provide a two-semester sequence for honors projects by students in good standing in an honors program within the Department of Biological Sciences. Before beginning BIO 499, students will have successfully completed BIO 498 as well as a contract describing the expectations for their work with the mentor in BIO 499. The contract must be approved by the honors program director. The approved contract will describe the specific requirements and expectations of the BIO 499 experience. Enrollment only by permission of the honors program director.

Prerequisite: BIO 498

*Typically offered in Fall, Spring, and Summer*

**BIO 518** Experience and the Brain (3 credit hours)

This seminar considers how an individual’s behavioral interactions with the world (i.e., experience) can alter the structure and/or function of the adult brain. Emphasis will be on reading and critically discussing the primary research literature.

Prerequisite: BIO 488 or ZO 588

**BIO 520** Skeletal Biological Laboratory Methods in Human Identification & Cold Cases (3 credit hours)

This laboratory-based course covers skeletal biological methods such as those used in human identification applied to medicolegal issues or issues of the law. Forensic identification methods will be introduced via lecture and students will apply these methods in the laboratory. The investigation of cold cases will be addressed through laboratory methodologies that intersects with missing persons cases. This course covers a broad array of investigative skeletal methods. However, students will not be qualified to practice after taking this course.

P: Graduate Standing

*Typically offered in Fall only*
BIO 560/BMA 560 Population Ecology  (3 credit hours)
Dynamics of natural populations. Current work, theories and problems dealing with population growth, fluctuation, limitation and patterns of dispersion, species interactions, community structure and ecological genetics. One semester of calculus and a junior/senior level ecology course are required.

Co-requisite: ST 511
Typically offered in Fall only

BIO 570 Evolutionary Ecology  (3 credit hours)
This course provides a detailed overview of evolutionary ecology, the multidisciplinary interface of ecological and evolutionary processes. The course includes an historical perspective of the development of the field, major theoretical and empirical milestones, and the cutting edge of modern evolutionary ecology research and application. This is a discussion-oriented course, drawing heavily from peer-reviewed literature. Grading is centered on participation, leading discussions, critical literature reviews, and a research project. The course Moodle website will contain files for all assigned readings, the course syllabus, tips for leading discussions, and a schedule of class meetings and discussion leaders.

Prerequisite: Graduate Standing or C- or better in AEC/PB 360 and Corequisite: C- or better in BIO 330 or BIO 432
Typically offered in Fall only

BIO 572/CH 572/BIT 572 Proteomics  (3 credit hours)
Introduction and history of the field of proteomics followed by the principles and applications of proteomics technology to understand protein expression and protein post-transitional modifications. Laboratory sessions include growing yeast with stable-isotope labeled amino acids, protein purification, Western blots, protein identification and quantification, and protein bioinformatic analysis. This is a half-semester course.

Prerequisite: BIT 410 or BIT 510 or BCH 454 (or approval from the instructor)
Typically offered in Spring only

BIO 588/BIO 488 Neurobiology  (3 credit hours)
Overview of the neurosciences, with a focus on fundamental principles in the function, structure, and development of the nervous system. Topics include neuroanatomy, electrical signaling, synaptic transmission, sensory and motor systems, neural development, neural plasticity, and complex brain functions. Multiple levels of analysis, from molecular to behavioral, with an emphasis on the mammalian nervous system. Motivated students who do not meet listed prerequisite can contact the instructor for permission to take the course.

Prerequisite: C- or better in BIO 250 or BIO 212 or BIO 240 or BIO 245 or permission of instructor
Typically offered in Fall only

BIO 592 Topical Problems  (1-3 credit hours)
Organized, formal lectures and discussion of a special topic.

Typically offered in Fall, Spring, and Summer

BIO 624 Topical Problems  (1-3 credit hours)
Organized, formal lectures and discussion of a special topic.

Typically offered in Fall and Spring
Biomanufacturing Training Education Center (BEC)

**BEC 220 Introduction to Drug Development and Careers in Biomanufacturing** (1 credit hours)
Introduction to discovery and development of biopharmaceuticals, industrial enzymes, food ingredients and biologics. Discussion of majors that prepare students for positions in the biotechnology industry. Lectures from staff and from professionals in the biotechnology industry focus on drug development, biopharmaceutical process development, design of biomanufacturing facilities, overview of methods used for manufacturing biopharmaceuticals, drug and enzyme purification, formulation, as well as careers in FDA compliance documentation related to manufacturing products using microbial biotechnology.

*Typically offered in Fall and Spring*

**BEC 330 Principles and Applications of Bioseparations** (2 credit hours)
Objectives, strategies, and approaches for recovery and purification of biomolecules, especially recombinant proteins. Description of common purification equipment, processes and materials used for cell lysis, precipitation, flocculation, membrane filtration, column chromatography, and centrifugation. Laboratories provide students with exposure to various techniques and the parameters that control protein isolation and purification of a recombinant protein. This is a half-semester course. Students who have completed BIT(CHE) 464 may not complete this course for credit.

Prerequisite: CH 223 or CH 227
*Typically offered in Fall and Spring*

**BEC 363 Foundations of Recombinant Microorganisms for Biomanufacturing** (2 credit hours)
Introduction to basic biomanufacturing techniques with particular focus on the most commonly used recombinant microbes in industry. Includes microbial identification, metabolism, and growth kinetics; recombinant production and analysis of low molecular weight molecules, alcohols, recombinant enzymes and others. The laboratory portion of this half-semester course provides students with practical experience on basic biomanufacturing techniques carried out in small scale.

Prerequisite: BIO 183
*Typically offered in Fall, Spring, and Summer*

**BEC 425/BEC 525 Molecular Biology for Biomanufacturing** (2 credit hours)
This course is an introduction to fundamental molecular biology techniques, applied to generate bacterial cell lines for the production of recombinant proteins. Course material provides a comprehensive description of an expression system, with emphasis on the central dogma of molecular biology, detailed gene structure, vector components and bacterial host cell characteristics. Different genetic, physiologic and growth condition aspects are included to ensure the overproduction of a functional protein of interest. This comprises different molecular approaches for gene cloning, bacterial selection/screening and regulation of genetic expression. The course provides hands-on experience during laboratory sessions, where students isolate a gene of interest, clone the gene into an expression vector, transform bacteria, select for positive clones, grow recombinant cells, and induce the production of the protein of interest. Techniques such as SDS-PAGE, Western blot, and ELISA are used for the detection and quantification of the active recombinant protein.

Prerequisite: BIO 183 or equivalent
*Typically offered in Fall, Spring, and Summer*

**BEC 426/BBS 526/FS 526/BEC 526/BBS 426/FS 426 Upstream Biomanufacturing Laboratory** (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.

Prerequisite: (MB 351 and FS 231) CHE/BEC 463
*Typically offered in Fall and Spring*

**BEC 436/BEC 536 Introduction to Downstream Process Development** (2 credit hours)
Objectives, strategies, and approaches for recovery and purification of biomolecules, especially recombinant proteins. Laboratories in the intermediate-scale pilot plant provide students with exposure to various unit operations and the parameters that control protein isolation and purification of a recombinant protein produced by an E. coli. This is a half-semester course. Students who have completed BEEC 436 may not take BEC 536 for credit.

Prerequisite: BEC 330 or graduate standing
*Typically offered in Fall and Spring*

**BEC 440/BEC 540 Expression Systems in Biomanufacturing 1** (3 credit hours)
Introduction to bacterial and yeast expression systems, their advantages and disadvantages. Basic techniques in molecular biology, cell transformation and optimization of protein expression. Selection, archiving and characterization of production line. Study of parameters affecting expression and yield. The lab portion of the course provides students with practical experience in DNA and protein expression techniques in bacterial and yeast expression systems. Credit not given for both.

Prerequisite: BEC 363 or (MB 351 and MB 352)
*Typically offered in Fall only*
BEC 441/BEC 541 Expression Systems in Biomanufacturing II (3 credit hours)
Introduction to insect and mammalian cell expression systems, their advantages and disadvantages. Advanced techniques in DNA cloning, cell transformation, and optimization of protein expression. Selection, archiving and characterization of production line. The lab portion of the course provides students with practical experience in DNA cloning and protein expression techniques in insect and mammalian cell expression systems. Credit not given for both.
Prerequisite: BEC 440/540 or BIT 410/510
Typically offered in Spring only

BEC 445/BEC 545 Cell Line Development for Biomanufacturing (2 credit hours)
This course provides the basic and advanced principles of genetic engineering in yeast and mammalian cells for the overproduction of a protein of interest. Students will use classical and novel strategies to establish a stable Chinese hamster ovary (CHO) cell line based on the industrially relevant strain, DG44 (DHF4 system). Students will also generate a yeast expression system based on Pichia pastoris for the production of the same protein. The generation of two different cell lines for the overproduction of the same protein of interest should provide students with an appreciation of each system in terms of cost, speed, productivity and product quality.
Corequisite: BEC 425/525 or Prerequisite: BIT 410, BEC 440, MB 351, MBA 352/354
Typically offered in Fall and Spring

BEC 448/BEC 548/CHE 548/CHE 448 Bioreactor Design (2 credit hours)
This course will cover critical aspects of bioreactor design, including design of reactors for enzyme-catalyzed reactions, fermentation of microorganisms, and scale-up considerations for bioreactors. Hands-on experiments involving fermentation of microorganisms and scale-up of bioreactors will be included. Students cannot get credit for both CHE 448 and CHE 548.
Typically offered in Spring only

BEC 462/BEC 562/CHE 462/CHE 562 Fundamentals of Bio-Nanotechnology (3 credit hours)
Concepts of nanotechnology are applied in the synthesis, characterization, recognition and application of biomaterials on the nanoscale. Emphasis will be given on hands-on experience with nanostructured biomaterials; students will also become familiarized with the potential impact of these materials on different aspects of society and potential hazards associated with their preparation and application.
Prerequisite: MA 241 and PY 208 and (CH 223 or CH 227)
Typically offered in Spring only

BEC 463/BIT 563/CHE 563/BEC 463/CHE 463 Fermentation of Recombinant Microorganisms (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.
Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BEC 363)
Typically offered in Fall, Spring, and Summer

BEC 475/BEC 575 Global Regulatory Affairs for Medical Products (3 credit hours)
This lecture-based course introduces students to the quality systems used to meet the regulatory requirements for developing, testing, manufacturing, and selling medical products in the global marketplace. It provides a general background for those going into the medical products field, but is especially useful to students preparing for a career in the Regulatory Affairs or Quality Assurance Department within a pharmaceutical, biomanufacturing or medical device company. BEC 575 students must have graduate standing.
Prerequisite: Senior standing
Typically offered in Fall and Spring

BEC 480/BEC 580 cGMP Fermentation Operations (2 credit hours)
Application of microbial fermentation techniques at production scale and evaluation of the inherent issues resulting from the integration of microbial fermentation unit operations, scale-up-production, and current Good Manufacturing (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in media preparation, bioreactor operation, process utilities, and manufacturing quality systems that simulate microbial cell growth and product expression in a commercial cGMP facility. This is a half-semester course. Students who have completed BEC 480 may not take BEC 580 for credit.
Corequisite: BBS/BEC/FS 426
Typically offered in Fall and Spring

BEC 483/BME 583/BEC 583/BME 483 Tissue Engineering Technologies (2 credit hours)
In this half-semester laboratory module, students will gain practical experience with two key elements of tissue engineering: tissue building and angiogenesis. Using advanced culture techniques, students will construct a complex living tissue that closely resembles its natural counterpart, then assess its ability to support ingrowth of capillaries (angiogenesis). The effects of different biomaterials and angiogenic factors will be evaluated. The engineered tissue will be embedded, sectioned and stained for histological analysis.
Prerequisite: BIT 466/566 or permission of instructor
Typically offered in Fall only

BEC 485/BEC 585 cGMP Downstream Operations (2 credit hours)
Application of downstream bioprocessing techniques at production scale and evaluation of the inherent issues resulting from the integration of recovery and purification unit operations, scale-up-production issues, and current Good Manufacturing Practice (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in cell removal, cell disruption, purification, and manufacturing quality systems that simulate downstream bioprocessing in a commercial cGMP facility. This is a half-semester course. Students who have completed BEC 485 may not take BEC 585 for credit.
Corequisite: BEC 436/536
Typically offered in Fall and Spring
BEC 488/CHE 488/BEC 588/CHE 588 Animal Cell Culture Engineering (2 credit hours)
Design and operation of animal cell culture bioreactors for therapeutic protein production. Topics include: batch, fed-batch and perfusion bioreactors, agitation and aeration for mixing and oxygen mass transfer, bioreactor monitoring and control, optimizing bioreactor performance, single-use [disposal] bioreactors, and the production of gene therapy vectors. This is a half-semester course. Time outside of the regularly scheduled class time may be required.

Typically offered in Spring only

BEC 495 Special Topics in Biomanufacturing (1-4 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis. Departmental approval required.

Typically offered in Fall, Spring, and Summer

BEC 497 Biomanufacturing Research Projects (1-3 credit hours)
Introduction to biomanufacturing research through experimental, theoretical, and literature studies. Oral and written presentation of reports. Departmental approval required. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

BEC 515 Biopharmaceutical Product Characterization Techniques (2 credit hours)
This 8 week graduate course introduces engineering students to bioanalytical testing to processes that produce structurally complex biopharmaceuticals. Students will gain hands-on experience including assay validation, drug/biologic substance characterization (structural and activity) and biopharmaceutical purity. The technologies and related theory will include rapid micro SDS-PAGE, lab-on-a-chip, HPLC, mass spectrometry, UV/Vis absorbance and fluorescence spectroscopy. Students will also learn assay development and validation concepts as per ICH Q2(R1) and other U.S. and international government regulatory guidelines.

Prerequisite: CH 222 or equivalent
Typically offered in Fall only

BEC 525/BEC 425 Molecular Biology for Biomanufacturing (2 credit hours)
This course is an introduction to fundamental molecular biology techniques, applied to generate bacterial cell lines for the production of recombinant proteins. Course material provides a comprehensive description of an expression system, with emphasis on the central dogma of molecular biology, detailed gene structure, vector components and bacterial host cell characteristics. Different genetic, physiologic and growth condition aspects are included to ensure the overproduction of a functional protein of interest. This comprises different molecular approaches for gene cloning, bacterial selection/screening and regulation of genetic expression. The course provides hands-on experience during laboratory sessions, where students isolate a gene of interest, clone the gene into an expression vector, transform bacteria, select for positive clones, grow recombinant cells, and induce the production of the protein of interest. Techniques such as SDS-PAGE, Western blot, and ELISA are used for the detection and quantification of the active recombinant protein.

Prerequisite: BIO 183 or equivalent
Typically offered in Fall, Spring, and Summer

BEC 526/BBS 426/FS 426/BEC 426/BBS 526/FS 526 Upstream Biomanufacturing Laboratory (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.

Prerequisite: (MB 351 and FS 231) CHE/BEC 463
Typically offered in Fall and Spring

BEC 532 Biological Processing Science (2 credit hours)
Fundamental scientific principles underlying the recovery, purification and formulation of biologics (biotherapeutics), especially proteins, are examined. Emphasis is placed on delineating the key chemical and physical properties of biomolecules that impact processing and formulation development. Laboratories in the analytical and small-scale purification facility provide students with ‘hands-on’ exposure to key scientific principles and small scale unit operations. This is a half-semester course.

Prerequisite: BCH 451 or graduate standing
Typically offered in Fall and Spring

BEC 536/EC 436 Introduction to Downstream Process Development (2 credit hours)
Objectives, strategies, and approaches for recovery and purification of biomolecules, especially recombinant proteins. Laboratories in the intermediate-scale pilot plant provide students with exposure to various unit operations and the parameters that control protein isolation and purification of a recombinant protein produced by an E. coli. This is a half-semester course. Students who have completed BEC 436 may not take BEC 536 for credit.

Prerequisite: BEC 330 or graduate standing
Typically offered in Fall and Spring
BEC 540/BEC 440  Expression Systems in Biomanufacturing I  (3 credit hours)
Introduction to bacterial and yeast expression systems, their advantages and disadvantages. Basic techniques in molecular biology, cell transformation and optimization of protein expression. Selection, archiving and characterization of production line. Study of parameters affecting expression and yield. The lab portion of the course provides students with practical experience in DNA and protein expression techniques in bacterial and yeast expression systems. Credit not given for both.
Prerequisite: BEC 363 or (MB 351 and MB 352)
Typically offered in Fall only

BEC 541/BEC 441  Expression Systems in Biomanufacturing II  (3 credit hours)
Introduction to insect and mammalian cell expression systems, their advantages and disadvantages. Advanced techniques in DNA cloning, cell transformation, and optimization of protein expression. Selection, archiving and characterization of production line. The lab portion of the course provides students with practical experience in DNA cloning and protein expression techniques in insect and mammalian cell expression systems. Credit not given for both.
Prerequisite: BEC 440/540 or BIT 410/510
Typically offered in Spring only

BEC 545/BEC 445  Cell Line Development for Biomanufacturing  (2 credit hours)
This course provides the basic and advanced principles of genetic engineering in yeast and mammalian cells for the overproduction of a protein of interest. Students will use classical and novel strategies to establish a stable Chinese hamster ovary (CHO) cell line based on the industrially relevant strain, DG44 (DHFR system). Students will also generate a yeast expression system based on Pichia pastoris for the production of the same protein. The generation of two different cell lines for the overproduction of the same protein of interest should provide students with an appreciation of each system in terms of cost, speed, productivity and product quality.
Corequisite: BEC 425/525 or Prerequisite: BIT 410, BEC 440, MB 351, MBA 352/354
Typically offered in Fall and Spring

BEC 548/CHE 448/BEC 448  Bioreactor Design  (2 credit hours)
This course will cover critical aspects of bioreactor design, including design of reactors for enzyme-catalyzed reactions, fermentation of microorganisms, and scale-up considerations for bioreactors. Hands-on experiments involving fermentation of microorganisms and scale-up of bioreactors will be included. Students cannot get credit for both CHE 448 and CHE 548.
Typically offered in Spring only

BEC 542/CHE 462/BEC 562  Fundamentals of Biotechnology  (3 credit hours)
Concepts of nanotechnology are applied in the synthesis, characterization, recognition and application of biomaterials on the nanoscale. Emphasis will be given to hands-on experience with nanostructured biomaterials; students will also be familiarized with the potential impact of these materials on different aspects of society and potential hazards associated with their preparation and application.
Prerequisite: MA 241 and PY 208 and (CH 223 or CH 227)
Typically offered in Spring only

BEC 563/BIT 463/CHE 463/BEC 463/BIT 563/CHE 563  Fermentation of Recombinant Microorganisms  (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.
Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BEC 363)
Typically offered in Fall and Spring

BEC 575/BEC 475  Global Regulatory Affairs for Medical Products  (3 credit hours)
This lecture-based course introduces students to the quality systems used to meet the regulatory requirements for developing, testing, manufacturing, and selling medical products in the global marketplace. It provides a general background for those going into the medical products field, but is especially useful to students preparing for a career in the Regulatory Affairs or Quality Assurance Department within a pharmaceutical, biomanufacturing, or medical device company. BEC 575 students must have graduate standing.
Prerequisite: Senior standing
Typically offered in Fall and Spring

BEC 577/CHE 577  Advanced Biomanufacturing and Biocatalysis  (3 credit hours)
Overview of biomanufacturing using microorganisms (bacteria, yeast, fungi), eukaryotic cells (hybridomas, insect, plant, CHO) and recombinant enzymes focusing on methods used in industry. Course will emphasize process design for optimization of heterologous protein expression, metabolic/cell line engineering, metabolomics, protein engineering to alter enzymes and antibodies. Pathway engineering strategies include developing microbes to produce new therapeutic compounds or overproduce primary metabolites, antibiotics, biotherapeutics, therapeutic enzymes, diagnostics, recombinant vaccines, and biopharmaceuticals. Utilization of immobilized biocatalysts, and microbial kinetics are covered.
Graduate standing in engineering or life-science graduate program
Typically offered in Spring only
BEC 580/BEC 480  cGMP Fermentation Operations  (2 credit hours)
Application of microbial fermentation techniques at production scale and evaluation of the inherent issues resulting from the integration of microbial fermentation unit operations, scale-up/production, and current Good Manufacturing (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in media preparation, bioreactor operation, process utilities, and manufacturing quality systems that simulate microbial cell growth and product expression in a commercial cGMP facility. This is a half-semester course. Students who have completed BEC 480 may not take BEC 580 for credit.
Corequisite: BBS/BEC/FS 426
Typically offered in Fall and Spring

BEC 583/BME 483/BEC 483/BME 583  Tissue Engineering Technologies  (2 credit hours)
In this half-semester laboratory module, students will gain practical experience with two key elements of tissue engineering: tissue building and angiogenesis. Using advanced culture techniques, students will construct a complex living tissue that closely resembles its natural counterpart, then assess its ability to support ingrowth of capillaries (angiogenesis). The effects of different biomaterials and angiogenic factors will be evaluated. The engineered tissue will be embedded, sectioned and stained for histological analysis.
Prerequisite: BIT 466/566 or permission of instructor
Typically offered in Fall only

BEC 585/BEC 485  cGMP Downstream Operations  (2 credit hours)
Application of downstream bioprocessing techniques at production scale and evaluation of the inherent issues resulting from the integration of recovery and purification unit operations, scale-up/production issues, and current Good Manufacturing Practice (cGMP) compliance. Lectures prepare students for pilot-scale laboratory experiences in cell removal, cell disruption, purification, and manufacturing quality systems that simulate downstream bioprocessing in a commercial cGMP facility. This is a half-semester course. Students who have completed BEC 485 may not take BEC 585 for credit.
Corequisite: BBE/BEC/FS 436/536
Typically offered in Fall and Spring

BEC 588/CHE 588/BEC 488/CHE 488  Animal Cell Culture Engineering  (2 credit hours)
Design and operation of animal cell culture bioreactors for therapeutic protein production. Topics include: batch, fed-batch and perfusion bioreactors, agitation and aeration for mixing and oxygen mass transfer, bioreactor monitoring and control, optimizing bioreactor performance, single-use [disposable] bioreactors, and the production of gene therapy vectors. This is a half-semester course. Time outside of the regularly scheduled class time may be required.
Typically offered in Spring only

BEC 590  Industry Practicum in Biomanufacturing  (3 credit hours)
This is an industry case study course emphasizing scientific, engineering, analytical, and professional skills related to biomanufacturing of human therapeutics; the course will provide students with the opportunity to design a complete cGMP process and facility capable of licensure.
Typically offered in Fall only

BEC 595  Special Topics in Biomanufacturing  (1-6 credit hours)
Offered to present graduate course content not available in existing courses or for offering of new graduate courses on a trial basis. Departmental approval required.

BEC 601  Biomanufacturing Seminar  (1 credit hours)
Weekly seminars on topics of current interest in biomanufacturing and affiliated subjects. Seminars will be presented by resident faculty members, graduate students and visiting lecturers from industry, government regulatory agencies such as the FDA or from academic programs related to biomanufacturing.
Typically offered in Fall and Spring

BEC 620  Leadership and Preparation for Industry Internship in Biomanufacturing  (2 credit hours)
Advanced communication skills specific to the regulatory requirements of the biomanufacturing and biopharmaceutical industries regulated by the U.S. FDA. Instructors teach writing professional and technical resumes, advanced interview skills, team or project leadership, teamwork and communication skills required by industry to prepare and present discipline-specific documents to the FDA. Students learn change management in a biopharmaceutical company and how to develop emotional intelligence. Interviews by industry professionals give each student experience and feedback. Restricted to students with graduate standing.
Typically offered in Spring only

BEC 621  Communicating and Industry Internship in Biomanufacturing  (1 credit hours)
Organize information learned in a biomanufacturing internship and demonstrate effective oral presentation of proprietary information. Create a professional presentation about their industry internship experience and write a paper describing their experience.
Prerequisite: BEC 620
Typically offered in Fall only

BEC 669  Biomanufacturing Research Projects  (1-4 credit hours)
Introduction to biomanufacturing research through experimental, theoretical and literature studies under the mentorship of a member of the graduate faculty. Oral and written presentation of reports. Departmental approval required.
Prerequisite: Graduate standing in engineering, biological science or physical science
Typically offered in Fall, Spring, and Summer

Biomathematics (BMA)

BMA 560/BIO 560  Population Ecology  (3 credit hours)
Dynamics of natural populations. Current work, theories and problems dealing with population growth, fluctuation, limitation and patterns of dispersion, species interactions, community structure and ecological genetics. One semester of calculus and a junior/senior level ecology course are required.
Co-requisite: ST 511
Typically offered in Spring only

BMA 567  Modeling of Biological Systems  (4 credit hours)
An introduction to quantitative modeling in biology. Use of Forrester diagrams, probabilistic and deterministic description of dynamic processes, development of model equations, simulation methods and criteria for model evaluation. Examination of current literature dealing with application of models and simulation in biology. Individual and class modeling projects.
Prerequisite: MA 131
BMA 573/MA 573 Mathematical Modeling of Physical and Biological Processes I (3 credit hours)
Introduction to model development for physical and biological applications. Mathematical and statistical aspects of parameter estimation. Compartmental analysis and conservation laws, heat transfer, and population and disease models. Analytic and numerical solution techniques and experimental validation of models. Knowledge of high-level programming languages required.
Prerequisite: MA 341 and knowledge of high-level programming language.
Typically offered in Fall only

BMA 574/MA 574 Mathematical Modeling of Physical and Biological Processes II (3 credit hours)
Model development, using Newtonian and Hamiltonian principles, for acoustic and fluid applications, and structural systems including membranes, rods, beams, and shells. Fundamental aspects of electromagnetic theory. Analytic and numerical solution techniques and experimental validation of models.
Prerequisite: MA/BMA 573
Typically offered in Fall, Spring, and Summer

BMA 590 Special Topics (1-6 credit hours)
Special topics in BMA.
Typically offered in Fall, Spring, and Summer

BMA 591 Special Topics (1-6 credit hours)
Directed readings, problem sets, written and oral reports as dictated by need and interest of student, e.g., cellular, molecular and physiological modeling; new 500-level courses during the developmental phase.
Typically offered in Fall, Spring, and Summer

BMA 610 Special Topics (1-6 credit hours)
Directed readings, problem sets, written and oral reports as dictated by need and interest of student, e.g., cellular, molecular and physiological modeling; new 500-level courses during the developmental phase.
Typically offered in Fall, Spring, and Summer

BMA 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BMA 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall and Spring

BMA 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BMA 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall and Spring

BMA 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

BMA 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BMA 771/MA 771/ST 771 Biomathematics I (3 credit hours)
Role of theory construction and model building in development of experimental science. Historical development of mathematical theories and models for growth of one-species populations (logistic and offshoots), including considerations of age distributions (matrix models, Leslie and Lopez; continuous theory, renewal equation). Some of the more elementary theories on the growth of organisms (von Bertalanffy and others; allometric theories; cultures grown in a chemostat).
Mathematical theories of two and more species systems (predator-prey, competition, symbiosis; leading up to present-day research) and discussion of some similar models for chemical kinetics. Much emphasis on scrutiny of biological concepts as well as of mathematical structure of models in order to uncover both weak and strong points of models discussed. Mathematical treatment of differential equations in models stressing qualitative and graphical aspects, as well as certain aspects of discretization. Difference equation models.
Prerequisite: Advanced calculus, reasonable background in biology
Typically offered in Fall only

BMA 772/MA 772/ST 772 Biomathematics II (3 credit hours)
Continuation of topics of BMA 771. Some more advanced mathematical techniques concerning nonlinear differential equations of types encountered in BMA 771: several concepts of stability, asymptotic directions, Liapunov functions; different time-scales. Comparison of deterministic and stochastic models for several biological problems including birth and death processes. Discussion of various other applications of mathematics to biology, some recent research.
Prerequisite: BMA 771, elementary probability theory
Typically offered in Spring only

BMA 773/MA 773/OR 773/ST 773 Stochastic Modeling (3 credit hours)
Prerequisite: BMA 772 or ST (MA) 746
Typically offered in Spring only
BMA 774/OR 774/MA 774  Partial Differential Equation Modeling in Biology (3 credit hours)
Prerequisite: BMA 771 or MA/OR 731; BMA 772 or MA 401 or MA 501
Typically offered in Spring only

BMA 790  Special Topics (1-6 credit hours)
Graduate students in biomathematics are expected to attend through most of their residence period.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

BMA 815 Advanced Special Topics (1-6 credit hours)
Directed readings, problem sets, written and oral reports as dictated by need and interest of student; new 600-level courses during the development phase (currently includes courses in stochastic modeling and biophysical theory).
Typically offered in Fall, Spring, and Summer

BMA 885  Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BMA 890  Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BMA 893  Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BMA 895  Doctoral Dissertation Research (1-9 credit hours)
Dissertation research
Prerequisite: Doctoral student
Typically offered in Fall and Spring

BMA 896  Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

BMA 899  Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Biomedical Engineering (BME)

BME 201  Computer Methods in Biomedical Engineering (3 credit hours)
Students develop computer-based problem solving techniques using Excel and MATLAB to solve introductory problems in Biomedical Engineering. Emphasis is on developing solution algorithms, implementing these with spreadsheets and computer programming, and presenting results in a clear and concise manner. Students registered for BME 201 who fail to matriculate into BME will be dropped from the course.
Prerequisite: BME matriculated students
Typically offered in Fall only

BME 203/MSE 203 Introduction to the Materials Science of Biomaterials (3 credit hours)
This course introduces fundamental physical principles governing the structure, processing, properties and performance of metallic, ceramic and polymeric materials. Relationships are developed defining how mechanical, physical and chemical properties are controlled by microstructure and chemistry. Material failure modes are developed with an emphasis on biocompatibility and the applications/performance of materials in the human body. Basic aspects of material biocompatibility are presented, leading into studies of the current and future applications of biomaterials.
Prerequisite: C- or better in CH 101, CH 102 and PY 205
Typically offered in Fall and Spring

BME 204  Biomedical Measurements (3 credit hours)
This course will introduce students to modern topics in biomedical engineering and areas of emphasis in the biomedical engineering curriculum through the study and use of biomedical measurement tools. The course will include a lecture and a laboratory component.
Prerequisite: BME Majors
Typically offered in Fall and Spring

BME 205  Introduction to Biomedical Mechanics (4 credit hours)
Study of the state of rest or motion of bodies subjected to the action of forces. Properties of force systems, free body diagrams, concepts of equilibrium, kinematics of particles, newton's laws, conservational principles of energy of momentum in mechanics, mechanical vibrations and their applications in biomedical systems. Restricted to student in the Biomedical Engineering Department.
Credit cannot be received for both BME 205 and (CE 214 or MAE 206)
Typically offered in Spring only
BME 207 Biomedical Electronics (4 credit hours)
Fundamentals of analog and digital circuit analysis and design as applied to biomedical instrumentation and measurement of biological potentials. Passive circuit components, node and mesh analysis, transient behavior, operational amplifiers, frequency response, analog filter design, diode, transistors, biological signal acquisition, binary math and logical operators, digital circuit design, circuit simulation tools and techniques. Laboratory exercises supplement the topics presented in class lectures.

Prerequisites: PY 208/209, BME Majors Only
Typically offered in Spring only

BME 209 Introduction to the Materials Science of Biomaterials (4 credit hours)
This course covers the chemistry, physics, and engineering theory underlying materials science and also discusses the diagnostic and analytical techniques necessary to assess these properties experimentally. This strong foundation prepares students to conceive and build better materials for a wide assortment of biomedical applications.

Co-req: PY 208/209. Pre-req: BME Students Only. Credit cannot be received for BME 209 and (MSE 200, MSE 201, MSE 203 or BME 203)
Typically offered in Fall only

BME 215 Biomedical Mechanics Laboratory (1 credit hours)
This laboratory is part of BME 205 – Biomedical Mechanics and complements it with relevant labs and examples. Statics and dynamics subjects will be studied with experimental techniques, including strain gauges and accelerometers, and computational methods, including finite-element analysis and motion capture. Finally, the human arm will be studied to derive forces, moments, and kinematic properties during various exercises. BME student only.

Co-requisites: MAE 208
Typically offered in Spring only

BME 217 Biomedical Electronics Laboratory (1 credit hours)
Laboratory in analog and digital circuit analysis. Electrical safety; Exercises in resistor networks, capacitors and inductors, steady-state and dynamic circuit behavior, active circuits, amplifiers, logic gates, combinatorial and sequential circuits, elementary digital system design, A/D conversion, biomedical applications.

Prerequisite: ECE 331, BME Majors
Typically offered in Spring only

BME 219 Materials Science of Biomaterials Lab (1 credit hours)
Introductory laboratory experience focused on integrating biological engineering and materials engineering principles by exploring key topics in materials science. Topics include biomaterial fabrication, evaluation of their physical properties and interpretation of results.

Pre-req: MSE 200 or MSE 201 or MSE/BME 203. Credit cannot be received for both BME 219 and BME 209
Typically offered in Fall only

BME 295 Research in Biomedical Engineering for Undergraduates (1-3 credit hours)
Opportunity for faculty mentored research in biomedical engineering. Approved plan of work required with significant independent research culminating in a final paper. Students must identify an advisor or co-advisor from within the BME faculty with whom

R: BME Majors, Departmental Approval Required
Typically offered in Fall and Spring

BME 298 Biomedical Engineering Design and Manufacturing I (2 credit hours)
This is the first in a series of four courses in Biomedical Design. The course introduces the tools and problem-solving skills required in the field of Biomedical Engineering.

Co-requisites: PY 208/209, BME Majors only
Typically offered in Fall only

BME 299 Biomedical Engineering Design and Manufacturing I Lab (1 credit hours)
BME 299 together with BME 252 or another course in CAD design fulfills the requirements of BME 298 Biomedical Engineering Design and Manufacturing I. In this course students learn some of the practical fundamentals of electronics manufacturing. Activities include use of bench equipment, soldering techniques, circuit board types, how to identify common electronic components and how they work in a circuit and simple C programming for microcontrollers.

Prerequisite: BME 252. Credit cannot be received for both BME 298 and BME 299
Typically offered in Fall only

BME 301 Human Physiology: Electrical Analysis (4 credit hours)
This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on neural, sensory, muscle, and cardiac physiology. Autonomic and somatic motor control will be discussed. Engineering applications, including neural stimulators, functional imaging, cochlear implants, artificial noses, vestibular implants, visual implants, artificial larynges, pacemakers and defibrillators will be discussed. Assignments include computer-based exercises using MATLAB.

Prerequisites: BIO 183, BM(M)E 201, [BME 210 or BM(M)E 207]
Typically offered in Fall only

BME 302 Human Physiology: Mechanical Analysis (4 credit hours)
This course explores a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on systems physiology described using mechanical properties. Topics include the physiological and mechanical behavior of the blood vessels, lungs, kidney muscles and larynx. In the course lab exercises, students investigate mechanical properties of fluids, electrolyte exchange in dialysis, spirometry and blood pressure measurement among other topics. The course culminates with the design of a novel laboratory experiment.

Prerequisite: BIO 183, [BM(M)E 205 or MAE 208], [BM(M)E 209 or BMME 150]
Typically offered in Spring only

BME 315 Biotransport (3 credit hours)
Quantification and modeling of heat and mass transfer in biomedical systems. Topics include heat transfer rate equations, conservation of energy, steady-state and transient heat transfer, Brownian motion, Fick’s laws, conservation of mass equations, molecular transport through membranes, porous media, Stoke-Einstein relations, boundary layer theory, mass transfer coefficients and hemodialysis.

Prerequisite: BIO 183 and BME/BMME 201 and BME/BMME 205 or MAE 208 and MA 341 or MA 331
Typically offered in Spring only
BME 325 Biochemistry for Biomedical Engineers (3 credit hours)
An overview of how alterations in bioenergetics, enzyme catalysis, protein and membrane structure, carbohydrate, lipid and nucleic acid metabolism affect human health and how biomedical engineering tools are used to detect and monitor the problems by understanding these biochemical processes. Topics include: Biological Thermodynamics, Energy of macromolecular structure and binding, Structure/function of proteins, enzymes and nucleic acids, Kinetics, enzyme catalysis and biochemical network analysis, Generation of chemical and electrical potential in membranes, Carbohydrate/lipid/protein metabolism and energy production, DNA synthesis, transcription, Technologies used to monitor/detect biochemical processes including clinical imaging modalities.

Prerequisite: CH 221, (BME 209 or BME 203)
Typically offered in Fall only

BME 335 Biomaterials (3 credit hours)
Fundamental sciences behind the design and selection of biomaterials, including crystallography, polymer science, characterization, mechanical testing, and surface preparation. Integration of biomaterials into the body and its response, including inflammation and rejection. Semester-long research project.

Pre-req: BIO 183, (BME 209 or BME 203)
Typically offered in Spring only

BME 342 Analytical and Experimental Methods for Biomedical Engineers (3 credit hours)
Experimental and analytic tools are developed and used to solve problems in biomedical engineering. Techniques include kinematic analysis, closed form and finite element analysis of stresses and strains in a body, and failure analysis. Transducers necessary for experimental analysis and testing are introduced. Students learn advanced software packages such as the finite element program ANSYS and the dynamic analysis program ADAMS to assist in their analyses.

Prerequisite: BME 201; MAE 208 or CE 215; MAE 214 or CE 313; MA 341
Typically offered in Spring only

BME 345 Biomedical Solid Mechanics (3 credit hours)
This course covers topics ranging from multi-body systems to stress superposition to failure criteria to prepare students for the more advanced subjects of biomechanics and rehabilitation engineering. Topics include the following: Free-body diagrams, Multibody statics and dynamics, Linkage kinematics and kinetics, Anthropometric kinematics, Stress/strain/torsion, Beam bending, Stress superposition, Constitutive relationship, Strain gauges, Finite-element analysis, Failure analysis, Failure mechanisms.

P: BME 201 and (BME 205 or MAE 208) and (BME 209 or BME 203)
Typically offered in Spring only

BME 355 Biocontrols (3 credit hours)
Quantitative analysis of dynamic and feedback control systems, including modeling of physiological systems and physiological control systems, system time and frequency responses, control characteristics, and stability analysis. Design techniques for feedback systems in biomedical applications.

Prerequisite: MA 341; Corequisite: BME 311
Typically offered in Spring only

BME 365 Linear Systems in Biomedical Engineering (3 credit hours)
Fundamentals of linear systems analysis as applied to problems in biomedical modeling and instrumentation. Properties of biomedical systems and signals. Representation of continuous- and discrete-time signals and system response. Convolution.

Pre-reqs: [BM(M)E 207 or BME 210], BM(M)E 201. Co-reqs: MA 341 or MA 331
Typically offered in Fall only

BME 375 Biomedical Microcontroller Applications (3 credit hours)
Overview of microcontroller-based systems, including applications, architecture, number systems, and languages. Students gain experience using a PIC-based microcontroller to input information from a user and output information using LEDs and LCD displays. Student will learn capabilities of the PIC through in class exercises and weekly programming assignments. Both assembly language and PIC-based C are used. Students develop a PIC-based heart rate monitor and work in pairs on a BME-related project of their choice.

Pre-reqs: [BM(M)E 207 or BME 210], BM(M)E 201. Co-reqs: BM(M)E 385 or BME 422
Typically offered in Fall only

BME 385 Bioinstrumentation (3 credit hours)
Fundamentals of biomedical instrument design and implementation. Sensing mechanisms, sensor microfabrication methods, sensor interfacing circuits, analog-to-digital conversion, biosignal capture and storage, embedded microprocessors, data compression methods, system integration and prototyping. Laboratory exercises using LabVIEW and MATLAB, supplement the topics presented in class lectures. Students build a sensor using cleanroom facilities in the BME department as part of a semester-long design project.

Pre-reqs: [BM(M)E 207 or BME 219], BM(M)E 201
Typically offered in Fall only

BME 398 Biomedical Engineering Design and Manufacturing II (2 credit hours)
Students will be required to continue their use of the tools learned in Biomedical Design and Manufacturing I in the context of modern design practices and manufacturing processes. The organizational and project management tools of modern design will be introduced, and a technical discussion of a modern manufacturing technology will be introduced each week.

Pre-reqs: BM(M)E 298, [BM(M)E 207 or BME 210], BM(M)E 201
Typically offered in Spring only

BME 412 Biomedical Signal Processing (3 credit hours)
Fundamentals of continuous- and discrete-time signal processing as applied to problems in biomedical instrumentation. Properties of biomedical signals and instruments. Descriptions of random noise and signal processes. Interactions between randombiom
**BME 418/BME 518/ECE 518/ECE 418 Wearable Biosensors and Microsystems** (3 credit hours)
This course surveys the methods and application of wearable electronics and microsystems to monitor human biometrics, physiology, and environmental conditions. Topics covered include wearable electrocardiograms, blood-glucose monitors, electronic tattoos, wearable energy harvesting, "smart" clothing, body area networks, and distributed population networks. Critical comparison of different sensor modalities, quantitative metrics, and how their limitations in realistic applications define the selection, design, and operation criteria of one type of sensor over another will be considered.

Prerequisite: Senior standing

**Typically offered in Fall only**

**BME 425/BME 525 Bioelectricity** (3 credit hours)
Quantitative analysis of excitable membranes and their signals, including plasma membrane characteristics, origin of electrical membrane potentials, action potentials, voltage clamp experiments, the Hodgkin-Huxley equations, propagation, subthreshold stimuli, extracellular fields, membrane biophysics, and electrophysiology of the heart. Design and development of an electrocardiogram analysis system.

Prerequisite: BME 302 or (ZO 421 and a course in electrical circuits)

**Typically offered in Spring only**

**BME 444/BME 544 Orthopaedic Biomechanics** (3 credit hours)
Students study human body kinematics, force analysis of joints, and the structure and composition of biological materials. Emphasis is placed on the measurement of mechanical properties and the development and understanding of models of biological material mechanical behavior.

P: BM(M)E 301, BM(M)E 302, [BM(M)E 345 or MAE 214 or CE 313]

**Typically offered in Fall only**

**BME 451 Biomedical Engineering Senior Design I** (3 credit hours)
This course encompasses the project proposal and design concepts, including: individual pre-proposals, team proposals, project planning, scheduling, needs assessment, product requirements, competitive landscape and patent review, business risks, design concepts, and phase reviews. BME majors only.

Prerequisites: BME 302, BME 352, and completion of two of the suggested BME electives for their area of emphasis; BME majors;
Corequisites: ENG 331 or ENG 333

**Typically offered in Fall only**

**BME 452 Biomedical Engineering Senior Design II** (3 credit hours)
This course is a continuation of BME 451 moving from proposal and concepts into manufacturing, prototyping, and testing. The deliverables in this course include: detailed manufacturing specifications, biomaterials review, supplier identification, product feasibility, issues tracking, manufacturing planning, bill of materials, product risks, qualification protocol, IP disclosure, process validation planning, regulatory review, design history file audit, lessons learned, and phase reviews.

Prerequisite: BME 451, BME Majors

**Typically offered in Spring only**

**BME 462 Biomaterials Characterization** (3 credit hours)
Introductory laboratory experience focused on integrating engineering and biological principles by exploring key topics in biomaterials. Topics include evaluation and interpretation of experimental results, modeling and testing of tissues and cells, and biomaterial/tissue, cell interactions. BME and MSE Majors only; Juniors and Seniors.

Pre-reqs: [BM(M)E 325 or BCH351 or BCH 451], [BM(M)E 335 or MSE 485] and BME Majors.

**Typically offered in Spring only**

**BME 466/TE 566/BME 566/TE 466 Polymeric Biomaterials Engineering** (3 credit hours)
In-depth study of the engineering design of biomedical polymers and implants. Polymeric biomaterials, including polymer synthesis and structure, polymer properties as related to designing orthopedic and vascular grafts. Designing textile products as biomaterials including surface modification and characterization techniques. Biodegradable polymers.

Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 or CH 225) and (MAE 206 or CE 214)

**Typically offered in Fall only**

**BME 467/TE 467 Mechanics of Tissues & Implants Requirements** (3 credit hours)
Application of engineering and biological principles to understand the structure and performance of tendons, ligaments, skin, and bone; bone mechanics; viscoelasticity of soft biological tissues; models of soft biological tissues; mechanics of skeletal muscle; and tissue-derived devices as well as interfaces between native tissues and synthetic devices.

Prerequisite: (ZO 160 or BIO 183) and (MAE 214 or CE 225)

**Typically offered in Spring only**

**BME 481 Quality Management Systems for Engineers** (3 credit hours)
This course is designed for biomedical engineering students who plan to work in industry. The course covers industry related topics including team work, conflict resolution, manufacturing and specifications, gap analysis, and root cause of analysis. Design topics including design of experiments, and standards and regulations relevant to the biomedical engineering profession are also covered. Lean and six sigma are taught with an option to test for a six sigma green belt if a six sigma project is completed in the following semester.

Co-reqs: BMME 697 or BME 451

**Typically offered in Fall only**

**BME 483/BEC 483/BME 583/BEC 583 Tissue Engineering Technologies** (2 credit hours)
In this half-semester laboratory module, students will gain practical experience with two key elements of tissue engineering: tissue building and angiogenesis. Using advanced culture techniques, students will construct a complex living tissue that closely resembles its natural counterpart, then assess its ability to support ingrowth of capillaries (angiogenesis). The effects of different biomaterials and angiogenic factors will be evaluated. The engineered tissue will be embedded, sectioned and stained for histological analysis.

Prerequisite: BIT 466/566 or permission of instructor

**Typically offered in Fall only**
BME 484/BME 584 Fundamentals of Tissue Engineering (3 credit hours)
This course covers essential concepts of organ and tissue design and engineering using living components, including cell-based systems and cells/tissues in combination with biomaterials, synthetic materials and/or devices. Topics include: In vivo tissue structure and function; isolation and culture of primary cells and stem cells; Principles of cellular differentiation; Mass transport processes in cell culture systems; Design, production and seeding of scaffolds for 3D culture; Design of bioreactors to support high-density cell growth; State-of-the-art engineered tissue systems; Clinical translation; and Ethics.
Prerequisite: BIO 183, CH 221, and (MAE 201 or MSE 301 or CHE 315 or TE 303 or BME 315 or BME 325)
Typically offered in Spring only

BME 490 Special Topics in Biomedical Engineering (1-4 credit hours)
Offered as needed for presenting material not normally available in regular BME Department courses or for new BME courses on a trial basis.
Typically offered in Fall, Spring, and Summer

BME 498 Undergraduate Research in Biomedical Engineering (3 credit hours)
Opportunity for hands-on faculty mentored research project in biomedical engineering. Course may be a stand-alone project completed in one semester/summer or serve as part of a two-semester project. Approved plan of work required with significant indep
Typically offered in Fall and Spring

BME 501 Biomedical Innovation and Entrepreneurship I - Needs Discovery (4 credit hours)
This course utilizes clinical immersion to identify medical device and other healthcare opportunities. Students will be exposed to diverse healthcare environments and learn to triage opportunities based on financial, regulatory and intellectual property landscapes. Guest lectures will feature experts in the medical device, pharmaceutical and healthcare industries as well as local entrepreneurs.
Prerequisite: Graduate Standing; R: Restricted to students enrolled in the M.S. Biomedical Engineering Program
Typically offered in Summer only

BME 502 Biomedical Innovation and Entrepreneurship II - Design and Regulation (4 credit hours)
This course teaches path-to-market concepts including regulatory aspects unique to medical devices and pharmaceuticals. Topics include detailed analyses of Phase I-IV clinical trials, 510(k) and PMA approvals, Investigational Device Exemption (IDE) Investigational New Drug (IND) application, Good Laboratory Practices (GLP) and clinical research organizations (CROs). Students will participate in frequent visits to local biotech companies. Guest lectures will feature experts in FDA processes, clinical research and early stage biotech ventures.
Prerequisite: Graduate Standing; R: Restricted to students enrolled in the M.S. Biomedical Engineering Program
Typically offered in Fall only

BME 503 Biomedical Innovation and Entrepreneurship III - Product Development (4 credit hours)
This course covers product development and project management for new biomedical-related products from accessing various streams of funding to allocation of resources for rapid prototyping and scale-up manufacturing. Students will visit local biotech companies and discuss.
Prerequisite: Graduate Standing; R: Restricted to students enrolled in the M.S. Biomedical Engineering Program
Typically offered in Spring only

BME 518/ECE 518/ECE 418/BME 418 Wearable Biosensors and Microsystems (3 credit hours)
This course surveys the methods and application of wearable electronics and microsystems to monitor human biometrics, physiology, and environmental conditions. Topics covered include wearable electrocardiograms, blood-glucose monitors, electronic tattoos, wearable energy harvesting, "smart" clothing, body area networks, and distributed population networks. Critical comparison of different sensor modalities, quantitative metrics, and how their limitations in realistic applications define the selection, design, and operation criteria of one type of sensor over another will be considered.
Prerequisite: Senior standing
Typically offered in Fall only

BME 522/ECE 522 Medical Instrumentation (3 credit hours)
Fundamentals of medical instrumentation systems, sensors, and biomedical signal processing. Example instruments for cardiovascular and respiratory assessment. Clinical laboratory measurements, therapeutic and prosthetic devices, and electrical safety requirements. Students should have background in electronics design using operational amplifiers.
Typically offered in Spring only

BME 525/BME 425 Bioelectricity (3 credit hours)
Quantitative analysis of excitable membranes and their signals, including plasma membrane characteristics, origin of electrical membrane potentials, action potentials, voltage clamp experiments, the Hodgkin-Huxley equations, propagation, subthreshold stimuli, extracellular fields, membrane biophysics, and electrophysiology of the heart. Design and development of an electrocardiogram analysis system.
Prerequisite: BME 302 or (ZO 421 and a course in electrical circuits)
Typically offered in Spring only

BME 540 Nanobiotechnology Processing, Characterization, and Applications (3 credit hours)
Topics at the interface of nanoscale science and biotechnology will be discussed. Chemical, physical, and biological properties of nanostructured biomaterials, devices, and systems. Lectures and problem-based learning will be used to present development of nanobiotechnology-enhanced materials and devices.
Prerequisite: BIO 183 and PY 212
Typically offered in Spring only

BME 543 Cardiovascular Biomechanics (3 credit hours)
Engineering principles are applied to the cardiovascular system. Anatomy of cardiovascular system; form and function of blood and blood vessels. Electric analogs; continuum mechanics with derivation of equations of motion; and constitutive models of soft tissue mechanics, with attention to normal, diseased, and adaptive processes. Programming project required.
BME 544/BME 444 Orthopaedic Biomechanics (3 credit hours)
Students study human body kinematics, force analysis of joints, and the structure and composition of biological materials. Emphasis is placed on the measurement of mechanical properties and the development and understanding of models of biological material mechanical behavior.

Prerequisite: BM(M)E 301, BM(M)E 302, [BM(M)E 345 or MAE 214 or CE 313]
Typically offered in Fall only

BME 550 Medical Imaging: Ultrasonic, Optical, and Magnetic Resonance Systems (3 credit hours)
Physical and mathematical foundations of ultrasonic, optical, and magnetic resonance imaging systems in application to medical diagnostics. Each imaging modality is examined on a case-by-case basis, highlighting the following critical system characteristics: (1) underlying physics of the imaging system, including the physical mechanisms of data generation and acquisition; (2) image creation, and (3) basic processing methods of high relevance, such as noise reduction.

Prerequisite: BME 412, ST 370 or ST 371, and PY 208
Typically offered in Fall only

BME 551 Medical Device Design (3 credit hours)
Student multidisciplinary teams work with local medical professionals to define specific medical device concepts for implementation. Medical specialty immersion with clinical departments at local medical centers; design input based on stakeholder-needs
Typically offered in Fall only

BME 552 Medical Device Design II (3 credit hours)
Student groups build and test prototypes of devices designed in the first course of this series. Good manufacturing practices; process validation; regulatory approval planning; and
Typically offered in Fall only

BME 560 Medical Imaging: X-ray, CT, and Nuclear Medicine Systems (3 credit hours)

Prerequisite: BME 311, ST 370 or ST 371, and PY 208

BME 566/TE 466/BME 466/TE 566 Polymeric Biomaterials Engineering (3 credit hours)
In-depth study of the engineering design of biomedical polymers and implants. Polymeric biomaterials, including polymer synthesis and structure, polymer properties as related to designing orthopedic and vascular grafts. Designing textile products as biomaterials including surface modification and characterization techniques. Biodegradable polymers.

Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 or CH 225) and (MAE 206 or CE 214)
Typically offered in Fall only

BME 583/BEC 583/BME 483/BEC 483 Tissue Engineering Technologies (2 credit hours)
In this half-semester laboratory module, students will gain practical experience with two key elements of tissue engineering: tissue building and angiogenesis. Using advanced culture techniques, students will construct a complex living tissue that closely resembles its natural counterpart, then assess its ability to support ingrowth of capillaries (angiogenesis). The effects of different biomaterials and angiogenic factors will be evaluated. The engineered tissue will be embedded, sectioned and stained for histological analysis.

Prerequisite: BIT 466/566 or permission of instructor
Typically offered in Fall only

BME 584/BME 484 Fundamentals of Tissue Engineering (3 credit hours)
This course covers essential concepts of organ and tissue design and engineering using living components, including cell-based systems and cells/tissues in combination with biomaterials, synthetic materials and/or devices. Topics include: In vivo tissue structure and function; Isolation and culture of primary cells and stem cells; Principles of cellular differentiation; Mass transport processes in cell culture systems; Design, production and seeding of scaffolds for 3D culture; Design of bioreactors to support high-density cell growth; State-of-the-art engineered tissue systems; Clinical translation; and Ethics.

Prerequisite: BIO 183, CH 221, and (MAE 201 or MSE 301 or CHE 315 or TE 303 or BME 315 or BME 325)
Typically offered in Spring only

BME 590 Special Topics in Biomedical Engineering (1-6 credit hours)
A study of topics in the special fields under the direction of the graduate faculty.

Prerequisite: Senior or Graduate standing in Engineering or physical or biological sciences or textiles
Typically offered in Fall, Spring, and Summer

BME 620 Special Problems in Biomedical Engineering (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. Subject may pertain to the student's particular interest in any area of study in biomedical engineering.

Prerequisite: Graduate standing in BME
Typically offered in Fall, Spring, and Summer

BME 650 Internship in Biomedical Engineering (1 credit hour)
Students obtain professional experience through advanced engineering work in industrial and commercial settings under joint supervision of a member of the graduate faculty and an outside professional.

Prerequisite: Graduate standing in BME
Typically offered in Summer only

BME 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
BME 693  Master’s Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall and Spring

BME 695  Master’s Thesis Research  (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BME 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

BME 699  Master’s Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BME 790  Advanced Special Topics in Biomedical Engineering  (1-6 credit hours)
A study of topics in advanced or emerging special areas under the direction of the graduate faculty. Experimental doctoral level courses.
Prerequisite: Graduate standing in engineering, physical, or biological sciences or textiles
Typically offered in Fall, Spring, and Summer

BME 802  Advanced Seminar in Biomedical Engineering  (1 credit hours)
Elaboration of advanced subject areas, techniques and methods related to professional interest through presentations of personal and published works; opportunity for students to present and critically defend ideas, concepts, and inferences; opportunity for distinguished scholars to present results of their work. Discussions to uncover analytical solutions and analogies between problems in biomedical engineering and other technologies, and to present relationship of biomedical engineering to society.
Prerequisite: Doctoral student in BME or other engineering, physical science, or biological science majors, or textiles
Typically offered in Fall and Spring

BME 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning but the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BME 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Summer only

BME 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

BME 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

BME 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

BME 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Bioprocessing (BBS)

BBS 201  Introduction to Biopharmaceutical Science  (3 credit hours)
Through this course, students will experience laboratory and manufacturing terminology relevant to the biomanufacturing industries. Students will also gain exposure to regulatory and compliance procedures and issues facing this industry. This course will provide an introduction to prepare students to meet the demands and expectations of this industry and the bioprocessing science program.
Typically offered in Spring only

BBS 301  Process Validation Science  (3 credit hours)
Process validation is a tested and documented subset of the panel of activities that are performed during the production of a biopharmaceutical. This course will introduce the concept of process validation as it applies to the biotechnology industry, and more specifically, to the manufacture of protein molecules as therapeutic agents.
Prerequisite: (FS 231 and BBS 201) or BBS 426.
Typically offered in Fall only
BBS 325/FS 325 Introduction to Brewing Science and Technology (3 credit hours)
For centuries brewing has been and remains a vitally important application of fermentation science, both economically and socially. This course will provide a detailed description of the fundamental chemical and biological processes involved in brewing beer, as well as the physical and hygienic aspects of modern beer production. Successful completion of this course will provide students with the understanding of the science and technology underlying the key steps in a commercial brewing process and provide the basic knowledge necessary for an entry level position in a commercial brewery.
Prerequisite: CH 101 and BIO 183 or BIO 181
Typically offered in Spring only

BBS 326/FS 326 Brewing Practices and Analyses (3 credit hours)
This course will provide a hands on learning experience to both complement the classroom lectures offered in BBS/FS 325 and acquaint the student with the equipment and practices encountered in real-world analytical labs of breweries of all scales. The laboratory experience will replicate the sequence of events encountered in actual beer production and illustrate the relevant evaluations and analyses which are concurrent with those processing steps, stressing at each stage not only the execution of the appropriate analytical or testing techniques, but also corrective action that may be taken should undesirable results be obtained.
Prerequisite: BBS/FS 325 Introduction to Brewing Science and Technology
Typically offered in Fall only

BBS 426/FS 426/BEC 426/BBS 526/FS 526/BEC 526 Upstream Biomanufacturing Laboratory (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.
Prerequisite: (MB 351 and FS 231) CHE/BEC 463
Typically offered in Fall and Spring

BBS 526/FS 526/BEC 526/BBS 426/FS 426/BEC 426 Upstream Biomanufacturing Laboratory (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.
Prerequisite: (MB 351 and FS 231) CHE/BEC 463
Typically offered in Fall and Spring

Biotechnology (BIT)

BIT 100 Current Topics in Biotechnology (4 credit hours)
This course provides both science and non-science students an opportunity to learn about current issues in biotechnology that play a role in our society. Topic areas will include contemporary and historical applications of biotechnology. From alternative fuel sources to the ramifications of the elucidation of the human genome on health care issues, advances in biotechnology are constantly reshaping the world we live in. Students will give presentations and participate in discussions in the classroom, as well as be engaged in the laboratory on a variety of different topics in biotechnology that affects all our lives.
Prerequisite: High School Biology
GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall only

BIT 200 Early Research in Biotechnology (4 credit hours)
This course offers first-and second-year students an opportunity for a mentored research experience in a small class environment. Students will learn how to apply the scientific method to make new discoveries and contribute to scientific knowledge. Stud
Prerequisite: High School Biology
GEP Natural Sciences
Typically offered in Fall and Spring

BIT 210/MB 210 Phage Hunters (3 credit hours)
This course offers first-year students an opportunity for mentored research. Students will apply the scientific method to make novel discoveries. Students will isolate and characterize naturally-occurring bacteriophage (viruses that infect bacteria, but not humans) from the environment. They will present their data to each other, and the genome of one phage will be sequenced. Students have the option to continue in a second semester to annotate that genome, culminating in a submission to genbank and a poster presentation. Students in the course are part of the National Genome Research Initiative funded by The Howard Hughes Medical Institute. Student should have had a high school biology course before taking this course.
GEP Natural Sciences
Typically offered in Fall only

BIT 211/MB 211 Phage Genomics (2 credit hours)
This course offers first-year students an opportunity for mentored research. Students will apply the scientific method to make novel discoveries. Students will build on the work they began in BIT/MB 210; The novel phage isolated in the previous semester will undergo genome sequencing over winter break, and in this course students will learn to analyze and annotate the genome sequence. This semester will culminate in a submission to genbank and a poster presentation. Students in the course are part of the national genome research initiative funded by the Howard Hughes Medical Institute.
Prerequisite: BIT(MB) 210
GEP Natural Sciences
Typically offered in Fall only

BIT 295 Special Topics in Biotechnology (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer
BIT 402/BIT 502  Biotechnology Networking and Professional Development  (1 credit hours)
This course provides students interested in the biotechnology field an opportunity to gain valuable network, job application and interviewing skills. Over the course of the semester students will meet with ~30 biotechnology professionals in our area. In addition, students will learn from individuals in biotechnology jobs about the diverse careers options available and strategies for navigating the job market successfully.

Typically offered in Spring only

BIT 410  Manipulation of Recombinant DNA  (4 credit hours)
Introduction to molecular biology and protein chemistry. Theory behind laboratory techniques and overview of cloning strategies starting from nucleic acid or protein sequence data. Laboratory sessions involve subcloning, preparation of competent cells, transformation, screening recombinant DNA by colony hybridization and PCR, SDS-PAGE of recombinant protein, affinity purification, and western blots.

Prerequisite: BIO 183 or ZO/BIO 160 and CH 223 or CH 227 with a C- or better
Typically offered in Fall, Spring, and Summer

BIT 462/BIT 562  Gene Expression Analysis: Microarrays  (2 credit hours)
Microarray analysis is an evolving technique with its basis in the dynamic properties of the nucleic acid hybridization. We will review current theory, techniques, instrumentation, troubleshooting, analysis tools, and advanced protocols for microarray analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment and have access to exceptional instrumentation. At the conclusion of this course, students should feel comfortable with microarray experimental design, its tools, an analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections

Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 463/CHE 463/BEC 463/BIT 563/CHE 563/BEC 563  Fermentation of Recombinant Microorganisms  (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.

Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BEC 363)
Typically offered in Fall and Spring

BIT 464/BIT 564  Protein Purification  (2 credit hours)

Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only

BIT 465/BIT 565  Real-time PCR Techniques  (2 credit hours)
Real time PCR is an evolving technique with its basis in the dynamic properties of the polymerase chain reaction and fluorescent detection. We will review current real-time theory, techniques, machinery, troubleshooting, tools, and advanced protocols for sequence detection including SYBR green, TaqMan, Beacons, multiplexing, and single nucleotide polymorphism analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment. At the conclusion of this course, students should feel comfortable with real-time experimental design, its tools, and analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections.

Prerequisite: BIT 410 or BIT 510
Typically offered in Spring only

BIT 466/BIT 566/PO 566/PO 466  Animal Cell Culture Techniques  (2 credit hours)
Introduction to animal cell culture techniques. Aseptic technique for vertebrate cell culture, media formulation, primary cell culture, long-term maintenance of cell lines, application of molecular techniques to in vitro situations. Half semester course, first part.

Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Fall, Spring, and Summer

BIT 467/BIT 567  PCR and DNA Fingerprinting  (2 credit hours)
Introduction to polymerase chain reaction. Optimization of PCR reactions and primer design for DNA sequences using DNA databases available on the web. Laboratory sections include using rapid techniques for isolating and sequencing DNA from small amount

Prerequisite: BIT 410/510
Typically offered in Spring only

BIT 468/BIT 568  Genome Mapping  (2 credit hours)
Students will be introduced to basic techniques in genetic and physical mapping. The principles of DNA marker development, marker detection, genetic and physical mapping and DNA sequencing will be addressed from a practical view with an emphasis on agricultural applications. This is a half semester course. Student must register for both lecture and lab sections.

Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only

BIT 471/BIT 571  RNA Interference and Model Organisms  (2 credit hours)
Introduction and history of RNA interference technology. Principles, mechanism, and applications of RNA interference in model organisms. Laboratory sessions include RNA interference-mediated silencing of genes in plants, C. elegans, and mammalian cell culture. This is a half-semester course (8 weeks). Student may not earn credit for both BIT 471 and BIT 571.

Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only
BIT 473/BIT 573 Protein Interactions (2 credit hours)
The interactions of proteins mediate numerous biological processes of cells. This course focuses on ways to identify and study protein-protein interactions, focusing on the advantages and limitations of each technique and how to apply the methods in a laboratory setting. In lab, students will perform a yeast two-hybrid experiment and a co-immunoprecipitation from proteins expressed in mammalian cell culture to confirm detected interactions. This is a half-semester course.

Prerequisite: BIT 410 or BCH 454
Typically offered in Fall and Spring

BIT 474/BIT 574 Plant Genetic Engineering (2 credit hours)
This course covers fundamental hands-on techniques and strategies in plant genetic engineering. Plants are major sources of food, fiber and fuel and provide model systems for both fundamental and applied research. Students will learn techniques for stable and transient transformation of plants and plant cell cultures and selection and detection of transgene expression. Additional topics covered will include methods to generate and screen for mutants, synthetic biology and applications of plant genetic engineering. This is a half-semester course. Credit is not allowed for both BIT 474 and BIT 574.

Prerequisite: BIT 410 or BIT 510 or BCH 454 or PB 421
Typically offered in Fall only

BIT 476 Applied Bioinformatics (2 credit hours)
The haploid human genome occupies a total of just over 3 billion DNA base pairs. This information is not contained in books, but stored in electronic databases. Computational biology utilizes infer function by comparative analysis. This course is designed for life scientists from all fields to introduce them to the power of bioinformatics and enable them to access and utilize biological information in databases for their own research.

Prerequisite: BIT 410 or BCH 454 or GN 311
Typically offered in Fall only

BIT 477/BIT 577 Metagenomics (2 credit hours)
Participants will be introduced to a variety of methods for studying the complex microbial populations that surround us, including theory, applications, limitations, and health and legal implications. Students will apply deep sequencing techniques to mine the genetic diversity of complex microbial populations such as the rhizosphere, a swine lagoon sample, or even the communities of microbes growing happily inside your kitchen sink drain. This course will provide hands-on experience with molecular and computational tools that can be used to study the relationships between microbial communities and ecosystems or hosts.

Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 478/BIT 578 Mapping the Brain (2 credit hours)
Mapping the Brain is designed to provide students with a neuroscience research experience. In lecture, students will gain an appreciation for the fundamental challenges inherent in studying the brain and explore the theory, applications, and limitations of new and traditional technologies employed in modern neuroscience. In the lab, students will use a novel transgenic mouse model to analyze the connections of a single population of neurons and the effects of stimulating their activity in vivo. This hands-on laboratory research experience will expose students to common laboratory approaches (histology, microscopy, etc.) as well as to cutting edge genetic approaches.

Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 479/BIT 579 High-Throughput Discovery (2 credit hours)
In this eight-week lab module, participants will be introduced to high-throughput (HT) discovery science and the underlying quantitative biology skills necessary for robust assay design. Participants will learn modern high-throughput screening approaches that will prepare them to design, validate, and perform cutting-edge screens. Different HT approaches will be discussed using authentic case studies and critical thinking scenarios based on published studies. Essential quantitative biology skills for the design and analysis of HT discovery science will be emphasized and tested regularly using "biomath" quizzes. The power of automation and robotics will be highlighted and hands-on experience with a liquid handler and the software used to operate it will be routine in the lab sessions. Participants will also be exposed to novel high-throughput approaches through discussions of new technologies and guest speakers who are experts in the field. Students will not receive credit for both BIT 479 and BIT 579.

Prerequisite: BIT 410 or 510
Typically offered in Spring only

BIT 480/BIT 580 Yeast Metabolic Engineering (2 credit hours)
Participants will be introduced to a variety of methods for using yeast to produce commercially relevant products. Topics will include cultivation, genetic manipulation to delete or replace genes, transformation, heterologous gene expression and codon optimization/gene synthesis. Various modern molecular cloning approaches and computational resources will be discussed. Students will apply gene manipulation approaches to engineer Saccharomyces cerevisiae to produce beta-carotene and/or other relevant biotechnology products. This will be accomplished by assembling a series of optimized genes in the biosynthetic pathway using the versatile genetic assembly system (VEGAS) that exploits the capacity of Saccharomyces cerevisiae to join sequences with terminal homology by homologous recombination. Expression will be compared by assembling libraries of transcriptional units with different promoters and using different genetic knock-outs as hosts. Additionally, computational modeling of metabolic processes will be used to assess perturbations to metabolic fluxes.

Prerequisite: BIT 410 or 510
Typically offered in Spring only
Typically offered in Fall, Spring, and Summer

**BIT 481/PB 481** Plant Tissue Culture and Transformation (2 credit hours)
Basic techniques in plant tissue culture and transformation. Empirical approaches to techniques in plant tissue culture, designing transgenes for expression in specific plant cell organelles and tissues, use of reporter genes to optimize transformation, and troubleshooting transformation. Laboratory sessions provide hands-on experience with plant tissue culture and transformation. Use of reporter genes, fluorescence microscopy and digital imaging. Half semester course, first part.

Typically offered in Spring only

**BIT 492** External Learning Experience (1-6 credit hours)
A learning experience in the area of biotechnology within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, and the departmental teaching coordinator prior to the experience. Project must be approved by the Academic Coordinator or Program Director of the Biotechnology Program.

Typically offered in Fall and Summer

**BIT 493** Special Problems in Biotechnology (1-6 credit hours)
A learning experience within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective mentor(s) must be initiated by student and approved by a faculty adviser, the prospective mentor, and the departmental teaching coordinator prior to the experience. Project must be approved by the Academic Coordinator or Program Director of the Biotechnology Program.

Typically offered in Fall, Spring, and Summer

**BIT 495** Special Topics in Biotechnology (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

**BIT 501** Ethical Issues in Biotechnology (1 credit hour)
Students investigate and discuss current controversial issues in biotechnology. This course emphasizes thinking about new technologies in a rational and thoughtful way.

Typically offered in Fall and Spring

**BIT 502/BIT 402** Biotechnology Networking and Professional Development (1 credit hours)
This course provides students interested in the biotechnology field an opportunity to gain valuable network, job application and interviewing skills. Over the course of the semester students will meet with ~30 biotechnology professionals in our area. In addition, students will learn from individuals in biotechnology jobs about the diverse careers options available and strategies for navigating the job market successfully.

Typically offered in Spring only

**BIT 510 Core Technologies in Molecular and Cellular Biology** (4 credit hours)
Basic technologies of recombinant DNA procedures, gene expression, isolation and identification of nucleic acids and proteins.

Prerequisite: Equivalent of CH 223 and (MB 351 or GN 311)

Typically offered in Fall, Spring, and Summer

**BIT 562/BIT 462** Gene Expression Analysis: Microarrays (2 credit hours)
Microarray analysis is an evolving technique with its basis in the dynamic properties of the nucleic acid hybridization. We will review current theory, techniques, instrumentation, troubleshooting, analysis tools, and advanced protocols for microarray analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment and have access to exceptional instrumentation. At the conclusion of this course, students should feel comfortable with microarray experimental design, its tools, an analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections.

Prerequisite: BIT 410 or 510

Typically offered in Fall only

**BIT 563/CHE 563/BEC 563/BIT 463/CHE 463** Fermentation of Recombinant Microorganisms (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.

Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BEC 363)

Typically offered in Fall and Spring

**BIT 564/BIT 464** Protein Purification (2 credit hours)

Prerequisite: BIT 410 or BIT 510 or BCH 454

Typically offered in Spring only

**BIT 565/BIT 465** Real-time PCR Techniques (2 credit hours)
Real time PCR is an evolving technique with its basis in the dynamic properties of the polymerase chain reaction and fluorescent detection. We will review current real-time theory, techniques, machinery, troubleshooting, tools, and advanced protocols for sequence detection including SYBR green, TaqMan, Beacons, multiplexing, and single nucleotide polymorphism analysis. Students will have the opportunity to utilize skills learned during lecture in a laboratory environment. At the conclusion of this course, students should feel comfortable with real-time experimental design, its tools, and analysis of generated data. This is a half-semester course. Student must register for both lecture and lab sections.

Prerequisite: BIT 410 or 510

Typically offered in Spring only

**BIT 566/PO 566/PO 466/BIT 466** Animal Cell Culture Techniques (2 credit hours)
Introduction to animal cell culture techniques. Aseptic technique for vertebrate cell culture, media formulation, primary cell culture, long-term maintenance of cell lines, application of molecular techniques to in vitro situations. Half semester course, first part.

Prerequisite: BIT 410 or BIT 510 or BCH 454

Typically offered in Fall, Spring, and Summer
BIT 567/BIT 467 PCR and DNA Fingerprinting (2 credit hours)
Introduction to polymerase chain reaction. Optimization of PCR reactions and primer design for DNA sequences using DNA databases available on the web. Laboratory sections include using rapid techniques for isolating and sequencing DNA from small amount.
Prerequisite: BIT 410/510
Typically offered in Spring only

BIT 568/BIT 468 Genome Mapping (2 credit hours)
Students will be introduced to basic techniques in genetic and physical mapping. The principles of DNA marker development, marker detection, genetic and physical mapping and DNA sequencing will be addressed from a practical view with an emphasis on agricultural applications. This is a half semester course. Student must register for both lecture and lab sections.
Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only

BIT 569 RNA Purification and Analysis (2 credit hours)
Laboratory-intensive course covering techniques in RNA purification and analysis including: isolation of quality RNA; quantification by gel and spectrophotometer; separation by gel electrophoresis; reverse transcription PCR; and Northern blotting using
Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 571/BIT 471 RNA Interference and Model Organisms (2 credit hours)
Introduction and history of RNA interference technology. Principles, mechanism, and applications of RNA interference in model organisms. Laboratory sessions include RNA interference-mediated silencing of genes in plants, C. elegans, and mammalian cell culture. This is a half-semester course (8 weeks). Student may not earn credit for both BIT 471 and BIT 571.
Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 572/BIO 572/CH 572 Proteomics (3 credit hours)
Introduction and history of the field of proteomics followed by the principles and applications of proteomics technology to understand protein expression and protein post-transitional modifications. Laboratory sessions include growing yeast with stable-isotope labeled amino acids, protein purification, Western blots, protein identification and quantification, and protein bioinformatic analysis. This is a half-semester course.
Prerequisite: BIT 410 or 510 or BCH 454 (or approval from the instructor)
Typically offered in Spring only

BIT 573/BIT 473 Protein Interactions (2 credit hours)
The interactions of proteins mediate numerous biological processes of cells. This course focuses on ways to identify and study protein-protein interactions, focusing on the advantages and limitations of each technique and how to apply the methods in a laboratory setting. In lab, students will perform a yeast two-hybrid experiment and a co-immunoprecipitation from proteins expressed in mammalian cell culture to confirm detected interactions. This a half-semester course.
Prerequisite: BIT 410 or BCH 454
Typically offered in Spring only

BIT 574/BIT 474 Plant Genetic Engineering (2 credit hours)
This course covers fundamental hands-on techniques and strategies in plant genetic engineering. Plants are major sources of food, fiber and fuel and provide model systems for both fundamental and applied research. Students will learn techniques for stable and transient transformation of plants and plant cell cultures and selection and detection of transgene expression. Additional topics covered will include methods to generate and screen for mutants, synthetic biology and applications of plant genetic engineering. This is a half-semester course. Credit is not allowed for both BIT 474 and BIT 574.
Prerequisite: BIT 410 or BIT 510 or BCH 454 or PB 421
Typically offered in Fall only

BIT 577/BIT 477 Metagenomics (2 credit hours)
Participants will be introduced to a variety of methods for studying the complex microbial populations that surround us, including theory, applications, limitations, and health and legal implications. Students will apply deep sequencing techniques to mine the genetic diversity of complex microbial populations such as the rhizosphere, a swine lagoon sample, or even the communities of microbes growing happily inside your kitchen sink drain. This course will provide hands-on experience with molecular and computational tools that can be used to study the relationships between microbial communities and ecosystems or hosts.
Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 578/BIT 478 Mapping the Brain (2 credit hours)
Mapping the Brain is designed to provide students with a neuroscience research experience. In lecture, students will gain an appreciation for the fundamental challenges inherent in studying the brain and explore the theory, applications, and limitations of new and traditional technologies employed in modern neuroscience. In the lab, students will use a novel transgenic mouse model to analyze the connections of a single population of neurons and the effects of stimulating their activity in vivo. This hands-on laboratory research experience will expose students to common laboratory approaches (histology, microscopy, etc.) as well as to cutting edge genetic approaches.
Prerequisite: BIT 410 or 510
Typically offered in Fall only

BIT 579/BIT 479 High-Throughput Discovery (2 credit hours)
In this eight-week lab module, participants will be introduced to high-throughput (HT) discovery science and the underlying quantitative biology skills necessary for robust assay design. Participants will learn modern high-throughput screening approaches that will prepare them to design, validate, and perform cutting-edge screens. Different HT approaches will be discussed using authentic case studies and critical thinking scenarios based on published studies. Essential quantitative biology skills for the design and analysis of HT discovery science will be emphasized and tested regularly using “biomath” quizzes. The power of automation and robotics will be highlighted and hands-on experience with a liquid handler and the software used to operate it will be routine in the lab sessions. Participants will also be exposed to novel high-throughput approaches through discussions of new technologies and guest speakers who are experts in the field. Students will not receive credit for both BIT 479 and BIT 579.
Prerequisite: BIT 410 or 510
Typically offered in Spring only
BIT 580/BIT 480 Yeast Metabolic Engineering (2 credit hours)
Participants will be introduced to a variety of methods for using yeast to produce commercially relevant products. Topics will include cultivation, genetic manipulation to delete or replace genes, transformation, heterologous gene expression and codon optimization/gene synthesis. Various modern molecular cloning approaches and computational resources will be discussed. Students will apply gene manipulation approaches to engineer Saccharomyces cerevisiae to produce beta-carotene and/or other relevant biotechnology products. This will be accomplished by assembling a series of optimized genes in the biosynthetic pathway using the versatile genetic assembly system (VEGAS) that exploits the capacity of Saccharomyces cerevisiae to join sequences with terminal homology by homologous recombination. Expression will be compared by assembling libraries of transcriptional units with different promoters and using different genetic knock-outs as hosts. Additionally, computational modeling of metabolic processes will be used to assess perturbations to metabolic fluxes.
Prerequisite: BIT 410 or 510
Typically offered in Spring only

BIT 590 Independent Study in Biotechnology (1-3 credit hours)
Independent study in Biotechnology under the supervision of a Biotechnology faculty member. Restricted to graduate students in the Biotechnology Program with consent of the supervising faculty. May not be taken in the first semester of graduate study.
Typically offered in Fall, Spring, and Summer

BIT 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Master's students only
Typically offered in Fall and Spring

BIT 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

BIT 696 Summer Thesis Res (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Typically offered in Summer only

BIT 790 Independent Study in Biotechnology (1-3 credit hours)
Independent study in Biotechnology under the supervision of a Biotechnology faculty member. Restricted to graduate students in the Biotechnology Program with consent of the supervising faculty. May not be taken in the first semester of graduate study.
Typically offered in Fall, Spring, and Summer

BIT 815 Advanced Special Topics (1-6 credit hours)
Intensive three-week or six-week courses in advanced technologies such as DNA sequencing, downstream processing, immunological techniques, construction of c-DNA libraries, mammalian embryo manipulation, plant transformation, bioreactor design, cloning in gram positive bacteria, electron microscopy or techniques in yeast molecular biology.
Prerequisite: BIT 510
Typically offered in Summer only

BIT 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Doctoral students only (DR)
Typically offered in Fall and Spring

BIT 896 Summer Dissert Res (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Typically offered in Summer only

Business Administration (MBA)

MBA 500 Managerial and Career Effectiveness (0.5-3 credit hours)
Frameworks, concepts and tools for management and career effectiveness. Assessment of managerial strengths, weaknesses, and potential. Team building, public speaking, networking, decision making, creativity and problem solving. Career development techniques including data mining, job search, behavior based interviewing, and negotiation skills with practical application of those concepts. Restricted to MBA Students.
Typically offered in Fall only

MBA 501 Financial Accounting for Decision Makers (1 credit hours)
Methods used by accountants to record to economic events such as operating, investing, and financing activities, in the income statement, balance sheet, and statement of cash flows. Analysis of financial statements and disclosures. Impact of accounting standards and managerial incentives on the financial reporting process. Restricted to MBA students.
Typically offered in Fall, Spring, and Summer

MBA 502 Managerial Accounting for Decision Makers (1 credit hours)
Foundational knowledge in managerial accounting for decision making. Internal uses of accounting information for decision making within the organization. Identification of revenue and cost information to conduct break-even analyses, assign product costs, complete operational budgets, assess performance, and complete other management decision-making processes. Restricted to MBA students.
Typically offered in Fall, Spring, and Summer

Prerequisite: MBA 501
**MBA 505  Essential Economics for Managers** (2 credit hours)
Survey of economic concepts applied to management decisions.

*Typically offered in Fall and Spring*

**MBA 506  Data-Driven Managerial Decisions 1** (1 credit hours)
Business cases and problems where data analysis is part of the decision-making process. Applications to finance, management, marketing, and operations. Proficiency in Excel methods commonly used in management. Completion of a project where students follow a business problem from formulation to solution using data analysis. Restricted to MBA students.

Prerequisite: BUS/ST 350

*Typically offered in Fall, Spring, and Summer*

**MBA 507  Data-Driven Managerial Decisions 2** (1 credit hours)
Continuation of a series of business cases and problems where data analysis is part of the decision making process. Estimation of linear relationships among variables, with applications to finance, management, marketing, and operations. Proficiency with Excel methods commonly used for estimation. Completion of a project where students follow a business problem from formulation to solution using the methods covered in the course. Restricted to MBA students.

Prerequisite: MBA 506

*Typically offered in Fall, Spring, and Summer*

**MBA 510  Critical Thinking for Managers** (1 credit hours)
Structure for critically analyzing and evaluating an issue, claim, text, or speech from a management perspective. Systematic analysis and evaluation of information, concepts, and ideas in order to identify underlying assumptions, purposes, and questions. Synthesis of this knowledge to logically form conclusions and recognize implications. Communication of arguments and beliefs and recognition of common language barriers in the written and spoken word. For online sections, must be enrolled in MBA program.

*Typically offered in Fall and Spring*

**MBA 511  Data Security and Privacy** (3 credit hours)
Data security and privacy necessary for today's business environment. Common vulnerabilities, securing data, encryption, policies, privacy management, standards, and compliance.

*Typically offered in Fall and Spring*

**MBA 515  Enterprise Resource Planning Systems** (3 credit hours)

*Typically offered in Fall and Spring*

**MBA 516  Ethics and Fraud Examination** (3 credit hours)
Examination of business ethics and occupational fraud cases, including asset misappropriation, corruption, and fraudulent financial reporting. Theories about fraud, prevalence of and effects of fraud, in the US and globally. Fraud examination skills including investigation, data analysis, and interviewing. Identification of common schemes and development of internal controls to prevent and detect fraud. Business ethics and socio-political responses to occupational fraud.

*Typically offered in Spring and Summer*

**MBA 518  Enterprise Risk Management** (3 credit hours)
Integrated approach to managing the risks that can prevent an organization from achieving its objectives, both financial and non-financial. Core elements of an effective enterprise risk management process. Links to management strategy. Risk assessment methodologies.

*Typically offered in Fall only*

**MBA 519  Enterprise Risk Management Practicum** (3 credit hours)
Applied approach to managing the risks that can prevent an organization from achieving its objectives, both financial and nonfinancial, by working in teams to address real problems in real organizations.

Prerequisite: MBA 518

*Typically offered in Spring only*

**MBA 520  Financial Management of Corporations** (2 credit hours)
Financial decision making at profit-motivated businesses: decisions about what to produce and how and decisions about how to finance the assets needed for production. Cash as the basis of asset valuation. Capital budgeting decisions under certainty and uncertainty.

Prerequisite: MBA 501 Financial Accounting for Decision Makers

*Typically offered in Fall, Spring, and Summer*

**MBA 521  Advanced Corporate Finance** (3 credit hours)
Overview of financial management. Evaluation of projects and valuation of real assets using traditional discounted cash flow analysis and real options. Role of financial leverage; optimal capital structure. Conflicts between security holders and management; stockholder-bondholder conflicts; financial distress, bankruptcy and reorganization; corporate control and restructuring; corporate governance issues.

Prerequisite: MBA 520

*Typically offered in Fall and Spring*

**MBA 522  Financial Modeling** (3 credit hours)
This course examines models for capital budgeting, equity and bond valuation, capital structure, dividend policy, among other topics, using spreadsheet analyses. The course will take a very hands-on approach in building spreadsheet models. The course also includes sensitivity analysis, pro-forma analysis and using financial statements.

Prerequisite: MBA 520

*Typically offered in Fall only*

**MBA 523  Investment Theory and Practice** (3 credit hours)
Advanced topics in investments with a focus on underlying theory and practical application using real world data. Stock valuation models, bond valuation, derivatives, portfolio performance evaluation, investment strategies, efficient market theory and other current issues in investment finance.

Prerequisite: MBA 520

*Typically offered in Fall and Spring*
MBA 524 Equity Valuation (3 credit hours)
Advanced quantitative course on applied equity valuation. Students conduct stock valuation analysis which is then used to select stocks for the student-managed SunTrust MBA fund. Topics include the investment decision making process, empirical evidence on securities returns, forecasting financial statements, industry and macro-economic analysis, valuation models, portfolio performance evaluation and performance attribution. Students will also learn how to write computer programs using SAS software in order to generate statistical tests of investment strategies using "big financial data."
Prerequisite: MBA 520
Typically offered in Spring and Summer

MBA 525 Taxes and Business Strategy (3 credit hours)
Importance of tax considerations in business decisions. Framework for understanding how taxes affect business strategy and financing decisions in a wide variety of settings.
Typically offered in Spring only

MBA 526 International Finance (3 credit hours)
Theory and practice of financial management in the international arena, including spot and forward markets for foreign exchange, currency futures and options contracts, international arbitrage conditions, foreign exchange exposure, foreign trade financing instruments, direct and portfolio investment abroad, and the role of country risk in determining investments.
Prerequisite: MBA 520
Typically offered in Fall only

MBA 528/FIM 528/MA 528/ECG 528 Options and Derivatives Pricing (3 credit hours)
The course covers (i) structure and operation of derivative markets, (ii) valuation of derivatives, (iii) hedging of derivatives, and (iv) applications of derivatives in areas of risk management and financial engineering. Models and pricing techniques include Black-Scholes model, binomial trees, Monte-Carlo simulation. Specific topics include simple no-arbitrage pricing relations for futures/forward contracts; put-call parity relationship; delta, gamma, and vega hedging; implied volatility and statistical properties; dynamic hedging strategies; interest-rate risk, pricing of fixed-income product; credit risk, pricing of defaultable securities.
Prerequisites: MA 341 and MA 405 and MA 421
Typically offered in Fall only

MBA 530 Leading People (3 credit hours)
This course is about the fundamentals of leading people, a critical aspect of every management position and leadership role. The course will focus at three levels of analysis: the individual, the group and the organization. Students will gain exposure to topics and issues in the field of organizational behavior and human resource management. These include knowing about and dealing with individual differences, international and cultural issues, working in groups (both virtually and geographically co-located), motivation, leadership, organizational structures and cultures, change management, empowerment, delegation, communication, and management ethics. Restricted to MBA students.
Typically offered in Spring only

MBA 531 Leading People 1 (1 credit hours)
This one-credit course is designed for part-time and online students and serves as the first part of the Leading People series. The Leading People series focuses at three levels of analysis: the individual, the group and the organization. In this series, students will gain exposure to topics and issues in the field of organizational behavior and human resource management. Content covered in part 1 addresses team leadership and change management. This course also includes instruction on improving communication skills, making presentations, leading from strengths, and emotional intelligence. Restricted to MBA students. Students may not receive credit in MBA 530 and MBA 531.
Restriction: Restricted to MBA students. Students may not receive credit in MBA 530 and MBA 531.
Typically offered in Fall and Spring

MBA 532 Leading People 2 (2 credit hours)
This two-credit course is designed for part-time and online students and serves as the second part of the Leading People series. The Leading People series focuses at three levels of analysis: the individual, the group and the organization. Students will gain exposure to topics and issues in the field of organizational behavior and human resource management. Content covered in this course includes dealing with individual differences, international and cultural issues, working in groups (both virtually and geographically co-located), motivation, leadership, organizational structures and cultures, empowerment, delegation, and management ethics. Restricted to MBA students. Students may not receive credit in MBA 530 and MBA 532.
Restriction: Restricted to MBA students. Students may not receive credit in MBA 530 and MBA 532.
Typically offered in Spring and Summer

MBA 533 Negotiation and Conflict Management (3 credit hours)
Course emphasizes ensuring that the organization benefits from inevitable conflicts that occur. It provides skills in diagnosis, negotiation, and building trust and cooperative working relationships in organizations.
Typically offered in Fall only

MBA 534 Core Concepts of Human Capital Management (3 credit hours)
The course will cover the core concepts behind successfully acquiring, deploying and motivating talent to achieve organization competitiveness. Students will think strategically about company human assets, learn basic HRM concepts and then create practical solutions to typical HCM problems. At the end of this course, students will demonstrate a basic understanding of the topics of equal opportunity employment, diversity, recruiting and selection, performance evaluation, performance goal setting, performance coaching and feedback, competitive compensation and benefits, fair discipline and termination processes and strategic talent management and succession programs.
Typically offered in Fall only

MBA 535 Leading Teams (1 credit hours)
More and more organizations are using team-based work to accomplish tasks. This course provides the latest, evidence-based best practices for working in, and leading, teams in organizations. The course is designed to be activity-driven and hands-on to give students the opportunity to practice and improve their team skills.
Typically offered in Fall only
MBA 536 Experience Innovation and Strategic Design (3 credit hours)
Successful innovation involves creating more valuable experiences for users and customers. The course covers key concepts and methodologies for experience-based innovation, drawing on design and creativity frameworks to fully understand customer experiences. Course activities include exercises and a project to practice innovation and "design-thinking" tools and techniques in a business context. Relevant strategic perspectives for designing innovative products and services are addressed through case studies and other managerial readings with practical business application. The importance of a multi-disciplinary approach to experience innovation is emphasized, such that the course is suitable for students in all disciplines with an interest in innovation.

Typically offered in Spring only

MBA 538 Women as Leaders (1 credit hours)
This course focuses on helping women uncover and reflect on their leadership styles so that they can become more empowered leaders, take responsibility for recognizing the potential in people and ideas, and have the courage to develop that potential.

Typically offered in Spring only

MBA 539 Jenkins Leadership Challenge (1 credit hours)
Leadership skills are highly valued in today's business environment. This is the capstone course for the Jenkins MBA Leadership Certificate. In other classes in the leadership series, students have learned what a successful leader is, what a successful leader does, and how a successful leader deals with contingencies in an effective way. In this class participants will review the Five Practices of Exemplary Leadership and select behaviors in their own leadership practice that need to be adjusted for stronger leadership performance. Students will then plan and execute a personal leadership challenge to address these behaviors. Course content includes a leadership assessment, lectures and readings, required participation in group coaching, periodic individual reflections, development of videos for leadership challenge proposals and testimonials, and a final paper that reflects on the student's journey through the leadership program and identifies plans for the future.

Prerequisite: MBA 510 and MBA 530 or MBA 531 and MBA 532.
Typically offered in Fall and Spring

MBA 540 Principles of Operations and Supply Chain Management (2 credit hours)
Design and management of operations and supply chains. Analysis of strategies, processes, planning and control, and advanced techniques using a variety of managerial frameworks and quantitative tools. Restricted to MBA students.

Prerequisite: MBA 507
Typically offered in Fall, Spring, and Summer

MBA 541 Supply Management (3 credit hours)
Major themes and strategies of supply management relationships. The focus is on establishing a basis for collaborative relationships with suppliers through focused market intelligence research, relationship assessment and management, negotiation, collaborative contracting, and on-going management of relationships in global supply chains. Emphasis on the importance of collaboration through the application of practical tools and approaches that drive mutually beneficial outcomes. Core processes around initial exploration and assessment of supply chain relationships, establishing metrics/expectations for the relationship, crafting and managing contracts, and sustaining continuous performance improvement in sourcing, logistics and operations. Every student will participate in a team-based supply chain project with an organization and will learn the team-based, deadline-driven nature of supply chain initiatives in a real-company setting.

Co-requisite: MBA 540 Operations and Supply Chain Management
Typically offered in Fall and Spring

MBA 542 Supply Chain Logistics (3 credit hours)
Effective logistics decision-making using a variety of conceptual frameworks and quantitative tools. Relationship between logistics and broader issues of managing the entire supply chain and fulfilling the strategic objectives of a firm. Inventory management.

Typically offered in Fall and Spring

MBA 543 Planning and Control Systems (3 credit hours)
Design and management of planning and control systems within the organization and across the supply chain. Business planning, master production scheduling, material requirements planning, just-in-time and theory of constraints. Enterprise resource planning (ERP) and business-to-business (B2B) systems. Impact of information technologies on planning and control systems. Major project using state-of-the-art ERP system.

Typically offered in Spring only

MBA 545 Decision Making under Uncertainty (3 credit hours)
Structured framework for modeling and analyzing business decisions in the presence of uncertainty and complex interactions among decision parameters. Topics include decision models, value of information and control, risk attitude, spreadsheet applications, and decision analysis cycle. Interactive case study.

Typically offered in Fall, Spring, and Summer

MBA 548 Analytical Supply Chain Management (3 credit hours)
The objective of the course is to build an understanding of how to manage and improve the performance (efficiency and responsiveness) of operations and supply chains through decision making that is based on analysis and facts, rather than intuition. The course introduces fundamental aspects of operations and supply chain management as well as analytical modeling tools and techniques that can be used to support decision making (e.g., optimization, regression analysis, simulation). The approach taken in the course is entirely example-based and hands-on, since all these techniques will be implemented in Excel, either with Excel's built-in tools or with Excel add-ins.

Prerequisites: MBA 507 and MBA 540
Typically offered in Fall only
MBA 549 Supply Chain Management Practicum  (3 credit hours)
Research project examining supply chain management issues at an organization, usually a member of the Supply Chain Resource Cooperative. Projects will typically focus on procurement, logistics, materials management, operations, or integrated supply chain issues.

Prerequisite: MBA 540
Typically offered in Fall and Spring

MBA 551 Predictive Analytics for Business and Big Data  (3 credit hours)
This course is designed around the full analytics lifecycle which encompasses the business problem, the data, the analysis, and the decision. Students will learn to identify and clearly explain business problems that can be addressed with analytics. They will learn to determine which analytic methods are best suited to solve particular problems and clearly explain the results of an analytic model and how those results might impact the business bottom line. Analytical methods to be covered include data visualization, a review of regression analysis; logistic regression; classification and regression trees (including boosting and bagging methodologies); and clustering (segmentation) methods. Students will also develop at least a beginning proficiency with several statistical software packages including Tableau, JMP, R, and SAS Enterprise Miner. Emphasis will be placed on analyzing real data and understanding how analytical thinking can be applied to solve big data problems.

Prerequisites: MBA 506 and MBA 507
Typically offered in Fall, Spring, and Summer

MBA 552 Data Engineering, Management and Warehousing  (3 credit hours)
This course examines how to collect and process data to make it useful, how to validate, protect, and process data to make it available, and how to create a place to properly store data.

Typically offered in Fall, Spring, and Summer

MBA 555 Product Design and Development  (4 credit hours)
Total product realization process, including customer needs analysis, product design and engineering, manufacturability assessment and marketing plan development. Definition of relevant market, design and engineering principles, financial considerations and manufacturing aspects of product development process. Application and integration of business, design and engineering methodologies, concepts and tools on actual product design and development project.

Typically offered in Fall only

MBA 559 Business Analytics Practicum  (3 credit hours)
This course focuses on solving a real-world business problem that includes a heavy data analytic component. The business problem will vary according to the client but could include problems from finance, human resources, marketing, finance, supply chain, or other management areas.

Prerequisite: MBA 506 and MBA 507 and MBA 551
Typically offered in Fall and Spring

MBA 560 Marketing Management and Strategy  (2 credit hours)
Market segmentation, targeting, and positioning. Channels of distribution, promotion strategy, product development strategy, and pricing strategy. Relationship marketing and marketing strategy. Applications in high-tech environments. Restricted to MBA students.

Typically offered in Fall, Spring, and Summer

MBA 561 Consumer Behavior  (3 credit hours)
Consumer perception of products and brands, including the role of product design and development of consumer attitudes. Analysis of how consumers make decisions and how those decisions can be influenced by messaging, pricing, and emotions.

Typically offered in Fall and Spring

MBA 562 Research Methods In Marketing  (3 credit hours)
A systematic approach to structure, implementation and analysis of marketing research for decision making. Models of consumer demand and firm behavior analyzed in a marketing context.

Typically offered in Fall only

MBA 563 Product and Brand Management  (3 credit hours)

Typically offered in Fall and Spring

MBA 564 Business Relationship Management  (3 credit hours)
Strategic, successful management of the multitude of business relationships that contemporary managers face. Universal and idiosyncratic business relationship skills to allow technically-oriented managers such as engineers and scientists to interact with a variety of constituents. Integrated perspective of marketing communications as a process of successfully interacting with each constituency with the goal of fostering long-term satisfaction and loyalty, which ultimately translates to sustainable competitive advantage.

Typically offered in Fall and Spring

MBA 565 Marketing Analytics  (3 credit hours)
Analytical techniques to convert a wealth of data on customers and markets into insights to guide business decisions. Taking a hands-on and systematic approach on the steps involved in harnessing knowledge from data, the course covers the various data techniques and steps involved in data- and model-driven management decisions. Techniques include market response models, conjoint analysis, discrete choice models.

Prerequisites: MBA 507 and MBA 560
Typically offered in Fall and Spring

MBA 566 Digital Marketing  (3 credit hours)
This course covers the basics of digital marketing from an analytics perspective. Each channel of digital marketing, such as search engine optimization, social, mobile, web, email, and video, are examined and their relationship to overall firm marketing strategy is explored.

Typically offered in Spring only
MBA 570 Opportunity Evaluation and Value Creation (3 credit hours)
First course in a two-course entrepreneurship sequence focusing on opportunities outside the technology arena. Management of the innovative activities of a firm (new or existing) to facilitate entrepreneurship-the discovery, evaluation, and exploitation of opportunities to create value. Generation and screening of new product/process ideas or concepts. Transformation of such ideas into products, processes, or services that satisfies stakeholders (e.g., customers, employees). Topics include self-assessment of personal aspirations, skills, and competencies, as well as opportunity identification/evaluation, business model design, and launching and scaling ventures.

Credit not allowed in MBA 570 if the student has already taken MBA 576 or MBA 577.
Typically offered in Fall and Spring

MBA 571 High Growth Entrepreneurship (3 credit hours)
Second course in a two-course entrepreneurship sequence focusing on opportunities outside the technology arena. Theoretical and practical, team-based, approach to the evaluation and assessment of opportunities for value creation. Emphasis on how to discover, validate, and then execute on an action plan to create value. Credit not allowed if the student has already taken MBA 576 or MBA 577.

Prerequisite: MBA 570. Credit not allowed if the student has already taken MBA 576 or MBA 577.
Typically offered in Fall and Spring

MBA 572 Venture Opportunity Analysis Analytics (3 credit hours)
Application of the process-based model for new business startups to multiple clients. Emphasis is placed on data gathering, data analysis and data interpretation in the context of evaluating opportunities for new business. Students work in teams on a variety of projects with technology commercialization clients such as Wolfpack Investment Network and Office of Technology Commercialization and New Ventures.

Typically offered in Fall and Spring

MBA 576/MSE 576 Technology Entrepreneurship and Commercialization I (3 credit hours)
First course in a two-course entrepreneurship sequence focusing on opportunities for technology commercialization. Evaluation of commercialization of technologies in the context of new business startups. Emphasis is placed on creating value through technology portfolio evaluation and fundamentals of technology-based new business startups. This includes development of value propositions and strong technology-product-market linkages. The process based approach is appropriate for new business startup as well as entrepreneurship in existing organizations through spinoffs, licensing, or new product development. Credit not allowed for MBA 576 if the student has already taken MBA 570 or MBA 571.

Credit not allowed in MBA 576 if the student has already taken MBA 570 or MBA 571
Typically offered in Fall and Spring

MBA 577/MSE 577 Technology Entrepreneurship and Commercialization II (3 credit hours)
Continuation of evaluation of technologies for commercialization through new business startups. Emphasis is placed on creating value through strong technology-products-markets linkages using the TEC algorithm. Topics include industry and market testing of assumptions, legal forms of new business startups, funding sources and creating a quality, integrative new business startup plan. Credit not allowed in 577 for students who have already taken 570 or 571.

Prerequisite: MBA/MSE 576. Credit not allowed in 577 for students who have already taken 570 or 571.
Typically offered in Fall and Spring

MBA 578 Venture Launch (3 credit hours)
Immersion in the activities of opportunity exploitation. Students work in groups to plan and execute the launch of a new value creating entity. Strategy formulation and strategy implementation for a new business startup. Includes all aspects of value creation.

Prerequisite: MBA 571 or MBA 577
Typically offered in Fall and Spring

MBA 579 Entrepreneurship Clinic Practicum (3 credit hours)
Inspired by the university teaching hospital model, the NC State Entrepreneurship Clinic is a place where students, faculty, entrepreneurs, and service providers go to teach, learn and build the next generation of businesses in Raleigh. Each person in this class will take on the role of "Clinic Lead" managing groups of undergraduate students working with clients of the NC State Entrepreneurship Clinic during the semester developing ideas, evaluating options, and providing insights to emerging ventures.

Typically offered in Fall and Spring

MBA 580 Creating Value in Organizations (3 credit hours)
Process-based approach to creating high value in existing organizations by understanding strategy formulation and implementation. The approach also will reapply to entrepreneurs in new venture startups as well as organizations managing innovation and.

Typically offered in Fall, Spring, and Summer

MBA 582 Sustainability and Business (3 credit hours)
Explore the current sustainability trends. Learn how business are integrating sustainability into their strategies. Gain an understanding of the tools businesses are using to operate businesses in a sustainability manner. Experience current and evolving.

Typically offered in Fall only

MBA 585 Current Topics in BioSciences Management (3 credit hours)
Business processes and strategies across the global BioSciences value chain, including the R&D realities, product life cycles, key elements of product discovery and development, intellectual property, regulatory trials, government approval, production, sourcing, logistics, sales, marketing and customer service. The complete value chain of a new biotechnology-based product.

Typically offered in Spring only
MBA 586 Legal, Regulatory and Ethical Issues in Life Science Industries (3 credit hours)
Exploration of unique environment in which biotechnology research is conducted and resultant drugs and products are sold. Legal restraints affecting pharmaceutical marketing and reimbursement options; regulatory issues; pre-clinical research. Laws limit

Typically offered in Fall only

MBA 589 Jenkins Consulting Practicum (3 credit hours)
This class provides the opportunity to learn about business consulting and be part of a consulting team, helping real clients with real business challenges and market opportunities. Students will help their client organization by understanding a problem, conducting analyses, and suggesting relevant, actionable steps that clients can take to become more competitive or achieve important goals. Projects will deal with creative, complex, risky, and ambiguous issues involved in developing new products/services, serving new markets, achieving quality standards, or creating new business models in an enterprise setting.

Restriction: MBA Students Only

Typically offered in Fall, Spring, and Summer

MBA 590 Special Topics In Business Management (1-6 credit hours)
Presentation of material not normally available in regular courses offerings or offering of new courses on a trial basis.

MBA 610 Special Topics in Business Administration (1-6 credit hours)
Special topics course dealing with issues not covered in regularly scheduled courses. Restricted to MBA students.

MBA 630 Independent Study In Business Management (1-3 credit hours)
Detailed investigation of topics of particular interest to graduate students under faculty direction on a tutorial basis. Determination of credits and content by faculty member in consultation with department head.

Typically offered in Fall, Spring, and Summer

Business Management (BUS)

BUS 225 Personal Finance (3 credit hours)
Economic and financial strategies used to accumulate, manage and protect personal assets. Emphasizing income generation, expense reduction, investment selection, and wealth creation to meet future needs and goals. Topics include investing (mutual funds, stocks, etc.), annuities, insurance, retirement planning, and estate planning.

Typically offered in Fall, Spring, and Summer

BUS 295 Special Topics in Business Management (1-6 credit hours)
Experimental course development. Special topics in Business Management at the introductory level.

BUS 320 Financial Management (3 credit hours)
Financial decision making by businesses, including capital structure and dividend decisions, capital budgeting and working capital management. Basic financial concepts are covered such as risk and return measurement, portfolio theory and the time value of money.

Prerequisite: ACC 210

Typically offered in Fall, Spring, and Summer

BUS 340 Information Systems Management (3 credit hours)
Fundamentals of information systems development and use in organizational setting. Information systems (IS), concepts, hardware, software, telecommunications, database management. IS development, applications and management in telecommunications, database management, various business processes, global issues, security and ethical challenges.

Typically offered in Fall, Spring, and Summer

BUS 350/ST 350 Economics and Business Statistics (3 credit hours)
Introduction to statistics applied to management, accounting, and economic problems. Emphasis on statistical estimation, inference, simple and multiple regression, and analysis of variance. Use of computers to apply statistical methods to problems encountered in management and economics.

Prerequisite: MA 114

Typically offered in Fall, Spring, and Summer

BUS 351 Predictive Analytics for Business (3 credit hours)
This course builds on BUS/ST 350 with an emphasis on the application of statistical methods using software. The course uses analytical methods and tools to drive actionable business decisions. Students will be exposed to a variety of statistical and machine learning methods including linear regression, logistic regression, decision analysis, classification trees, clustering techniques, optimization, monte carlo simulation, and statistical forecasting.

Prerequisites: BUS 340 and (BUS/ST 350, or ST 312, or ST 370, or ST 372); Corequisite: ST 307

Typically offered in Fall and Spring

BUS 360 Marketing Methods (3 credit hours)
Examination of decisions affecting marketing of goods and services in consumer, industrial and international markets. Emphasis on the role of marketing in a managerial context. Areas studied include: the activities of marketing research, identification of marketing opportunities, and the development of marketing mix strategies including the decisions concerning pricing, distribution, promotion and product design.

Prerequisite: MIE 201, Sophomore standing

Typically offered in Fall, Spring, and Summer

BUS 370 Operations and Supply Chain Management (3 credit hours)
Concepts in planning, controlling, and managing the operations function of manufacturing and service firms. Topics include operations strategy, process choice decisions, forecasting, production planning and control, and trends in operations management. Common tools for informed decision-making in these areas.

Typically offered in Fall, Spring, and Summer

BUS 420 Financial Management of Corporations (3 credit hours)
Advanced theory and practice of corporate financial management. Topics covered include: asset management, evaluating financial statements, capital budgeting, alternative investments, cash flow management, equity valuation, and financing. Corporate financial policy decisions will include: cost of capital, capital structure, and dividend policy decisions.

Prerequisite: BUS 360 and (BUS/ST 350, or ST 312, or ST 370, or ST 372)

Typically offered in Fall, Spring, and Summer
BUS 422 Investments and Portfolio Management (3 credit hours)
Analysis of the investment process, dichotomized into security analysis and portfolio management. Background information on financial assets, securities markets, and risk-return concepts. Analysis of valuation theory and techniques, modern portfolio theory and portfolio performance.
Prerequisite: BUS 360 and (BUS/ST 350, or ST 312, or ST 370, or ST 372)
Typically offered in Fall and Spring

BUS 425 Advanced Personal Financial Management (3 credit hours)
Detailed economic, financial and legal analysis of risk management, retirement planning, investments, and estate planning. Additional emphasis on professional financial planning for those interested in personal finance as a career.
Prerequisite: BUS 320
Typically offered in Fall and Spring

BUS 426 International Financial Management (3 credit hours)
Prerequisite: BUS 320 and (BUS/ST 350 or ST 312 or ST 370 or ST 372)
Typically offered in Spring only

BUS 428 Financial Analytics (3 credit hours)
Advanced course examining the use of big data analytics in finance. The focus will be on the application of these tools in the areas of asset management and equity valuation. Topics covered include risk-return tradeoff, financial intermediaries in asset management (e.g., mutual funds, hedge funds, etc.), stock valuation models, and using financial statement information in stock selection / asset management. Students will complete a semester-long project involving data analysis (e.g., write an equity research report on a publicly traded U.S. firm, backtest an investment strategy, etc.).
Prerequisite: BUS 320
Typically offered in Spring only

BUS 429 Financial Modeling (3 credit hours)
BUS 429 is 'corporate finance in Excel.' Starting from the theoretical base gained in BUS320, students work through problems in time value of money, capital budgeting, and valuation (among other things) using spreadsheet analyses. The course will take a very hands-on approach in building financial spreadsheet models. Microsoft Excel is the primary tool we will use to implement these financial models and the course will go into detail on the proficient use of Excel.
Prerequisite: BUS 320
Typically offered in Fall and Spring

BUS 440 Database Management (3 credit hours)
The fundamentals of database management within business applications. Data structures, user requirements, structured query language, query by example, application development, user interface design.
Prerequisite: ACC 340 or BUS 340
Typically offered in Fall and Spring

BUS 441 Business Data Communications and Networking (3 credit hours)
The fundamentals of computer networking and the use of computer networks in business applications. Client-server networks, architecture, network hardware and software, key issues in network management, network security, and the fundamentals of data communications.
Prerequisite: ACC 340 or BUS 340
Typically offered in Fall and Spring

BUS 442 Information Systems Development (3 credit hours)
This course provides concepts and skills necessary for designing, developing, and deploying information systems (applications) to aid in business and managerial decisions. It includes hands-on experience with development (coding) theory and concepts, object-oriented algorithm design and development concepts, graphical user interface design concepts, and SQL and data structures using the C# programming language and the Microsoft .NET IDE.
Prerequisite: ACC 340 or BUS 340
Typically offered in Fall and Spring

BUS 443 Web Development for Business Applications (3 credit hours)
This course provides current technologies for designing and developing interactive, web-based systems for business. Topics may include current programming languages, server-side programming, client-side programming, server-side scripting, database integration, and more. Design concepts will be implemented through team projects.
Prerequisite: BUS 442; Corequisite: BUS 440
Typically offered in Fall and Spring

BUS 444 Systems Analysis and Design (3 credit hours)
This course provides an overview of methods for developing Information Systems. Principles and techniques of systems analysis and design are introduced so that students can successfully cope with the complexities of developing information systems. Topics include software development frameworks, project management, requirements analysis, systems analysis techniques, and systems design. Systems analysis and design methods covered include agile software engineering, structured analysis and design, and object-oriented analysis and design techniques.
Prerequisite: ACC 340 or BUS 340
Typically offered in Fall and Spring

BUS 449 Information Technology Capstone (3 credit hours)
This is a completely project-oriented course. Students will work on real applications for national or local firm(s) to solve "live" IT problems. Students will work in teams to develop client deliverables and present their final work to an appropriate
Prerequisite: BUS 440 or 441 or 442 or 443 or 444.
Typically offered in Spring only
BUS 458 Analytics: From Data to Decisions (3 credit hours)
Students will develop and apply their data analytics skills by analyzing case studies built around real business problems and real data. Case studies are designed around the full analytics lifecycle which encompasses the business problem, data, analysis, and decision. Students will learn to identify and explain business problems that can be addressed with analytics. They will also learn to determine which analytic methodologies are best suited to solve particular problems and will evaluate the impact of applying analytic methods. Finally, they will learn to explain the results of an analytic model and how those results impact the business "bottom line."

Prerequisite: BUS 351
Typically offered in Fall and Spring

BUS 459 Business Analytics Practicum (3 credit hours)
Advanced application of business analytics skills, tools and methodologies to solve business issues and problems. Small teams of students will undertake projects to identify business issues, confirm the information needed to address the issues, and apply the required data analytics tools and methodologies. The projects will include interaction with business personnel, refinement of business issues, gathering information, development of business analytics models, and presentation of results through data visualization. Each project will culminate with the student team presenting their findings and recommendations to the organization.

Prerequisites: BUS 351 and BUS 458
Typically offered in Fall and Spring

BUS 460 Consumer Behavior (3 credit hours)
The consumer decision process, with emphasis on consumer decision making, satisfaction/dissatisfaction factors, perception, learning, group influences, and marketing strategy implications. Restricted to majors within the College of Management.

Prerequisite: BUS 360
Typically offered in Fall and Spring

BUS 461 Channel and Retail Marketing (3 credit hours)
Retailing comprises a substantial component of the US economy, creating millions of jobs. Marketing channels are where marketing mix strategy and tactics ultimately impact customers and produce sales. This course is designed to prepare students for roles such as buying, merchandising, store management, professional selling, distribution, inventory management or other retailing-oriented careers. Emphasis will be placed on developing students relevant skill sets in key areas such as retail metrics, site analysis, pricing tactics, merchandising strategy, and customer relationship management. Relevant aspects of consumer behavior and organizational leadership in a retail setting will be covered.

Prerequisite: BUS 360
Typically offered in Spring only

BUS 462 Marketing Research (3 credit hours)
The use, collection, organization and analysis of information pertinent to marketing decisions. Use of qualitative and quantitative data in the solution of specific marketing problems.

Prerequisite: BUS 360 and (BUS/ST 350, or ST 312, or ST 370, or ST 372)
Typically offered in Fall and Spring

BUS 464 International Marketing (3 credit hours)
Explores moving from a national marketing approach to a global marketing strategy, and discusses competitive advantages and challenges in making the transition. Both traditional countries of Western Europe and emerging markets will be examined. Students will analyze culture considerations when evaluating the impact on local business strategies. In addition to learning the impact on the world's economy through globalization, emphasis will also be placed on developing necessary professional skills.

Prerequisite: BUS 360
Typically offered in Spring only

BUS 465 Traditional and Digital Brand Promotion (3 credit hours)
This course focuses on advertising and integrated brand promotions, spanning both traditional and digital media. Emphasis is on the brand. Includes development of marketing communications strategy and campaign materials, from consumer insight generation to creative execution.

Prerequisite: BUS 360
Typically offered in Fall and Spring

BUS 466 Personal Selling (3 credit hours)
Revolves around the art of people-to-people interaction, which applies not only to the business-to-business sales environment but is also applicable to other professions. The selling process will be examined along with activities necessary to be successful in sales. With a common thread of developing and nurturing relationships, students will examine building partnerships, implications of ethical and legal issues, adapting the approach to the situation and identifying social styles with associated behaviors. Attention will also be focused on the steps involved in the sales cycle and how to be successful in their execution.

Prerequisite: BUS 360
Typically offered in Fall and Spring

BUS 467 Product and Brand Management (3 credit hours)
Provides an in-depth understanding of marketing planning and implementation involved in product and brand management. The course places emphasis on developing specific marketing strategies to support the creation and launch of new products and to succeed.

Prerequisite: BUS 360
Typically offered in Fall and Spring

BUS 468 Marketing Strategy (3 credit hours)
This course is designed to build on the core marketing principles you learned in your introductory marketing course and to enhance your understanding of their strategic implications.

Prerequisite: BUS 360
Typically offered in Spring only

BUS 469 Digital Marketing Practicum (3 credit hours)
This course provides you with an introduction to the digital marketplace through an experiential learning approach. After conducting a client audit, your team will develop a digital marketing campaign including appropriate major digital platforms. Post-campaign metrics and data analytics will be utilized to measure campaign effectiveness and future marketing strategy. The course pedagogy emphasizes class discussion, industry expert lectures, digital simulation, and a client digital project.

Prerequisite: BUS 360
Typically offered in Fall and Spring
BUS 470  Operations Modeling and Analysis  (3 credit hours)
Tools, techniques, and strategies used for analyzing and improving business operations, including process mapping, capacity analysis, demand forecasting, and quality analysis and improvement. Emphasis on Excel as a tool for analysis, particularly on Excel functions and modules relevant to operations analysis.
Prerequisite: BUS 370 and (BUS/ST 350 or ST 305 or ST 312 or ST 370 or ST 372)
Typically offered in Fall and Spring

BUS 472  Operations Planning and Control Systems  (3 credit hours)
Design and management of operations planning and control systems for manufacturing and service firms. Forecasting, capacity management, production and workforce scheduling, project management, just-in-time and time-based competition, the impact of information technologies on planning and control systems.
Prerequisite: BUS 370; Co-requisite: BUS 470
Typically offered in Fall and Spring

BUS 473  Supply Chain Strategy  (3 credit hours)
THERE ARE NO PLANS TO OFFER THIS COURSE IN THE FORESEEABLE FUTURE. Purchasing, materials management, and logistics. Purchasing systems, supplier-based strategies, price-cost management, value analysis. Inventory strategies, quality and quality decisions, materials planning. Logistics strategies for services and manufacturing.
Prerequisite: BUS 370; Co-requisite: BUS 470
Typically offered in Spring only

BUS 474  Logistics Management  (3 credit hours)
Management of physical flows of goods between firms, management of inventories that support those flows, and assessment of the effects of freight transportation choices on these management activities. A variety of conceptual frameworks and quantitative tools are used to formulate the basis for effective logistics decision making and relate those decisions to broader issues in managing the entire supply chain and fulfilling the strategic objectives of a firm. A nominal fee for simulation software may be required.
Prerequisite: BUS 370; Co-requisite: BUS 470
Typically offered in Fall and Spring

BUS 475  Purchasing and Supply Management  (3 credit hours)
This course is designed to help students develop knowledge of basic principles in purchasing and supply management. Students will be able to explain the potential contributions of these efforts of the competitiveness of the firm.
Prerequisite: BUS 370; Co-requisite: BUS 470
Typically offered in Fall and Spring

BUS 476  Decision Modeling and Analysis  (3 credit hours)
Structured framework and process for modeling and analyzing business decisions. Business decisions are frequently made difficult by the presence of uncertainty and complex interactions among key drivers of the decision. In today's global environment the stakes of bad outcomes may be too high to justify learning by experience. Filled with in-depth insights and practical advice, this course covers the essential tools and techniques to improve your skills, such as: decision trees, influence diagrams, spreadsheet-based decision modeling, Monte Carlo simulation, demand forecasting, and methods to obtain and model decision-relevant data from subject matter experts in an unbiased manner.
Prerequisite: BUS 340 and (BUS/ST 350, or ST 312, or ST 370, or ST 372)
Typically offered in Fall and Spring

BUS 479  Supply Chain Management Undergraduate Practicum  (3 credit hours)
This course is comprised of a team-based project working on a Supply Chain Resource Consortium (SCRC) partner company’s supply chain management issues. These projects vary in scope as are company's supply chain issues and improvement initiatives.
Prerequisite: BUS 370 and one 400-level Operations/Supply Chain Management course
Typically offered in Fall and Spring

BUS 495  Special Topics in Business Management  (1-6 credit hours)
Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.

BUS 498  Independent Study in Business Management  (1-6 credit hours)
Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Department Head. Individualized/Independent Study and

Typically offered in Fall, Spring, and Summer

BUS 501  Strategic Management Foundations  (3 credit hours)
This course is designed to help students with an engineering or scientific undergraduate degree understand the world of business. The class will cover key business functions including finance, marketing, operations, strategy, organizational behavior. Students will undertake a semester-long group project to design and plan for a new company or new product within an existing company. Restricted to students with an engineering, scientific, or other technical background.

Typically offered in Fall and Spring

BUS 554  Project Management  (3 credit hours)
Life cycle view of organizing and managing technical projects, including project selection, planning, and execution. Methods for managing and controlling project costs, schedules, and scope. Techniques for assessing project risk. Use of popular project management software tools. Application of project management tools and methods to product development, software, and process reengineering projects.

Typically offered in Spring and Summer
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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<tbody>
<tr>
<td>BUS 571</td>
<td>High Growth Entrepreneurship</td>
<td>3</td>
<td>Second course in a two-course entrepreneurship sequence focusing on opportunities outside the technology arena. Theoretical and practical, team-based, approach to the evaluation and assessment of opportunities for value creation. Emphasis on how to discover, validate, and then execute on an action plan to create value. Credit not allowed if the student has already taken MBA 576 or MBA 577. Prerequisite: MBA 570. Credit not allowed if the student has already taken MBA 576 or MBA 577. Typically offered in Fall and Spring</td>
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<tr>
<td>BUS 585/TTM 585</td>
<td>Market Research in Textiles</td>
<td>3</td>
<td>A study and analysis of quantitative methods employed in market research in the textile industry. Function of market research and its proper orientation to management and decision making. Prerequisite: TAM (EC) 482</td>
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</tbody>
</table>
CHE 446 Design and Analysis of Chemical Reactors (3 credit hours)
Characterization and measurement of the rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors. Credit cannot be received for both CHE 446 and CHE 546.
Prerequisite: CHE 316
Typically offered in Fall only

CHE 447 Bioreactor Engineering (3 credit hours)
Design and analysis of chemical reactors with emphasis on enzyme-catalyzed reactions, microbial fermentation, and animal cell culture. Empirical kinetics of enzymatic reactions and cell growth. Design and scale-up of suspension bioreactors. Immobilized-enzyme and immobilized-cell bioreactors, including the classical Thiele reaction-diffusion analysis.
Prerequisite: CHE 312 and CHE 316; Corequisite: BCH 451
Typically offered in Fall only

CHE 448/BEC 448/BEC 548/CHE 548 Bioreactor Design (2 credit hours)
This course will cover critical aspects of bioreactor design, including design of reactors for enzyme-catalyzed reactions, fermentation of microorganisms, and scale-up considerations for bioreactors. Hands-on experiments involving fermentation of microorganisms and scale-up of bioreactors will be included. Students cannot get credit for both CHE 448 and CHE 548.
Typically offered in Spring only

CHE 450 Chemical Engineering Design I (3 credit hours)
Prerequisite: CHE 312; Corequisite: CHE 446 or CHE 447
Typically offered in Fall only

CHE 451 Chemical Engineering Design II (3 credit hours)
Chemical process design and optimization. The interplay of economic and technical factors in process development, site selection, project design, and production management. Comprehensive design problems.
Prerequisite: CHE 450, and (CHE 446 or CHE 447)
Typically offered in Spring only

CHE 452/CHE 552 Biomolecular Engineering (2 credit hours)
This course will cover modern methods in biomolecule design, including gene expression regulators, RNA structure, protein structure, and metabolic networks. Current methods in genetic engineering and ?omics-based analysis will be discussed, followed by a critical review of current literature on the applications of these methods to engineering microbes, cells, and multi-species communities. Hands-on assignments involving computational design will be included.
Typically offered in Spring only

CHE 460 Nano-Electronic Materials (3 credit hours)
Plasma and thermal inorganic chemical processes in semiconductor device fabrication. Thin films and electronic devices. Kinetics and chemical transport in electronic materials synthesis, modification and etching. Plasma physics and chemistry, reactors and process diagnostics. Credit for both CHE 460 and CHE 760 is not allowed.
Prerequisite: CHE 311 and CHE 315

CHE 461 Polymer Sciences and Technology (3 credit hours)
Concepts and techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.
Prerequisite: (CH 223 or CH 227) and CHE 316
Typically offered in Fall only

CHE 462/CHE 562/BEC 462/BEC 562 Fundamentals of Bio-Nanotechnology (3 credit hours)
Concepts of nanotechnology are applied in the synthesis, characterization, recognition and application of biomaterials on the nanoscale. Emphasis will be given to hands-on experience with nanostructured biomaterials; students will also be familiarized with the potential impact of these materials on different aspects of society and potential hazards associated with their preparation and application.
Prerequisite: MA 241 and PY 208 and (CH 223 or CH 227)
Typically offered in Spring only

CHE 463/BEC 463/BIT 563/CHE 563/BEC 563/BIT 463 Fermentation of Recombinant Microorganisms (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.
Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BEC 363)
Typically offered in Fall and Spring

CHE 465 Colloidal and Nanoscale Engineering (3 credit hours)
The first part of this course will present the fundamentals of nanoscale colloidal processes, including interactions and self-assembly of particles, surfactants and biomolecules. The applications of these fundamentals to the nanotechnology and engineering on the nanoscale will be discussed. The nanoscience has led to the development of many new technologies with relevance to chemical engineering, including microfluidics, lab-on-a-chip, bioarrays and bioassays. These emerging technologies will be presented and discussed in the second half of this course.
Prerequisite: C- or better in CHE 311 and CHE 315.
Typically offered in Fall and Spring

CHE 467 Polymer Rheology (3 credit hours)
Theoretical principles and experimental techniques associated with flow and deformation of polymer systems. Systems include: melts and solutions, suspension, gels, emulsions, and thixotropic materials.
Prerequisite: CHE 311
Typically offered in Spring only
CHE 468/CHE 568/ECE 568/ECE 468 Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems (3 credit hours)
Conventional and emerging nano-manufacturing techniques and their applications in the fabrication of various structures and devices. Review of techniques for patterning, deposition, and etching of thin films including emerging techniques such as an imprint and soft lithography and other unconventional techniques. Electronic and mechanical properties of 0 to 3-D nanostructures and their applications in nano-electronics, MEMS/NEMS devices, sensing, energy harvesting, storage, flexible electronics and nano-medicine. Credit for both ECE/CHE 468 and ECE/CHE 568 is not allowed.

Prerequisite: E 304
Typically offered in Fall only

CHE 475/CHE 575 Advances in Pollution Prevention: Environmental Management for the Future (3 credit hours)
Design of industrial processes which minimize or eliminate wastes. Regulations and the corporate organization of current pollution prevention efforts. Current pollution prevention research. Product life cycle analysis and the application to design of

Prerequisite: PY 208, MA 341
Typically offered in Spring only

CHE 488/BEC 588/CHE 588/BEC 488 Animal Cell Culture Engineering (2 credit hours)
Design and operation of animal cell culture bioreactors for therapeutic protein production. Topics include: batch, fed-batch and perfusion bioreactors, agitation and aeration for mixing and oxygen mass transfer, bioreactor monitoring and control, optimizing bioreactor performance, single-use [disposal] bioreactors, and the production of gene therapy vectors. This is a half-semester course. Time outside of the regularly scheduled class time may be required.

Typically offered in Spring only

CHE 495 Honors Thesis Preparation (1 credit hours)
Development and presentation of Honors Thesis in Chemical Engineering and discussion of graduate school selection and preparation.

Prerequisite: CHE 497, Senior standing
Typically offered in Spring only

CHE 497 Chemical Engineering Projects I (3 credit hours)
Introduction to chemical engineering research through experimental, theoretical and literature studies. Oral and written presentation of reports.

Prerequisite: Junior standing
Typically offered in Fall, Spring, and Summer

CHE 498 Chemical Engineering Projects II (1-3 credit hours)
Projects in research, design or development in various areas of chemical engineering.

Prerequisite: Junior standing
Typically offered in Fall, Spring, and Summer

CHE 525 Process System Analysis and Control (3 credit hours)
Dynamic analysis and continuous control of chemical engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques. Credit for both CHE 425 and CHE 525 is not allowed.

Prerequisite: CHE 312
Typically offered in Spring only

CHE 543 Polymer Science and Technology (3 credit hours)
Concepts and techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.

Prerequisite: CHE 223, CHE 316
Typically offered in Fall and Summer

CHE 546 Design and Analysis of Chemical Reactors (3 credit hours)
Characterization and measurement of rates of homogeneous and heterogeneous reactions. Design and analysis of chemical reactors. Credit for both CHE 446 and CHE 546 is not allowed.

Prerequisite: CHE 316
Typically offered in Fall only

CHE 548/CHE 448/BEC 448/BEC 548 Bioreactor Design (2 credit hours)
This course will cover critical aspects of bioreactor design, including design of reactors for enzyme-catalyzed reactions, fermentation of microorganisms, and scale-up considerations for bioreactors. Hands-on experiments involving fermentation of microorganisms and scale-up of bioreactors will be included. Students cannot get credit for both CHE 448 and CHE 548.

Typically offered in Spring only

CHE 551 Biochemical Engineering (3 credit hours)
Enzyme and microbial kinetics and reactor designs for processes involving enzymes and single and mixed cultures. Samples drawn from full range of applications: food processing, single cell proteins, tissue culture and vaccines, monoclonal antibodies, recombinant DNA and hybridomas, artificial organs, biological waste treatment and environmental processes.

Prerequisite: CHE 312 and (CHE 446 or CHE 447)
Typically offered in Spring only

CHE 552/CHE 452 Biomolecular Engineering (2 credit hours)
This course will cover modern methods in biomolecule design, including gene expression regulators, RNA structure, protein structure, and metabolic networks. Current methods in genetic engineering and ?omics-based analysis will be discussed, followed by a critical review of current literature on the applications of these methods to engineering microbes, cells, and multi-species communities. Hands-on assignments involving computational design will be included.

Typically offered in Spring only
CHE 560 Chemical Processing Of Electronic Materials (3 credit hours)
Plasma and thermal inorganic chemical processes in semiconductor device fabrication. Thin films and electronic devices. Kinetics and chemical transport in electronic materials synthesis, modification and etching. Plasma physics and chemistry, reactors and process diagnostics. Credit for both CHE 460 and CHE 560 is not allowed.
Prerequisite: CHE 312 and CHE 446
Typically offered in Spring only

CHE 562/BEC 462/CHE 462 Fundamentals of Bio-Nanotechnology (3 credit hours)
Concepts of nanotechnology are applied in the synthesis, characterization, recognition and application of biomaterials on the nanoscale. Emphasis will be given to hands-on experience with nanostructured biomaterials; students will also be familiarized with the potential impact of these materials on different aspects of society and potential hazards associated with their preparation and application.
Prerequisite: MA 241 and PY 208 and (CH 223 or CH 227)
Typically offered in Spring only

CHE 563/BIT 463/CHE 463/BEC 463/BIT 563 Fermentation of Recombinant Microorganisms (2 credit hours)
Introduction to fermentation and protein chemistry. Theory behind laboratory techniques and overview of industrial scale expression systems. Laboratory sessions involve use of microbial expression vectors, fermentation systems, and large-scale purification of recombinant protein. Half semester course, first part.
Prerequisite: CH 223 or CH 227; Corequisite: (BIT 410 or BCH 452 or MB 352 or BIT 363)
Typically offered in Fall and Spring

CHE 567/BEC 467/CHE 467 Animal Cell Culture (3 credit hours)
Overview of biomanufacturing using microorganisms (bacteria, yeast, fungi), eukaryotic cells (hybridomas, insect, plant, CHO) and recombinant enzymes focusing on methods used in industry. Course will emphasize process design for optimization of heterologous protein expression, metabolic/cell line engineering, metabolicomics, protein engineering to alter enzymes and antibodies. Pathway engineering strategies include developing microbes to produce new therapeutic compounds or overproduce primary metabolites, antibiotics, biotherapeutics, therapeutic enzymes, diagnostics, recombinant vaccines, and biopharmaceuticals. Utilization of immobilized biocatalysts, and microbial kinetics are covered.
Graduate standing in engineering or life-science graduate program
Typically offered in Spring only

CHE 568/ECE 468/CHE 468/CHE 468/BEC 568 Animal Cell Culture Engineering (2 credit hours)
Design and operation of animal cell culture bioreactors for therapeutic protein production. Topics include: batch, fed-batch and perfusion bioreactors, agitation and aeration for mixing and oxygen mass transfer, bioreactor monitoring and control, optimizing bioreactor performance, single-use [disposal] bioreactors, and the production of gene therapy vectors. This is a half-semester course. Time outside of the regularly scheduled class time may be required.
Typically offered in Spring only

CHE 586 Special Topics in Chemical Engineering (1-3 credit hours)
Typically offered in Fall and Spring

CHE 597 Chemical Engineering Projects (1-3 credit hours)
Independent study of some phase of chemical engineering or related field.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

CHE 601 Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

CHE 610 Special Topics (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

CHE 615 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall only

CHE 668 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall and Spring
CHE 690  Master’s Examination  (1-9 credit hours)
For students in non-thesis master’s programs who have completed all
other requirements of the degree except preparing for and taking the final
master’s exam.
Prerequisite: Master’s student
Typically offered in Fall only

CHE 693  Master’s Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the
Graduate Faculty.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

CHE 695  Master’s Thesis Research  (1-9 credit hours)
Thesis research.
Prerequisite: Master’s student
Typically offered in Summer only

CHE 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

CHE 697  Advanced Chemical Engineering Projects  (1-12 credit
hours)
Independent study of some phase of chemical engineering or related
field.
Prerequisite: Graduate standing in CHE
Typically offered in Fall, Spring, and Summer

CHE 699  Master’s Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-
time enrollment for the master’s degree and are writing and defending their
thesis.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

CHE 701  Introduction to Chemical Engineering Research  (2 credit
hours)
Introduction to graduate research guidelines and practices. Topics
include research ethics, electronic literature searching, research proposal
structure, technical writing styles, research problem identification, advisor
expectations, intellectual property and patents, laboratory notebooks,
proposal creation and oral presentation. Graduate standing in chemical
engineering or permission of instructor.
Typically offered in Fall only

CHE 702  Chemical Engineering Research Proposition  (2 credit
hours)
Preparation of a professional quality chemical engineering research
proposal. Includes selecting a novel research topic, drafting and
finalizing the proposal according to NSF formats, and orally presenting
and defending the proposal to a faculty advisory committee. Ethics in
proposal preparation.
Prerequisite: CHE 701
Typically offered in Spring only

CHE 711  Chemical Engineering Process Modeling  (3 credit hours)
Applications of methods of mathematical analysis to formulation and
solution of problems in transport phenomena, process dynamics and
chemical reaction engineering.
Prerequisite: (CHE 312, MA 301 or MA 341) or equivalent
Typically offered in Fall only

CHE 713  Thermodynamics I  (3 credit hours)
In-depth coverage of chemical engineering thermodynamics principles.
Application of non-ideal fluid-phase chemical potentials to problems in
phase and chemical reaction equilibria. Relations of molecular structure
and intermolecular forces to macroscopic behavior.
Prerequisite: CHE 316 or equivalent
Typically offered in Fall only

CHE 715  Transport Phenomena  (3 credit hours)
A theoretical unified study of transport of momentum, energy and matter.
Introduction to diffusional operations including coupled heat and mass
transfer in light of the theory.
Prerequisite: CHE 311 or equivalent
Typically offered in Spring

CHE 717  Chemical Reaction Engineering  (3 credit hours)
Rates and mechanisms of homogeneous and heterogeneous reactions.
Design, analysis and scale-up of batch and continuous chemical reactors.
Prerequisite: CHE 446 or CHE 447 or equivalent
Typically offered in Fall only

CHE 718  Advanced Chemical Reaction Engineering  (3 credit hours)
Topics relating to design, analysis and operation of homogeneous and
heterogeneous chemical reactors.
Prerequisite: CHE 717

CHE 719  Electrochemical Systems Analysis  (3 credit hours)
Electrochemical thermodynamics, electrochemical kinetics and
catalysis, coupled charge and material transport in an electric field and
electrophoretic effects. Design and analysis of electrochemical reactors.
Survey of electrochemical industry.
Prerequisite: CHE 715, 717

CHE 752  Separation Processes For Biological Materials  (3 credit hours)
Definition and engineering analysis of major bioseparation techniques
useful in product isolation and purification. Solid-liquid separation,
crystallization, filtration, extraction, chromatography, membrane
processes, distillation, drying, combined operations and process
economics.
Prerequisite: CHE 721 or CHE 551

CHE 761/MSE 761  Polymer Blends and Alloys  (3 credit hours)
Thermodynamics, morphological characteristics and properties of
multiphase polymer systems composed of homopolymers or copolymers.
Interfacial characteristics and modification of multicomponent polymer
blends through emulsification and reactive blending. Microphase
ordering in block copolymers, and emerging technologies employing these
nanostructured materials. Conformational properties and dynamics of
macromolecules constrained near an interface.
Prerequisite: CHE 316 or MAT 301
Typically offered in Fall only
CHE 775 Multi-Scale Modeling of Matter (3 credit hours)
Current methods for modeling liquids, soft matter (polymers, surfactant solutions, colloids, liquid crystals, etc), nano-structured materials (nanoparticles, nano-composites, nano-porous materials, etc.), biomolecular systems, and reacting systems at the electronic, atomistic, meso-scale and continuum levels. Graduate level thermodynamics and differential and integral calculus required.

Prerequisite: Graduate level thermodynamics, and differential and integral calculus
Typically offered in Spring only

CHE 795 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CHE 796 Special Topics In Chemical Engineering (1-6 credit hours)
Directed reading of chemical engineering literature, introduction to research methodology, and lectures and seminar discussion on topics which vary from term to term.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

CHE 797 Chemical Engineering Projects (1-3 credit hours)
Independent study of some phase of chemical engineering or related field.

Prerequisite: Graduate standing
Typically offered in Fall only

CHE 798 Advanced Chemical Engineering Projects (1-3 credit hours)
Independent study of some phase of chemical engineering or related field.

Prerequisite: Graduate standing in CHE
Typically offered in Fall, Spring, and Summer

CHE 801 Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

CHE 810 Special Topics (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

CHE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall only

CHE 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

CHE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

CHE 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CHE 796 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

CHE 799 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Chemistry (CH)

CH 100 Chemistry and Society (4 credit hours)
Awareness and understanding of chemistry in everyday life for the non-science student. Non-mathematical treatment of essential fundamental concepts. Emphasis on practical applications of chemistry to consumer affairs, energy, medicine, food, sports, and pollution. Laboratory activities are designed to provide a personal experience with the concepts discussed in the course. Credit is not allowed for CH 100 if student has prior credit for CH 101.

R: Credit is not allowed for CH 100 if student has prior credit for CH 101.

CHEP Natural Sciences
Typically offered in Fall and Spring

CH 101 Chemistry - A Molecular Science (3 credit hours)
A fundamental study of molecular bonding, structure, and reactivity. Principles of atomic structure, ionic and covalent bonding, reaction energetics, intermolecular forces, precipitation reactions, acid/base reactions, oxidation/reduction processes, and introductions to organic and inorganic chemistry.

Prerequisite: One yr of high school chemistry and successful completion of the Chem Placement Exam or Chem Modules Exam, or completion of CH 111 w/ C- or better. Coreq: CH 102. ADD BOTH CH 101 and CH 102 TO YOUR SHOPPING CART AND THEN ENROLL SIMULTANEOUSLY CHEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CH 102 General Chemistry Laboratory (1 credit hours)
Laboratory experience to accompany CH 101. Introduction to basic laboratory equipment and skills.

Corequisite: CH 101

CHEP Natural Sciences
Typically offered in Fall, Spring, and Summer
CH 103 General Chemistry I for Students in Chemical Sciences (3 credit hours)
A study of the structure of atoms and the periodic trends of the elements, chemical bonding, the spatial and electronic structure of molecules, chemical reactions, quantification of materials and reactions, energy changes of reactions, and properties of gases.
First half of a two-semester sequence for students interested in a chemistry or closely related career. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 11BIOCHBS, 11LSFY-11BCHI, and 17MARSCBS-17MARSCCHM majors and to students with departmental approval. Students cannot receive credit for both CH 101 and CH 103.
Prerequisites: (Pass Chemistry Placement Exam, or Chemistry Placement Modules Exam, or CH 111 with a grade of C- or better) and eligibility for MA 107; Co-requisite: CH 104
GEP Natural Sciences
Typically offered in Fall only

CH 104 General Chemistry Laboratory I for Students in Chemical Sciences (1 credit hours)
Laboratory and computer-based experiments in chemical formulas, atomic structure, bonding, qualitative analysis, solutions, quantitative analysis of acids and bases, and calorimetry. First half of a two-semester sequence for students interested in a chemistry or closely related career. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 11BIOCHBS, 11LSFY-11BCHI and 17MARSCBS-17MARSCCHM majors and to students with departmental approval. Students cannot receive credit for both CH 102 and CH 104.
Co-requisite: CH 103
GEP Natural Sciences
Typically offered in Fall only

CH 111 Preparatory Chemistry (3 credit hours)
Preparation for CH 101. Review of main topics from high school emphasizing nomenclature, vocabulary, the periodic table and problem solving. Emphasis on mathematical skills, data handling, reaction types, stoichiometry and solutions. Credit for CH 111 is not allowed if a student has prior credit in CH 101. Credit for CH 111 does not count towards graduation for students in curricula that require CH 101.
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CH 201 Chemistry - A Quantitative Science (3 credit hours)
Detailed quantitative aspects of solutions, solution stoichiometry, thermodynamics, chemical equilibrium, acid-base equilibrium, solubility equilibria, electrochemistry, chemical kinetics, and nuclear chemistry.
Prerequisite: CH 101 with grade C- or better, CH 102, and eligibility for MA 121 or higher, Corequisite: CH 202
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CH 202 Quantitative Chemistry Laboratory (1 credit hours)
Laboratory experience to complement CH 201. Experimental exploration of thermodynamic, kinetic, and electrochemical behavior.
Prerequisite: CH 101, CH 102, Corequisite: CH 201
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CH 203 General Chemistry II for Students in Chemical Sciences (3 credit hours)
A study of intermolecular forces between molecules, and their affect on the properties of solids, liquids and gases, and on phase changes. The interplay of energetics and chemical kinetics on equilibria, including gas phase, acid-base, redox, and solubility equilibria.
Second half of a two-semester sequence for students interested in a chemistry or closely related career. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 11BIOCHBS, 11LSFY-11BCHI, and 17MARSCBS-17MARSCCHM majors and to students with departmental approval. Students cannot receive credit for both CH 201 and CH 203.
Prerequisites: (CH 101 with a minimum of 3 grade points or CH 103), and (CH 102 or CH 104), and eligibility for MA 131 or higher; Co-requisite: CH 204
GEP Natural Sciences
Typically offered in Spring only

CH 204 General Chemistry Laboratory II for Students in Chemical Sciences (1 credit hours)
Laboratory experiments in solid state materials, preparation and analysis of an organic compound, separations, gases, solutions, equilibrium, acids and bases, and kinetics. Second half of a two-semester sequence for students interested in a chemistry or closely related career. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 11BIOCHBS, 11LSFY-11BCHI, and 17MARSCBS-17MARSCCHM majors and to students with departmental approval. Students cannot receive credit for both CH 202 and CH 204.
Prerequisite: CH 104 with a minimum of C-. Co-requisite: CH 203
GEP Natural Sciences
Typically offered in Spring only

CH 220 Introductory Organic Chemistry (3 credit hours)
A one-semester course in the fundamental principles of organic chemistry. Preparation, reactions, and physical properties of alkanes, cycloalkanes, alcohols, alkyl halides, aromatic compounds, aldehydes, ketones, organic acids, acid derivatives, and amines. Credit is not allowed for both CH 220 and CH 221.
Prerequisite: CH 101. Corequisite: CH 222.
Typically offered in Fall, Spring, and Summer

CH 221 Organic Chemistry I (3 credit hours)
First half of two-semester sequence in the fundamentals of modern organic chemistry. Structure and bonding, stereochemistry, reactivity and synthesis of carbon compounds. Detailed coverage of aliphatic hydrocarbons, alcohols, ethers, and alkyl halides. Introduction to spectral techniques of IR, UV-vis, and NMR. Students cannot receive credit for both CH 221 and CH 225.
Prerequisite: CH 101 with a grade of C- or better and CH 102; Co-requisite: CH 222
Typically offered in Fall, Spring, and Summer

CH 222 Organic Chemistry I Lab (1 credit hours)
Laboratory experience to accompany CH 220 or CH 221. Introduction to basic organic laboratory equipment and techniques. Students cannot receive credit for both CH 222 and CH 226.
Prerequisite: CH 101 and CH 102; Corequisite: CH 220 or CH 221
Typically offered in Fall, Spring, and Summer
CH 223 Organic Chemistry II (3 credit hours)
Second half of two-semester sequence in the fundamentals of modern organic chemistry. Structure and bonding, stereochemistry, reactivity and synthesis of carbon compounds. Detailed coverage of aromatic hydrocarbons, condensation reagents, and selected biological chemistry topics such as carbohydrates, lipids, and amino acids. Students cannot receive credit for both CH 223 and CH 227.
Prerequisite: CH 221 with a grade of C- or better and CH222; Corequisite: CH 224
Typically offered in Fall, Spring, and Summer

CH 224 Organic Chemistry II Lab (1 credit hours)
Laboratory experience to accompany CH 223. Introduction to basic organic laboratory equipment and techniques. Students cannot receive credit for both CH 224 and CH 228.
Prerequisite: CH 221 and CH 222; Corequisite: CH 223
Typically offered in Fall, Spring, and Summer

CH 225 Organic Chemistry I for Students in Chemical Sciences (3 credit hours)
First half of a two semester sequence in organic chemistry for students interested in a chemistry or closely related career. Structure and bonding, stereochemistry, reactivity and synthesis of aliphatic hydrocarbons, alcohols, ethers and alkyl halides. Introduction to IR, NMR, and mass spectral techniques. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 14CHEBS, 11BIOCHBS, 11LSFY-11BCHI, and 17MARSCBS-17MARSCHM majors and to students with departmental approval. Students cannot receive credit for both CH 221 and CH 225.
Prerequisites: (CH 201 or CH 203) and (CH 202 or CH 204); Co-requisite: CH 226
Typically offered in Fall only

CH 226 Organic Chemistry Laboratory I for Students in Chemical Sciences (1 credit hours)
First half of a two semester laboratory sequence in organic chemistry for students interested in a chemistry or closely related career. Laboratory experiments in the determination of physical properties of organic compounds, separation of mixtures and purification of compounds, synthesis and spectroscopic characterization of organic compounds, and the execution of a multi-step synthesis. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 14CHEBS, 11BIOCHBS, 11LSFY-11BCHI and 17MARSCBS-17MARSCHM majors and to students with departmental approval. Students cannot receive credit for both CH 222 and CH 226.
Co-requisite: CH 225
Typically offered in Fall only

CH 227 Organic Chemistry II for Students in Chemical Sciences (3 credit hours)
Second half of a two semester sequence in organic chemistry for students interested in a chemistry or other closely related career. Structure and bonding, stereochemistry, reactivity and synthesis of aromatic compounds. Condensation reactions and organic compounds of biological interest. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 14CHEBS, 11BIOCHBS, 11LSFY-11BCHI and 17MARSCBS-17MARSCHM majors and to students with departmental approval. Students cannot receive credit for both CH 223 and CH 227.
Prerequisites: (CH 221 B or better or CH 225) & (CH 222 or CH 226); Corequisite: CH 228; Restricted to:17CHEMBS, 17CHEMBA, 14CHEI, 14CHEBS, 11BIOCHBS, or 17MARSCHM majors or dept approval. Students cannot receive credit for both CH 223 and CH 227.
Typically offered in Spring only

CH 228 Organic Chemistry Laboratory II for Students in Chemical Sciences (1 credit hours)
Second half of a two semester laboratory sequence in organic chemistry for students interested in a chemistry or closely related career. Laboratory experiments in multi-step organic synthesis, identification and characterization of compounds by spectroscopic methods. Searching the chemical literature. This course is open to 17CHEMBS, 17CHEMBA, 14EFY-14CHEI, 14CHEBS, 11BIOCHBS, 11LSFY-11BCHI and 17MARSCBS-17MARSCHM majors and to students with departmental approval. Students cannot receive credit for both CH 224 and CH 228.
Co-requisite: CH 227
Typically offered in Spring only

CH 230 Computational Chemistry Lab I (1 credit hours)
An introduction to computational methods in the chemical sciences. A quantitative introduction to inter- and intramolecular forces in gas and condensed phases. Potential energy surfaces of molecules and chemical reactions. First of a two-semester sequen
Prerequisite: CH 221 or CH 225; Co-requisite: MA 241
Typically offered in Fall only

CH 232 Computational Chemistry Lab II (1 credit hours)
An introduction to computational methods in the chemical sciences. A computer-based introduction to quantum mechanics, including atomic and molecular orbitals and molecular orbital theory with applications to inorganic chemistry.
Prerequisite: CH 221 or CH 225, Corequisite: MA 241
Typically offered in Spring only

CH 295 Special Topics in Chemistry (1-3 credit hours)
Special topics in chemistry at the early undergraduate level. Trial offerings of new or experimental courses in chemistry. Enrollment requires permission of the department.
Typically offered in Fall, Spring, and Summer
CH 315  Quantitative Analysis  (3 credit hours)
Introduce the fundamental principles and modern techniques of chemical analyses. This includes examination of electrolytic solutions, including acid-base, oxidation-reduction, and solubility equilibria, and introduction to spectrochemical, electrochemical, volumetric and chromatographic methods of analysis, modern chemical instrumentation, and interpretation of data.
Prerequisite: (CH 201 or CH 203) with a grade of C- or better. Corequisite: CH 316
Typically offered in Fall, Spring, and Summer

CH 316  Quantitative Analysis Laboratory  (1 credit hours)
Application of spectrochemical, electrochemical, volumetric, and chromatographic methods of analysis for the identification and quantification of components in a mixture.
Prerequisite: (CH 201 or CH 203) and (CH 202 or CH 204); Corequisite: CH 315
Typically offered in Fall, Spring, and Summer

CH 331  Introductory Physical Chemistry  (4 credit hours)
Fundamental physiochemical principles including chemical thermodynamics, physical and chemical equilibrium, electrochemistry and reaction kinetics. For students requiring only a single semester of physical chemistry.
Prerequisite: (CH 201 or CH 203) and (CH 202 and 204) and (MA 231 or 241) and (PY 205 or PY 211)
Typically offered in Fall, Spring, and Summer

CH 335/PSE 335  Principles of Green Chemistry  (4 credit hours)
Introduction to the topic of green chemistry as an emerging field; identification of hazards and classes; overview of sources; alternative solvents and reagents; sustainability of chemical reactions; alternative chemical reactions and pathways; alternat
Prerequisite: Grade of C or better in CH 101/102, CH 201/202 (or equivalent general chemistry series), and CH 221/22 (or equivalent)
Typically offered in Fall only

CH 345  Chemistry and War  (3 credit hours)
This course will cover the influence of chemical discoveries on major military conflicts, from World War I to the present, as well as the effect that military conflicts during this time had on chemical discoveries. Topics will include but are not limited to: explosives, chemical weapons, nuclear weapons, military medicine, and chemical/biological weapons detection.
Prerequisites: CH 223 or CH 227
GEP Interdisciplinary Perspectives
Typically offered in Spring only

CH 401  Systematic Inorganic Chemistry I  (3 credit hours)
Descriptive chemistry of the elements with particular attention to their reactions in aqueous solution. Emphasis on the chemistry of the main group elements and the periodicity of their chemical properties. Introduction to transition element and coord
Prerequisite: (CH 201 or CH 203) with grade of C- or better.
Typically offered in Fall and Spring

CH 403  Systematic Inorganic Chemistry II  (3 credit hours)
Development and application of theoretical principles to the structure and energies of inorganic substances. Particular attention to the chemistry of coordination compounds of the transition elements. Special applications to bioinorganic chemistry, organometalic chemistry, and inorganic solid state chemistry.
Prerequisite: CH 401, CH 431
Typically offered in Fall and Spring

CH 415  Analytical Chemistry II  (3 credit hours)
Methods of quantitative analysis based on electronic instrumentation. Signal processing and electronics, spectroscopy (atomic, x-ray fluorescence, infrared/Raman, surface), voltammetry, chromatography (gas, liquid), mass spectrometry as well as chemical transducers and statistical methods of data handling.
Prerequisite: CH 315 or PCC 412
Typically offered in Fall only

CH 431  Physical Chemistry I  (3 credit hours)
Development of the basic concepts of quantum mechanics and wavefunctions as applied to atomic structure, to the translational, rotational and vibrational motion in molecules, and to molecular spectroscopy. Development of partition functions as applied to thermodynamic properties of materials. Cannot get credit for both CH 431 and CH 437.
Prerequisite: (CH 201 or CH 203) and MA 242 and (PY 203 or 208); Corequisite: MA 341
Typically offered in Fall and Spring

CH 433  Physical Chemistry II  (3 credit hours)
A classical thermodynamic treatment of states of matter, activities and chemical potentials, energy changes, equilibria, and electrochemical processes. The kinetics of multi-step, catalytic and enzyme reactions.
Prerequisite: MA 341
Typically offered in Fall and Spring

CH 435  Introduction to Quantum Chemistry  (3 credit hours)
An introduction to the basic principles of quantum theory and its application to atomic and molecular structure and spectroscopy.
Prerequisite: CH 431
Typically offered in Spring only

CH 437  Physical Chemistry for Engineers  (4 credit hours)
Selected physiochemical principles including quantum theory, spectroscopy, statistical thermodynamics, and rates of chemical reactions. Credit may not be claimed for both CH 431 and CH 437.
Prerequisite: PY 208 and CHE 315 and MA 341
Typically offered in Fall and Spring

CH 441  Forensic Chemistry  (3 credit hours)
Chemical identification (recognition), and chemical separation techniques (identification) used to demarcate class and individual characteristics relevant in legal claims.
Prerequisite: (CH 201 or CH 203) and (CH 223 or CH 227)
Typically offered in Spring only
Typically offered in Fall and Spring

CH 442 Advanced Synthetic Techniques (4 credit hours)
An advanced laboratory class in the synthesis, separation and characterization of organic, inorganic, and polymeric materials. Techniques include reactions under inert atmosphere, column chromatography, fractional distillations, NMR spectroscopy, and other advanced procedures. Scientific writing is emphasized.

Prerequisite: CH 223 or CH 227, Corequisite: CH 401

Typically offered in Fall and Spring

CH 444 Advanced Synthetic Techniques II (4 credit hours)
An advanced laboratory class in the synthesis, separation and characterization of organic, inorganic, polymer and materials compounds. Techniques include literature searches, reactions, under inert atmosphere, column chromatography, fractional distillations, NMR spectroscopy, and other advanced procedures. This course builds upon the skills acquired in CH 442 and has significant independent work.

Prerequisite: CH 442

Typically offered in Spring only

CH 452 Advanced Measurement Techniques I (4 credit hours)
Modern analytical and physical chemistry laboratory techniques. Emphasis on statistical methods, chemical thermodynamics, chromatography, atomic and molecular spectroscopy, report writing, scientific methodology, and laboratory safety.

Prerequisites: CH 315 and CH 316 and 431, all with grade of C- or better. Corequisites: CH 415 and CH 433

Typically offered in Spring only

CH 454 Advanced Measurement Techniques II (4 credit hours)
Advanced analytical techniques including Liquid Chromatography (HPLC), Gas Chromatography (GC), Atomic Absorption Spectroscopy (AAS), Spectrophotometry, Molecular Fluorescence, and Mass Spectrometry (MS). Physical aspects including time resolved spectrophotometric measurement of kinetics, dynamic fluorescence quenching and resonance Raman spectroscopy. Students will also participate in carrying out a project through consultation with the instructor and search of the literature.

Prerequisite: CH 452 with a grade of C- or better

Typically offered in Fall only

CH 463/CH 563 Molecular Origins of Life (3 credit hours)
Survey of the present state of understanding of the molecular mechanisms leading to the emergence of sustainable self-replicating systems in the prebiotic era on the early Earth, including historical context, experimental studies, and theoretical foundation. The course will include a focus on the fundamental chemistry of and mechanisms for the plausible prebiotic formation of diverse biomolecules (including amino acids, sugars, nucleotides, lipids, tetrapyrroles) and self-organizing chemistry leading to protocells, the proposed early progenitors of living cells. Credit will not be given for both CH 463 and CH 563.

Prerequisite: BCH 351 or BCH 451 or Permission of Instructor

Typically offered in Spring only

CH 472/BIT 572/BIO 572 Proteomics (3 credit hours)
Introduction and history of the field of proteomics followed by the principles and applications of proteomics technology to understand protein expression and protein post-transitional modifications. Laboratory sessions include growing yeast with stable-isotope labeled amino acids, protein purification, Western blots, protein identification and quantification, and protein bioinformatic analysis. This is a half-semester course.

Prerequisite: BIT 410 or BIT 510 or BCH 454 (or approval from the instructor)

Typically offered in Spring only

CH 473/BIT 573/BIO 573 Advanced Synthetic Techniques (4 credit hours)
Advanced laboratory class in the synthesis, separation and characterization of organic, inorganic, polymer and materials compounds. Techniques include literature searches, reactions, under inert atmosphere, column chromatography, fractional distillations, NMR spectroscopy, and other advanced procedures. This course builds upon the skills acquired in CH 442 and has significant independent work.

Prerequisite: BCH 351 or BCH 451 or Permission of Instructor

Typically offered in Spring only

CH 499 Undergraduate Research in Chemistry (1-3 credit hours)
Independent investigation of a research problem under the supervision of a chemistry faculty member. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student upon completion of the assignment.

Prerequisite: Two years of chemistry

Typically offered in Fall, Spring, and Summer

CH 563/CH 463 Molecular Origins of Life (3 credit hours)
Survey of the present state of understanding of the molecular mechanisms leading to the emergence of sustainable self-replicating systems in the prebiotic era on the early Earth, including historical context, experimental studies, and theoretical foundation. The course will include a focus on the fundamental chemistry of and mechanisms for the plausible prebiotic formation of diverse biomolecules (including amino acids, sugars, nucleotides, lipids, tetrapyrroles) and self-organizing chemistry leading to protocells, the proposed early progenitors of living cells. Credit will not be given for both CH 463 and CH 563.

Prerequisite: CH 351 or CH 451 or Permission of Instructor

Typically offered in Spring only

CH 677 Advanced Chemistry Projects (1-3 credit hours)
Independent literature study of a current subject in chemistry. Required written critical review paper of selected subject.

Prerequisite: Graduate standing in CH

Typically offered in Fall only

CH 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student

Typically offered in Fall only
CH 690  Master's Examination  (1-9 credit hours)
For students in non-thesis master's programs who have completed all
other requirements of the degree except preparing for and taking the final
master's exam.
Prerequisite: Master's student
Typically offered in Fall only

CH 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of
the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Summer only

CH 695  Master's Thesis Research  (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CH 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.
Prerequisite: Master's student
Typically offered in Summer only

CH 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-
time enrollment for the master's degree and are writing and defending
their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CH 711  Advanced Analytical Chemistry I  (3 credit hours)
First semester of two-semester integrated sequence covering advanced
methods for extraction and interpretation of chemical information from
electronic/optical signals in chemical analysis. Digital and analog
electronics, signal acquisition and processing, chemometrics, and
instrumentation.
Prerequisite: CH 433; CH 415
Typically offered in Fall only

CH 713  Advanced Analytical Chemistry II  (2 credit hours)
Second semester of two-semester integrated sequence covering advanced methods for extracting and interpreting chemical information
from electronic/optical signals in chemical analysis. Digital and analog
electronics, signal acquisition and processing, chemometrics, and
instrumentation.
Prerequisite: CH 711
Typically offered in Spring only

CH 714  Electronics and Instrumentation Laboratory  (1 credit hours)
Laboratory course covering operation and application of analog and
digital electronics in context of chemical instrumentation. Circuit
elements, integrated circuits, microprocessors and computers, data
acquisition systems, and signal processing.
Prerequisite: CH 711, Corequisite: CH 713
Typically offered in Spring only

CH 721  Advanced Organic Chemistry I  (3 credit hours)
Introduction to physical organic chemistry. Topics include: bonding/
introductory molecular orbital theory, reactive intermediates, aromaticity,
pericyclic reactions, thermochemistry, linear free-energy relationships,
kinetics, and transition-state theory. Topics and concepts are related to
molecular reactivity and reaction mechanisms.
Prerequisite: CH 223 or CH 227 or CH 433 or CH 435
Typically offered in Fall only

CH 723  Advanced Organic Chemistry II  (3 credit hours)
Introduction to acid-base theory and mechanistic organic chemistry as
applied to synthetically useful organic reactions.
Prerequisite: CH 721
Typically offered in Spring only

CH 725  Physical Methods in Organic Chemistry  (3 credit hours)
Application of physical methods to the solution of structural problems
in organic chemistry. Methods discussed include electronic absorption
spectroscopy, vibrational spectroscopy, nuclear magnetic resonance, and
mass spectrometry.
Prerequisite: (CH 223 or CH 227) and CH 433 or CH 435
Typically offered in Fall only
CH 727/BIO 727 Biological Mass Spectrometry (3 credit hours)
Fundamentals of mass spectrometry including topics such as: mass, isotopic distributions, resolving power, mass accuracy. Ionization source topics: electron impact, chemical ionization, matrix-assisted laser desorption ionization, electrospray ionization and contemporary methods. Instrumentation and mass analyzers: quadrupole, time-of-flight, Fourier transform based mass analyzers; hybrid instruments such as a quadrupole orbitrap. Tandem mass spectrometry and dissociation. Applications: quantitation, small molecule analysis, and peptide sequencing.
Prerequisite: CH 223 or CH 227
Typically offered in Fall only

CH 730 Advanced Physical Chemistry (3 credit hours)
Survey of chemical thermodynamics and kinetics, with emphasis on reactions in liquid phase. Problem solving an important part of course. Designed for review and expansion on materials usually covered in a one-year undergraduate physical chemistry course.
Prerequisite: Graduate standing
Typically offered in Fall only

CH 732 Advanced Physical Chemistry in Biological Applications (3 credit hours)
Modern views on structure, function, and thermodynamic stability of biological macromolecules including proteins, nucleic acids, and biological membranes; theories and models of protein folding, high resolution experimental methods for structure determination of soluble and membrane proteins including solution and solid-state NMR spectroscopy.
Prerequisite: CH 431 and CH 433 and BCH 453 or equivalent.

CH 734 Spectroscopic Methods in Chemical Biology (3 credit hours)
Physical principles underlying the experimental spectroscopic methods used to study structure and dynamics of biological macromolecules. Detailed discussion of experimental techniques include high-resolution solution Nuclear Magnetic Resonance, Electron Paramagnetic Resonance in combination with spin labeling and spin trapping methods, and fluorescence spectroscopy, including single molecule methods and fluorescence microscopy. This course is offered every third semester from Spring 2010.
Prerequisite: CH 331 or CH 431, CH 433 or equivalent

CH 735 Magnetic Resonance in Chemistry (3 credit hours)
This course is focused on physical and quantum mechanical principles that make magnetic resonance the most important spectroscopic technique in chemistry. Detailed discussion of description of magnetic resonance phenomena and NMR and EPR experimental techniques covers both classical and quantum mechanical treatments. Students of diverse backgrounds will gain in-depth knowledge of modern magnetic resonance as applied to problems in chemistry, materials, and nanoscience, and biophysics.
Prerequisite: CH 331 or CH 431, CH 433 or equivalent

CH 736 Chemical Spectroscopy (3 credit hours)
Introduction to rotational, vibrational and electronic molecular spectroscopy from a quantum mechanical viewpoint. Emphasis on the elucidation of structure, bonding and excited state properties of organic and inorganic molecules.
Prerequisite: CH 435

Typically offered in Spring only

CH 737 Quantum Chemistry (3 credit hours)
Elements of wave mechanics applied to stationary energy states and time-dependent phenomena. Applications of quantum theory to chemistry, particularly chemical bonds.
Prerequisite: MA 301, CH 435 or PY 407
Typically offered in Fall only

CH 743 Electrochemistry (3 credit hours)
Thermodynamics and kinetics of electrode reactions presented as well as experimental methods for studying them. Particular emphasis on measurement of standard potential and establishing number of electrons transferred. Applications of electrochemistry i
Prerequisite: CH 431 or CH 433
Typically offered in Spring only

CH 745 Chemical Separation (3 credit hours)
Basic principles of methods in chemical separation including gas chromatography, liquid chromatography, etc. Theory, instrumentation and applications of various chromatographic and electrophoretic techniques.
Prerequisite: CH 415, CH 416, Corequisite: CH 610 or 810
Typically offered in Fall only

CH 747 Nanobiotechnology (3 credit hours)
An introduction to nanobiotechnology, with a focus on biological applications such as bioimaging and biosensing. Principles underlying methods of nanomaterials fabrication and characterization will be introduced, and major characterization techniques will be discussed. Au nanoparticles, quantum dots, and carbon nanotubes will be used as representative examples of novel nanomaterials with unique properties. The strengths and weaknesses of various nanomaterials in biological applications will be compared through in-class discussions.
Typically offered in Spring only

CH 749 Analytical Spectroscopy (3 credit hours)
This is a graduate level course for analytical spectroscopy and instrumentation. The course covers the fundamentals of light-matter interaction, concepts and methodology of selected spectroscopic methods, components and working principles of optical instruments, and factors that affect the quality of optical measurements.
Prerequisite: CH 315 and CH 316 or equivalent

Typically offered in Fall only

CH 755 Organic Reaction Mechanisms (3 credit hours)
Effects of structure and substituents on direction and rates of organic reactions.
Prerequisite: CH 723, CH 433
Typically offered in Fall only
CH 757 Combinatorial Bioorganic Synthetic Chemistry (3 credit hours)
Modern topics in synthetic chemistry that underpin bioorganic chemistry including peptide synthesis, nucleic acid synthesis, and diverse methods for combinatorial syntheses of such biomolecules and analogues.
Prerequisite: BCH 453 or equivalent
Typically offered in Spring only

CH 759 Natural Products (3 credit hours)
Illustrative studies of structure determination, synthesis and biosynthesis of natural substances. Stress upon modern physical methods and fundamental chemical concepts. Examples from such classes as alkaloids, terpenes, steroids and antibiotics.
Prerequisite: CH 723 and CH 725
Typically offered in Fall only

CH 765 Chemistry of Materials (3 credit hours)
Detailed examination of the relationship between chemical structure and physical properties of materials with potential use in applications. Different classes of molecules and materials requirements for several applications will be emphasized.
Prerequisite: CH 201 or equivalent
Typically offered in Spring only

CH 770 Bioinorganic Chemistry (3 credit hours)
The interface between inorganic and biological chemistry will be explored, focusing on the catalytic processes in metalloenzymes, and with an emphasis on the diverse roles of transition metals in biology. The physical methods required for the study of bioinorganic systems will be introduced, with application toward determining enzymatic mechanisms. Selected topics will include heme chemistry, nitrogen fixation, C-H bond activation, electron transfer, oxygen transport, metal ion uptake and toxicity, drug activation and/or metabolism by metalloenzymes, and metallo drugs.
Prerequisite: CH 401
Typically offered in Spring only

CH 772 Solid State Chemistry (3 credit hours)
Selected topics in solid-state chemistry including: extended symmetry, structure, bonding, characterizations, and special topics. Graduate standing in Chemistry required.
Prerequisite: CH 701 or equivalent
Typically offered in Spring only

CH 795 Special Topics in Chemistry (1-6 credit hours)
Typically offered in Fall and Spring

CH 801 Seminar (1 credit hours)
Review and discussion of scientific articles, progress reports on research and special problems of interest to chemists.
Prerequisite: Graduate standing in CH
Typically offered in Fall and Spring

CH 810 Special Topics In Chemistry (1-6 credit hours)
Detailed study of a particular problem or technique pertaining to chemistry.
Typically offered in Fall only

CH 815 Advanced Topics In Chemistry (1-3 credit hours)
Critical study in one of branches of chemistry.
Typically offered in Fall and Spring

CH 877 Advanced Chemistry Projects (1-3 credit hours)
Independent literature study of a current subject in chemistry. Required written critical review paper of selected subject.
Prerequisite: Graduate standing in CH. 1-3
Typically offered in Fall only

CH 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning but the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall only

CH 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall only

CH 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall only

CH 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CH 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

CH 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Civil Engineering (CE)

CE 214 Engineering Mechanics-Statics (3 credit hours)
Basic force concepts and equilibrium analysis; distributed forces; centroids; moments of inertia; application to structural elements. Credit will not be given for both CE 214 and MAE 206.
Grade of C or better in PY 205 and MA 241; Co-requisite: MA 242.
Typically offered in Fall, Spring, and Summer
CE 215 Engineering Mechanics-Dynamics (3 credit hours)  
Kinematics and kinetics of particles; mass flow; vibrations; plane kinematics and kinetics of rigid bodies; selected topics from three-dimensional rigid body dynamics, and orbital motion.

Prerequisite: Minimum GPA => 2.5, Grade of C- or better in CE 214, and MA 242  
Typically offered in Fall, Spring, and Summer

CE 225 Mechanics of Solids (3 credit hours)  
Elementary analysis of deformable solids subjected to force systems. Concepts of stress and strain; one, two and three-dimensional stress-strain relationships for the linear elastic solid. Statically determinate and indeterminate axial force, torsion and bending members. Stress transformations, pressure vessels, combined loadings. Introduction to column buckling.

Grade of C- or better in CE 214; MA 242.  
Typically offered in Fall, Spring, and Summer

CE 250 Introduction to Sustainable Infrastructure (3 credit hours)  
History and future of civil infrastructure; engineering problem solving; environmental sustainability and life-cycle assessment; social sustainability; engineering economics; problem-driven, sustainability-focused case studies related to different aspects of civil infrastructure.

CE, ENE, or CON majors only; co-requisite: CSC 111 and CE 214.  
Typically offered in Fall and Spring

CE 263 Introduction to Construction Engineering (3 credit hours)  
Introduction to fundamental concepts in Construction Engineering and Management including principles of project management; profit, risk, and profitability; estimating, including WBS, productivities, costs, durations, and fundamentals of equipment selection and utilization; scheduling using both CPM and Linear scheduling techniques; contract methods and control principles; professional and legal aspects of construction; fundamentals of leadership; and basic construction safety.

Corequisites: CE 214 and CE 250; R: CON Majors Only.  
Typically offered in Spring only

CE 282 Hydraulics (3 credit hours)  
Fluid properties; mass, energy and momentum conservation laws; dimensional analysis and modeling; laminar and turbulent flows; surface and form resistance; flow in pipes and open channels; elementary hydrodynamics; fluid measurements; characteristics of hydraulic machines. Credit will not be given for both 282 and MAE 308.

Prerequisite: C- or better in CE 214; Corequisites: MA 341 or MA 305 or ST 370  
Typically offered in Fall, Spring, and Summer

CE 297 Current Topics in Civil Engineering (1-4 credit hours)  
Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with Department Head.

Typically offered in Fall, Spring, and Summer

CE 301 Civil Engineering Surveying and Geomatics (3 credit hours)  
Plane surveying, topographical surveying, horizontal and vertical curves, topographic surveys, construction surveys, earthwork, route surveying.  
Data collection using sight-based, laser-based, and global positioning system equipment. Methods for analysis and presentation of surveying and positioning data, including dealing with errors. Use and applications of GPS information. Limited to CON and CE majors. Credit will not be given for both BAE 325 and CE 301.

Junior standing; CON and CE Majors.  
Typically offered in Fall and Spring

CE 305 Traffic Engineering (3 credit hours)  
Integrated approach to planning, design, and operation of transportation systems with an emphasis on highway and street systems. Roadway design, traffic operations and performance, and control systems.

C- or better in CE 250; Corequisite: ST 370.  
Typically offered in Fall and Spring

CE 324 Structural Behavior Measurement (1 credit hour)  

Prerequisite: Grade of C- or better in CE 313  
Typically offered in Fall and Spring

CE 325 Structural Analysis I (3 credit hours)  
Analysis of determinant and indeterminate bars, trusses, beams and frames using the matrix displacement method. Qualitative deflected shapes and shear and bending moment diagrams. Implementation of analysis procedures through computer programming and commercial structural analysis software.

CSC 111 and C- or better in CE 225.  
Typically offered in Fall and Spring

CE 327 Reinforced Concrete Design (3 credit hours)  
Behavior, strength, and design of reinforced concrete members subjected to moment, shear, and axial forces. Introduction to the design of reinforced concrete structures.

Prerequisite: C- or better in CE 225  
Typically offered in Fall and Spring

CE 332 Materials of Construction (3 credit hours)  

MSE 200 and C- or better in CE 225.  
Typically offered in Fall and Spring

CE 339 Civil Engineering Systems (3 credit hours)  
A broad perspective, systematic approach to civil planning, analysis, evaluation and design for large scale projects in construction, structures, transportation, water resources and other civil engineering areas.

CSC 111 and (MA 341 or MA 305); Junior standing.  
Typically offered in Spring only
CE 342 Engineering Behavior of Soils and Foundations (4 credit hours)
Description, identification, and engineering classification of soils. The basic principles and mechanics of flow of water through soils, deformation and strength of soils, and the processes of consolidation and compaction. Effective stress concepts, stress and settlement analyses, and evaluation of shear strength. Methods of analysis and geotechnical engineering design concepts.
C- or better in CE 225 and CE 282.
Typically offered in Fall and Spring

CE 356 Construction Equipment and Methods (3 credit hours)
Study of construction operations as dynamic production processes. Utilization of equipment and other resources to achieve highest levels of productivity, safety, and quality. Covers a wide range of traditional and state-of-the-art construction methods.
Corequisite: CE 263 and ST 370
Typically offered in Spring only

CE 373 Fundamentals of Environmental Engineering (3 credit hours)
Concepts of sustainability and green engineering; energy and climate; overview of contaminants in water, air and terrestrial environments; introduction to water and wastewater treatment, air pollution control, and solid waste management.
Corequisites: CE 250 and (CHE 205 or CE 282).
Typically offered in Fall and Spring

CE 378 Environmental Chemistry and Microbiology (4 credit hours)
Principles of Environmental Chemistry and Microbiology, experimental techniques for assessing water and air quality; sampling; statistical interpretation of data.
Prerequisite: Junior standing in Environmental Engineering, MEA 323 or SSC 442, and C- or better in CE 250 and CE 373; Corequisite: ST 370.
Typically offered in Fall only

CE 381 Hydraulics Systems Measurements Lab (1 credit hours)
Introduction to experimental techniques for study of hydraulics systems: measurement of viscosity, fluid pressures, velocity distributions, flow rates; investigations into the friction, momentum transfer, and turbulence on fluid flow.
Corequisite: CE 282
Typically offered in Fall and Spring

CE 383 Hydrology and Urban Water Systems (3 credit hours)
Study of engineering hydrology and design of elements of urban stormwater systems. Commonly encountered applications in urban stormwater management, flood control and groundwater engineering. Familiarization with effects of watershed development on quantity and quality of streamflow.
C- or better in CE 282; Corequisite: ST 370; CE, ENE, and CON Majors. Typically offered in Fall and Spring

CE 390 Engineering Economics (1 credit hours)
Fundamental principles of engineering economics and their application to civil engineering planning and evaluation. Time value of money, interest and equivalence, and methods for assessing the feasibility and relative economic value of alternatives.
CSC 111 and (MA 341 or MA 305); Junior standing.
Typically offered in Fall and Spring

CE 400 Transportation Engineering Project (3 credit hours)
Integrated team approach to design of major transportation engineering projects. Professional topics in transportation engineering practice.
Prerequisite: CE 390, C- or better in CE 305, and one of the following courses: CE 401, 402, 403, or 413
Typically offered in Spring only

CE 401/CE 501 Transportation Systems Engineering (3 credit hours)
Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 402/CE 502 Traffic Operations (3 credit hours)
Highway capacity; traffic control systems; intelligent vehicle/highway systems; and other advanced topics. Credit for both CE 402 and CE 502 is not allowed.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 403/CE 503 Highway Design (3 credit hours)
Corridor selection; highway alignment; design of roadsides, intersections, and interchanges. Completion of research paper for students taking course for graduate credit. Credit will not be given for both CE 403 and CE 503.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 405/CE 505 Railroad System Planning, Design, and Operation (3 credit hours)
Students will learn about railroad technology and how to plan, design, and operate rail systems especially the design of alignments, track, and terminals; and the operation of freight and passenger services (including from transit through commuter rail to intercity and high speed rail). Field trips are involved during non-scheduled class time. Students must be able, if necessary, to provide their own transportation.
Prerequisite: CE 305
Typically offered in Spring only
CE 413 Principles of Pavement Design (3 credit hours)
Basic principles of analysis, design and performance of highway and airport pavements with critical evaluation of current design and maintenance strategies.

CE 332 and CE 342
Typically offered in Fall only

CE 420 Structural Engineering Project (3 credit hours)
Planning, analysis and design of complete structural systems composed of steel and reinforced concrete. Professional topics in structural engineering practice.

C- or better in CE 325 and CE 327 and CE 342 and CE 426.
Typically offered in Fall and Spring

CE 421 Structural Engineering Senior Project - Bridge Design (3 credit hours)
This structural engineering senior project course covers the fundamentals of bridge analysis and design including conceptual design, superstructure analysis, AASHTO-LRFD bridge specifications, flat slab bridge design, pre-stressed concrete bridge design, strut and tie modeling, column design, and foundations. A series of three bridges will be designed including a cable stay or suspension pedestrian bridge, flat slab bridge, and girder bridge. At the conclusion of the course, students will be able to analyze and design simple, but complete concrete bridge structures.

Prerequisites: C or better in each of the following: CE 325, CE 327, and CE 342; Corequisite: CE 390
Typically offered in Fall only

CE 425/CE 525 Structural Analysis II (3 credit hours)
Analysis of beam, 2D and 3D truss, 2D and 3D frame and plane strain structures using the matrix displacement method. Introduction to the finite element method of analysis by deriving the element stiffness matrices using Virtual Work. Beam and frame elements include shearing deformation and geometric stiffness effects. Computer implementation of analysis procedures using MATLAB and commercial structural analysis software. Modeling issues including convergence, symmetry and antisymmetry. Introduction to structural dynamics. Credit not given for both CE 425 and CE 525.

Prerequisite: C- or better in CE 325
Typically offered in Fall only

CE 426 Structural Steel Design (3 credit hours)
Design and behavior of structural steel members and their connections subjected to moment, shear, and axial forces. Introduction to the design of steel structures.

C- or better in CE 225.
Typically offered in Fall, Spring, and Summer

CE 435 Engineering Geology (3 credit hours)
Application of both geology and geotechnical engineering to engineering projects. Illustrations of relevant materials properties and techniques utilized in describing subsurface conditions.

Prerequisite: MEA 101 and Junior standing in colleges of Agriculture and Life Sciences, Engineering, Natural Resources, College of Sciences or Textiles
Typically offered in Spring only

CE 437 Civil Engineering Computing (3 credit hours)
Computational approaches to modeling with applications in construction, structures, transportation, water resources and other civil engineering areas; matrix computations, digital terrain modeling, network applications and algorithms, heuristic optimization.

Senior standing; CSC 111 and (MA 341 or MA 305).
Typically offered in Fall only

CE 440 Geotechnical Engineering Project (3 credit hours)
Integrated team approach to design of building foundations involving site selection, analysis and design of shallow and deep foundations, establishment of performance criteria, economic analysis, identification of potential construction problems and matters regarding professional practice and ethics.

Prerequisite: C- or better in CE 342; Corequisite: CE 390
Typically offered in Fall only

CE 443 Seepage, Earth Embankments and Retaining Structures (3 credit hours)
Review of shear strength concepts; ground water hydraulics; slope stability; lateral earth pressure problems; placement of fills.

C- or better in CE 342.
Typically offered in Spring only

CE 444 An Introduction to Foundation Engineering (3 credit hours)
This course will cover the basics of subsurface analysis and foundation design. Subsurface analysis includes the planning and interpretation of site investigation programs, including insitu testing and sampling, and laboratory testing and data interpretation. Foundation design will include the study of shallow and deep foundations subject to a combination of vertical and lateral loads.

C- or better in CE 342.
Typically offered in Fall only

CE 450 Civil Engineering Project (3 credit hours)
Integrated multi-disciplinary team approach to large-scale civil engineering design including topics from geotechnical engineering, land development, transportation engineering, and water resources engineering. Professional topics in civil engineering practice and ethics.

Prerequisite: CE 305 & CE 342 & CE 383; Corequisite: one of (CE 403, CE 413, CE 443, CE 444, or CE 488).
Typically offered in Fall and Spring

CE 463 Construction Estimating, Planning, and Control (3 credit hours)
Overview of the construction industry; life cycle of construction projects, work breakdown structure, activity cost and time estimation, computerized planning and scheduling methods, resource leveling, time-cost tradeoff; computerized cost estimating, bidding and negotiation strategies; and cost/schedule control systems.

Prerequisite: CE 263 and CE 365 and TDE 220
Typically offered in Fall only
CE 464/CE 564 Legal Aspects of Contracting (3 credit hours)
Legal aspects of contract documents, drawings and specifications; owner-engineer-constructor relationships and responsibilities; bids and contract performance, Labor laws; governmental administrative and regulatory agencies; torts; business organizations; ethics and professionalism.
Prerequisite: CE 463; Corequisite: CE 365
Typically offered in Spring only

CE 466 Building Construction Engineering (3 credit hours)
Construction processes for buildings and other structures including codes and standards, structural and architectural components and systems, form work and bracing design, erection and assembly methods.
Corequisite: CE 327
Typically offered in Fall only

CE 468/CE 568 Construction Engineering Laboratory (1 credit hour)
Measurements with and calibration of measurement instruments used in construction engineering field tests for quality and safety of the construction process. Interpretation of ANSI, ASTM, ACI and AISC specifications and standards. Credit for both CE 468 and CE 568 is not allowed.
Prerequisite: CE 332. Corequisite: CE 327 or CE 426
Typically offered in Fall only

CE 469 Construction Engineering Project (3 credit hours)
Capstone course involving integrated team approach in the design of the construction process, utilizing computerized tools for cost estimation, planning, scheduling, process design, and management of two construction projects. Each student also selects an individual project. Lecture topics include: ethics, professionalism, marketing, bid presentations, business planning, finance, and other appropriate topics by guest speakers from industry.
"Co-requisite: CE 464"
Typically offered in Spring only

CE 476 Air Pollution Control (3 credit hours)
Introduction to air pollution control fundamentals and design. Fundamentals include the physics, chemistry and thermodynamics of pollutant formation, prevention and control. Design will include gas treatment, process modification, and feedstock modification. Pollutants to be addressed include sulfur dioxide, nitrogen oxides, particulate matter, volatile organic compounds, hydrocarbons, and air toxics. Credit for both CE 476 and CE 576 will not be given.
CE 373 and MAE 201; Corequisite: ST 370 or CHE 450 (CHE majors)
Typically offered in Fall only

CE 477 Principles of Solid Waste Engineering (3 credit hours)
Solid waste management including generation, storage, transportation, processing, land disposal and regulation. Processing alternatives including incineration and composting. Integration of policy alternatives with evaluation of engineering decisions.
CE 250, CE 282 and CE 373.
Typically offered in Spring only

CE 478/CE 578 Energy and Climate (3 credit hours)
Interdisciplinary analysis of energy technology, natural resources, and the impact on anthropogenic climate change. Topics include basic climate science, energetics of natural and human systems, energy in fossil-fueled civilization, the impact of greenhouse gas emissions on climate, and technology and public policy options for addressing the climate challenge. The course is quantitative with a strong emphasis on engineering and science.
Prerequisite: Senior standing
Typically offered in Fall only

CE 479/MEA 479 Air Quality (3 credit hours)
Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the "acid rain" problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.
CE 282 and CE 373; or CHE 311(CHE Majors); or MEA 421 (MEA Majors); Corequisite: ST 370; or ST 380 (MEA Majors)
Typically offered in Fall only

CE 480 Water Resources Engineering Project (3 credit hours)
Engineering design of selected projects in water resources engineering involving interactions with other scientific and engineering disciplines. Discussion of ethical conduct and professional engineering practice. Projects will include site work, storm drainage, water supply, water transmission and water-quality issues.
Corequisite: CE 390; Prerequisite: Grade of C- or better in CE 382 and CE 383
Typically offered in Spring only

CE 481 Environmental Engineering Project (3 credit hours)
Engineering design of selected projects in environmental engineering involving interactions with other scientific and engineering disciplines. Discussion of ethical conduct and professional engineering practice.
Prerequisite: CE 378, 383, 390, Corequisite: CE 484 and two of: CE 476, 477, 479, 488
Typically offered in Spring only

CE 484 Water Supply and Waste Water Systems (3 credit hours)
Elements of the design of water supply and wastewater disposal systems.
CE 282 and CE 373.
Typically offered in Fall only

CE 487 Introduction to Coastal and Ocean Engineering (3 credit hours)
Introduction to the analysis of civil engineering projects in the ocean and along the coastline. Basic wave mechanics, tides, and ocean dynamics as applied to the understanding of coastal erosion control and other marine problems. An optional two-day field trip to the North Carolina Outer Banks at a nominal student expense is a regular feature of the course.
Senior standing and CE 282.
Typically offered in Spring only
CE 488/CE 588 Water Resources Engineering (3 credit hours)
Extension of the concepts of fluid mechanics and hydraulics to applications in water supply, water transmission, water distribution networks and open channels to include water-supply reservoirs, pump and pipe selection, determine and indeterminate pipe networks, and analysis of open channels with appurtenances.
Prerequisite: CE 339 and CE 383
Typically offered in Fall only

CE 493 Independent Study in Civil Engineering (1-4 credit hours)
Independent study of a topic in Civil Engineering. Topic and mode of study determined by faculty member(s) and student(s). Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses"
Typically offered in Fall only

CE 497 Current Topics in Civil Engineering (1-4 credit hours)
Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.
Typically offered in Fall, Spring, and Summer

CE 498 Special Problems in Civil Engineering (1-4 credit hours)
Directed reading in the literature of civil engineering, introduction to research methodology, seminar discussion dealing with special civil engineering topics of current interest.
Prerequisite: Senior standing
Typically offered in Fall and Spring

CE 499 Undergraduate Research Thesis in Civil, Construction and Environmental Engineering (1-3 credit hours)
Faculty mentored research related to civil, construction or environmental engineering. A plan of work is required describing the independent research culminating in a thesis. Presentation at the NC State Undergraduate Research Symposium, or other similar venue, may be included. The student must identify a research advisor from within the CCEE faculty. Departmental approval is required.
Senior standing. Departmental Approval Required.
Typically offered in Fall, Spring, and Summer

CE 501/CE 401 Transportation Systems Engineering (3 credit hours)
Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 502/CE 402 Traffic Operations (3 credit hours)
Highway capacity; traffic control systems; intelligent vehicle/highway systems; and other advanced topics. Credit for both CE 402 and CE 502 is not allowed.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 503/CE 403 Highway Design (3 credit hours)
Corridor selection; highway alignment; design of roadways, intersections, and interchanges. Completion of research paper for students taking course for graduate credit. Credit will not be given for both CE 403 and CE 503.
Prerequisite: C- or better in CE 305
Typically offered in Spring only

CE 504 Airport Planning and Design (3 credit hours)
Analysis, planning and design of air transportation facilities.
Prerequisite: C- or better in CE 305
Typically offered in Fall only

CE 505/CE 405 Railroad System Planning, Design, and Operation (3 credit hours)
Students will learn about railroad technology and how to plan, design, and operate rail systems especially the design of alignments, track, and terminals; and the operation of freight and passenger services (ranging from transit through commuter rail to intercity and high speed rail). Field trips are involved during non-scheduled class time. Students must be able, if necessary, to provide their own transportation.
Prerequisite: CE 305
Typically offered in Spring only

CE 506 Transportation Engineering Data Collection and Analysis (3 credit hours)
Broad range of transportation engineering data collection and analysis applications encompassing the modes of highway, transit and pedestrian travel and the contexts of system planning, design and operation. Proposal preparation with primary focus on methodology and work plan development for addressing important research and practice questions.
Prerequisite: CE 305, ST 370
Typically offered in Fall only

CE 507 Sensors, Instrumentation, and Data Analytics for Transportation Networks (3 credit hours)
Students will learn about the use of sensors, instrumentation, and big data analysis in transportation systems to observe, monitor, and evaluate performance. This includes the technology employed, the deployment strategies, the challenges associated with obtaining high-quality data, the fusion of data from independent sources, the imputation of missing data elements, and evaluation of performance based on the data assembled. The highway mode is the principal focus, including analyses of travel times, delays, queue dynamics, and spatial and temporal demand patterns.
Typically offered in Spring only

CE 509 Highway Safety (3 credit hours)
Methods to reduce collisions and injuries on highways. Identifying promising locations, choosing appropriate countermeasures, and evaluating past projects. Understanding the institutional context and establishing appropriate highway design standards.
Prerequisite: CE 305, Corequisite: ST 370 or equivalent
Typically offered in Spring only
CE 515  Advanced Strength of Materials  (3 credit hours)
Stresses and strains at a point; rosette analysis; torsion and
unsymmetrical bending of open and closed sections; nonlinear and
curved beams; stress concentration; beams on elastic foundations; shear
deformation of beams; classical plasticity; fracture
Prerequisite: CE 225 or MAE 314
Typically offered in Fall only

CE 522  Theory and Design Of Prestressed Concrete  (3 credit hours)
Principles and concepts of design in prestressed concrete including
elastic and ultimate strength analyses for flexure, shear, torsion, bond
and deflection. Principles of concordancy and linear transformation for
indeterminate prestressed structures. Application of pre-stressing to tanks
and shells.
Prerequisite: CE 327
Typically offered in Fall only

CE 523  Theory and Behavior Of Steel Structures  (3 credit hours)
Theory and behavior of steel structures leading to the development of
design requirements contained in current specifications; flexural, torsional
and flexural-torsional buckling of columns; plastic analysis of beams and
frames; lateral-torsional buckling of beams; stability and strength of flat
plates; beam-columns.
Prerequisite: CE 426
Typically offered in Fall only

CE 524  Analysis and Design Of Masonry Structures  (3 credit hours)
Theory and design of masonry arches, culverts, dams, foundations and
masonry walls subjected to lateral loads.
Prerequisite: CE 327
Typically offered in Fall only

CE 525/CE 425  Structural Analysis II  (3 credit hours)
Analysis of beam, 2D and 3D truss, 2D and 3D frame and plane strain
structures using the matrix displacement method. Introduction to the
finite element method of analysis by deriving the element stiffness
matrices using Virtual Work. Beam and frame elements include shearing
deformation and geometric stiffness effects. Computer implementation
of analysis procedures using MATLAB and commercial structural
analysis software. Modeling issues including convergence, symmetry and
antisymmetry. Introduction to structural dynamics. Credit not given for
both CE 425 and CE 525.
Prerequisite: C- or better in CE 325
Typically offered in Fall only

CE 526  Finite Element Method in Structural Engineering  (3 credit hours)
Development of the finite element method with an emphasis on
understanding the fundamental principles governing the analysis
technique. Applications to two-dimensional solids with particular attention
to applications in structural engineering. Typical m
Prerequisite: CE 515
Typically offered in Spring only

CE 527  Structural Dynamics  (3 credit hours)
Analysis of single and multi-degree-of-freedom structures subjected to
various types of excitations and initial conditions. Computational aspects
of dynamic analysis. Introduction to approximate methods of analysis.
Prerequisite: CE 425 or CE 525
Typically offered in Spring only

CE 528/FB 528  Structural Design in Wood  (3 credit hours)
Behavior, strength and design of wood structural members subjected to
moment, shear and axial forces. Design of connections and introduction
to design of wood structural systems.
Prerequisite: C- or better in CE 325
Typically offered in Spring only

CE 529  FRP Strengthening and Repair of Concrete Structures  (3 credit hours)
Fundamental behavior of Fiber-Reinforced Polymer (FRP) strengthened/
repaired reinforced concrete structures. Creation of sustainable and
resilient civil infrastructure by extending the useful life of existing
structures using advances materials. Applica
Prerequisite: CE 327 and CE 325
Typically offered in Fall only

CE 530  Properties of Concrete and Advanced Cement-Based
Composites  (3 credit hours)
This course consists of three parts. First part covers basic properties of
cements, mineral/chemical admixtures, and concrete production. Second
part covers mechanical properties including compressive and tensile
strength, multi-axial loading, composite models, and fracture mechanics.
Models of porosity and microstructures are also discussed. Third part
covers durability and deterioration mechanisms including corrosion
of steel in concrete, mass transport, service life prediction. Advanced
laboratory techniques are discussed. This course also covers emerging
topics such as geopolymers and aluminate cements.
Prerequisite: CE 332 and CE 225
Typically offered in Spring only

CE 536  Introduction to Numerical Methods for Civil Engineers  (3 credit hours)
Introduction to widely-used numerical methods through application to
civil and environmental engineering problems. Emphasis will be on
implementation and application rather than the mathematical theory
behind the numerical methods.
Prerequisite: MA 302, MA 341, or MA 401
Typically offered in Spring and Summer

CE 537/OR 537  Computer Methods and Applications  (3 credit hours)
Computational approaches to support civil planning, analysis, evaluation and
design. Applications to various areas of civil engineering, including
construction, structures, transportation and water resources.
Prerequisite: CSC 112 and (MA 341 or MA 305)
Typically offered in Fall only
CE 538  Information Technology and Modeling  (3 credit hours)
Computing research and advanced technologies of interest to civil engineers. Issues in the design and development of engineering software systems and engineering modeling of structures, assemblies, processes and phenomena. Additional topics from the most predominant and recent developments and advances in civil engineering computing.
Prerequisite: CE 390
Typically offered in Fall and Spring

CE 548  Engineering Properties of Soils I  (3 credit hours)
Significant soil properties in earthwork engineering, including soil elasticity and soil mineralogy, hydraulic conductivity, stress-strain relations and shear strength, compressibility and compaction. Evaluating laboratory work including plasticity, triaxial compression, permeability, consolidation and compaction tests.
Prerequisite: CE 342
Typically offered in Spring only

CE 549  Soil and Site Improvement  (3 credit hours)
Principles and design methodologies for techniques related to densification, including dynamic compaction, vibro-compaction and compaction grouting; drainage, including wick drains, horizontal drains and dewatering; physical and chemical modification, including admixtures, chemical and cement grouting, soil mixing, jet grouting and soil freezing; and use of inclusions, including stone columns, soil nailing, and meta and geosynthetic reinforcement.
Prerequisite: CE 342
Typically offered in Fall only

CE 557  Engineering Measurement and Data Analysis  (3 credit hours)
The course will introduce students to fundamentals of experimental design, measurement systems and applied data analysis techniques and includes 'hands-on' laboratory exercises with sensors and computer-based data acquisition. Emphasis is on general concepts and their practical application towards engineering problems. The goal of the class is to build needed background, skills and vocabulary to develop students' experimental practice rather than focusing on the underlying fundamentals of distinct areas. Students will develop more topic/media-specific knowledge through a team experimental project. Prerequisites include a course in statistics (e.g. ST 370, ST 515 or equivalent) and some coursework or experience involving scientific programming (e.g. CE 536 or 537; Matlab, Python, R, Igor Pro, IDL). Appropriate background can be determined via discussion with instructor.
Typically offered in Fall only

CE 561  Construction Project Management  (3 credit hours)
Construction project management and control using network based tools, time-money analysis and other quantitative and qualitative techniques. Planning and scheduling, critical path, lead-lag, resource allocation, uncertainty, cash flow and payment scheduling, change orders, project acceleration, coordination and communication, record keeping. Emphasis on computer-based techniques.
Prerequisite: CE 463

CE 562  Lean Construction Concepts and Methods  (3 credit hours)
Student teams apply concepts and methods in field studies of real project management processes and construction operations by using principles and methods in Lean Production, Construction, Design, Assembly, Supply, Production Control, and Work Process Design.
Prerequisite: CE 463
Typically offered in Fall only

CE 564/CE 464  Legal Aspects of Contracting  (3 credit hours)
Legal aspects of contract documents, drawings and specifications; owner-engineer-constructor relationships and responsibilities; bids and contract performance, Labor laws; governmental administrative and regulatory agencies; torts; business organizations; ethics and professionalism.
Prerequisite: CE 463; Corequisite: CE 365
Typically offered in Spring only

CE 565  Construction Safety Management  (3 credit hours)
Fundamentals of safety management principles. Detailed review of OSHA regulations and standards critical to construction engineers and managers who expect to design and administer safety related systems in a construction project. Analysis and design of example minimum safety requirements for application in construction field operations. Review of OSHA Standards for the Construction Industry, a review of selected sections of OSHA Standards for General Industry, a review of general principles of construction safety management.
Prerequisite: CE 465 or CE 466
Typically offered in Spring only

CE 567  Risk and Financial Management in Construction  (3 credit hours)
Fundamental concepts in financial and risk analysis in construction; accounting and financial metrics in construction; risk assessment and risk management in construction including the cost of risk, decision making strategies, the role of sureties, effects of risk in project delivery methods and contract types; risk effects in project financing including a review of financing sources, considerations for financing local and international projects; and the impact of financial and risk management in strategic planning in construction.
Prerequisite: ACC 220, CE 463
Typically offered in Spring only

CE 568/CE 468  Construction Engineering Laboratory  (1 credit hours)
Measurements with and calibration of measurement instruments used in construction engineering field tests for quality and safety of the construction process. Interpretation of ANSI, ASTM, ACI and AISC specifications and standards. Credit for both CE 468 and CE 568 is not allowed.
Prerequisite: CE 332, Corequisite: CE 327 or CE 426
Typically offered in Spring only
CE 571  Physical Principles of Environmental Engineering  (3 credit hours)
Mass balances, equation of motion for small particles, small particle interactions, particle collision/coagulation, partitioning, adsorption isotherms, fluid mechanics, diffusion, interphase mass transport and resistance models, elementary/non-elementary reactions, residence time distributions.

Prerequisite: CE 282, Graduate standing
Typically offered in Spring only

CE 573  Biological Principles of Environmental Engineering  (3 credit hours)
Concepts in environmental microbiology including cell structure and function, phylogeny, survey of environmentally relevant microbial groups, metabolism under different redox conditions, catabolism of macromolecules, methods in microbial ecology. Relationships to engineering processes and systems will be emphasized.

Prerequisite: Graduate standing in CE, BAE, CHE, or SSC
Typically offered in Fall only

CE 574  Chemical Principles of Environmental Engineering  (3 credit hours)
Inorganic and organic environmental chemistry including acid-base equilibria, precipitation, complexation, redox reactions, and natural organic matter. The role of these factors in controlling the fate of contaminants in engineered treatment systems and natural environments.

Prerequisite: Graduate standing in CE, CHE, BAE, NE, MEA, SSC
Typically offered in Fall only

CE 576  Engineering Principles Of Air Pollution Control  (3 credit hours)
Introduction to air pollution control fundamentals and design. Fundamentals including physics, chemistry and thermodynamics of pollutant formation, prevention and control. Design including gas treatment and process and feedstock modification. Addressed pollutants including sulfur dioxide, nitrogen oxides, particulate matter, volatile organic compounds, hydrocarbons and air toxins. Investigation of current research. Credit for both CE 476 and CE 576 is not allowed.

Prerequisite: CE 375, CE 470, CHE 315 or MAE 301, Corequisite: ST 511 or 515
Typically offered in Fall only

CE 577  Engineering Principles Of Solid Waste Management  (3 credit hours)
Solid waste management including generation, storage, transportation, processing, land disposal and regulation. Processing alternatives including incineration and composting. Integration of policy alternatives with evaluation of engineering decisions. Investigation of current research. Credit is only allowed for one of CE 477 and CE 577.

Prerequisite: CE 373
Typically offered in Spring only

CE 578/CE 478  Energy and Climate  (3 credit hours)
Interdisciplinary analysis of energy technology, natural resources, and the impact on anthropogenic climate change. Topics include basic climate science, energetics of natural and human systems, energy in fossil-fueled civilization, the impact of greenhouse gas emissions on climate, and technology and public policy options for addressing the climate challenge. The course is quantitative with a strong emphasis on engineering and science.

Prerequisite: Senior standing
Typically offered in Fall only

CE 579  Principles of Air Quality Engineering  (3 credit hours)
Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the "acid rain" problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.

Prerequisite: CE 373, CE 382 or CHE 311(CHE Majors), or MEA 421(MEA Majors), Corequisite: ST 370, ST 380(MEA Majors)
Typically offered in Spring only

CE 581/MEA 581  Fluid Mechanics in Natural Environments  (3 credit hours)
Free surface flows of water and air occurring in natural fluid systems and influencing environmental transport and mixing. Review of fundamental principles of fluids, covering the scales relevant to both engineering and geo-physical applications. Topics and examples include waves, instability, stratification, turbulent boundary layers, jets and plumes, and open channel flows. Cannot receive credit for both CE 581 and MEA 581.

Prerequisite: CE 282 or MEA 463 or permission of instructor
Typically offered in Fall only

CE 582  Coastal Hydrodynamics  (3 credit hours)
This course gives an introduction to water wave mechanics for engineers and scientists. Topics include wave generation, propagation, kinematics, transformation, breaking, forces, and dissipation.

Prerequisite: CE 282 or permission of instructor.
Typically offered in Spring only

CE 583  Engineering Aspects Of Coastal Processes  (3 credit hours)
Coastal environment, engineering aspects of mechanics of sediment movement, littoral drift, beach profiles, beach stability, meteorological effects, tidal inlets, inlet stability, shoaling, deltas, beach nourishment, mixing processes, pollution of coastal waters, interaction between shore processes and man-made structures, case studies.

C- or better in CE 282.
Typically offered in Spring only

CE 584  Hydraulics Of Ground Water  (3 credit hours)
Introduction to ground water hydraulics and hydrology. Hydrologic cycle, basic ground water hydraulics, numerical solution of governing equations, ground water hydrology of North Carolina, well design and construction, flow net development, and ground water contamination sources.

Prerequisite: CE 382
Typically offered in Fall only
CE 585  **Principles of Surface Water Quality Modeling** *(3 credit hours)*
This course addresses how human inputs affect natural and engineered aquatic systems, through mathematical modeling of system dynamics. Course topics integrate physical, chemical, and biologic processes related to pollutants and lower food-web dynamics. Lectures and assignments cover both theory and application. Applications are relevant to informing management, protection, and restoration of inland and coastal waters.
Prerequisite courses include environmental processes (e.g., CE 373) and quantitative calculus-based hydrology (e.g., CE 383), or permission of instructor.
*Typically offered in Spring only*

CE 586  **Engineering Hydrology** *(3 credit hours)*
Hydrologic principles underlying procedures for surface water modeling; applications of common hydrologic models to actual watersheds.
Prerequisite: CE 383
*Typically offered in Fall only*

CE 588/CE 488  **Water Resources Engineering** *(3 credit hours)*
Extension of the concepts of fluid mechanics and hydraulics to applications in water supply, water transmission, water distribution networks and open channels to include water-supply reservoirs, pump and pipe selection, determinate and indeterminate pipe networks, and analysis of open channels with appurtenances.
Prerequisite: CE 339 and CE 383
*Typically offered in Fall only*

CE 590  **Special Topics in Civil Engineering** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 591  **Special Topics in Civil Engineering Computing** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 592  **Special Topics in Construction Engineering** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 593  **Special Topics in Geotechnical Engineering** *(1-3 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 594  **Special Topics in Structures and Mechanics** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 595  **Special Topics in Transportation Engineering** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 596  **Special Topics in Water Resource and Environmental Engineering** *(1-6 credit hours)*
New or special course on recent developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
*Typically offered in Fall and Spring*

CE 603  **Construction Engineering Seminar** *(1 credit hours)*
Discussions and reports of subjects in civil engineering and allied fields.
*Typically offered in Fall and Spring*

CE 605  **Structures and Mechanics Seminar** *(1 credit hours)*
Discussions and reports of subjects in civil engineering and allied fields.
*Typically offered in Fall and Spring*

CE 607  **Water Resource and Environmental Engineering Seminar** *(1 credit hours)*
Discussions and reports of subjects in civil engineering and allied fields.
*Typically offered in Fall and Spring*

CE 610  **Special Topics CE** *(1-6 credit hours)*

CE 635  **Advanced Reading In Civil Engineering** *(1-3 credit hours)*
Directed reading of advanced topics in some phase of civil engineering.
Prerequisite: Graduate standing
*Typically offered in Summer only*

CE 675  **Civil Engineering Projects** *(1-6 credit hours)*
Research- or design-oriented independent study and investigation of a specific civil engineering topic, culminating in final written report.
*Typically offered in Fall, Spring, and Summer*

CE 685  **Master’s Supervised Teaching** *(1-3 credit hours)*
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master’s student
*Typically offered in Fall, Spring, and Summer*
CE 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Summer only

CE 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Summer only

CE 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Summer only

CE 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CE 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

CE 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Summer only

CE 701 Urban Transportation Planning (3 credit hours)
Planning and design of urban transportation systems as related to comprehensive urban planning; principles of land use planning, urban thoroughfare planning and regional planning.
Prerequisite: CE 501
Typically offered in Spring only

CE 702 Traffic Flow Theory (3 credit hours)
Stream flow, shock wave, queuing, and other macroscopic theories; car following, gap acceptance, and other microscopic theories; distributions of traffic stream parameters; building traffic simulation models.
Prerequisite: CE 502, Corequisite: ST 370
Typically offered in Fall only

CE 703 Economic Analysis of Transportation Systems (3 credit hours)
Transportation economics in terms of its supply and demand, costs, pricing, and regulation, especially the way in which the theory of economics in the marketplace and for public and private firms applies to the transportation market given its unique characteristics.
Typically offered in Fall only

CE 705 Intelligent Transportation Systems (3 credit hours)
Intelligent Transportation Systems (ITS) planning and human factor elements; application of monitoring, communications and information dissemination technologies to transportation systems; advanced traffic management for freeway and arterial systems; traveler information and public transportation systems; automated vehicle and highway systems. ITS evaluation methods and models.
Prerequisite: CE 501 and CE 502
Typically offered in Fall only

CE 706 Advanced Traffic Control (3 credit hours)
Advanced signalized traffic control methods at intersections, arterials and networks. Applications of mathematical optimization techniques to signal timing and coordination. Use of traffic simulation and optimization models for signal evaluation and design. Roundabout analysis and design.
Prerequisite: CE 502
Typically offered in Spring only

CE 707 Transportation Policy and Funding (3 credit hours)
Understanding and debating important current transportation policy issues in the U.S. Raising and allocating funds for building and maintaining the transportation system. Highway, public transit, rail, air, and other modes.
Prerequisite: CE 501 or graduating in Economics or Public Administration
Typically offered in Spring only

CE 708 Transportation Logistics Planning and Optimization (3 credit hours)
The mathematical treatment of transportation logistics from the perspective of infrastructure providers and system operators, including models used by freight service providers to determine how they will meet the demands for freight service. Private and common carrier operations are covered. Rail, truck, and air are the primary modes examined.
Typically offered in Fall only

CE 714 Stress Waves (3 credit hours)
Theory of stress waves in solids. Origins and nature of longitudinal transverse and surface waves originating at an impact site or from other transient disturbances. Determination of stresses, particle velocities, wave velocities. Wave interaction with other waves and with boundaries and dissimilar materials. Modern instrumentation and seismic refraction exploration.
Prerequisite: MA 341; CE 225 or PY 411 or MA 401
Typically offered in Fall only

CE 718 Constitutive Modeling of Engineering Materials (3 credit hours)
Stresses and strains (vectors, tensors and indicial notations), general theorems for elastic-plastic solids, constitutive modeling of metals and concrete, numerical implementations of plasticity models.
Prerequisite: CE 515 (old CE 715)
Typically offered in Spring only
Typically offered in Spring only

Prerequisite: CE 522

CE 722 Advanced Structural Dynamics (3 credit hours)
Finite element formulation of equations of motion; advanced analysis techniques for discrete parameter systems; investigation of damping; analysis of continuous systems; applications to civil engineering structures.

Prerequisite: CE 527
Typically offered in Fall only

CE 724 Probabilistic Methods Of Structural Engineering (3 credit hours)

Prerequisite: MA 421
Typically offered in Fall only

CE 725 Earthquake Structural Engineering (3 credit hours)
Effects of earthquakes on structures and of design of structures to resist earthquake motions; earthquake mechanisms and ground motions; response of structures to earthquake motions; behavior of materials, structural elements and assemblages subjected to earthquakes; principles of earthquake-resistant design practice; soil-structure interaction; and special topics.

Prerequisite: CE 527
Typically offered in Fall only

CE 726 Advanced Theory Of Concrete Structures (3 credit hours)

Prerequisite: CE 522
Typically offered in Spring only

CE 728 Performance Based Seismic Design of Bridges (3 credit hours)
This course covers the seismic analysis and design of bridge structures. The progression through the course follows six thematic areas, namely: Conceptual design; Analysis approaches; Capacity Design; Response Verification; Assessment and Retrofit of Bridges; and New (or underutilized) frontiers in bridge engineering. The emphasis during the course will be on the relationships between engineer's choices, analysis, and design.

Prerequisite: CE 725
Typically offered in Spring only

CE 730 Mechanics and Failure of Quasi-Brittle Materials (3 credit hours)
This course is in three parts. Part one covers fundamentals of composites including estimating the mechanical and thermomechanical properties, failure of composites, laminate, and shear-lag model. Advanced topics including homogenization theories, Eigenstrain and Eigenstress, dilute, self-consistent and Mori-Tanaka methods are also covered. Part two covers fundamental of fracture mechanics including Griffith theory, stress field at crack tip, energy release rate, crack tip plasticity, and mixed mode fracture. Part three covers interface cracks, cracks approaching an interface, and fracture of composites.

Prerequisite: CE 515 and Corequisite: CE 526
Typically offered in Fall only

CE 737 Computer-Aided Engineering Systems (3 credit hours)
Design and implementation issues for building real-world computer-aided engineering systems. Engineering data modeling; data definition, query and manipulation methodologies; application program interfaces; problem-oriented languages and software supervisors; and knowledge-based systems to support engineering design and decision making.

Prerequisite: CE 537 or 538
Typically offered in Spring only

CE 741 Geomechanics of Stress Deformation (3 credit hours)
Concepts of volume change and effective stress, stress-strain behavior of clays and sands, stress path and failure conditions; mechanistic interaction between solids and water, problems in elasticity and plasticity pertaining to stress distribution, elastic, consolidation and secondary settlements, and tolerance limits to deformation levels.

Prerequisite: CE 440, or CE 443 or CE 548

CE 742 Deformation and Instability of Soils (3 credit hours)

Prerequisite: CE 440, or CE 443 or CE 548

CE 744 Foundation Engineering (3 credit hours)
Subsoil investigations; excavations; design of sheeting and bracing systems; control of water; footing, grillage and pile foundations; caisson and cofferdam methods of construction.

Prerequisite: CE 342
Typically offered in Spring only
CE 746 Soil Dynamics and Earthquake Engineering (3 credit hours)
Dynamics of discrete and continuous systems with application to soil dynamics: dynamic soil properties, analysis of foundation vibration, construction-induced vibration, dynamic soil-structure interaction. Geotechnical earthquake engineering: ground motion characteristics, dynamic response of soil sites, effect of local site conditions on design ground motion, liquefaction of soils.
Prerequisite: CE 440, or CE 443 or CE 548

CE 747 Geosynthetics in Geotechnical Engineering (3 credit hours)
Introduction to use, manufacturing techniques, design and construction of geosynthetics in geotechnical engineering applications; design and analysis of geotextiles, geonets, geogrids and geomembranes in pavements base and subbase reinforcement, reinforced walls, slopes, moisture barriers, dams and hazardous impoundment, landfill liners and covers.
Prerequisite: CE 548
Typically offered in Fall only

CE 751 Theory Of Concrete Mixtures (3 credit hours)
In-depth study of theory of portland cement concrete mixtures including types and properties of portland special cements; chemical reactions; brief examination of history of mixture design; detailed study of current design methods; properties of fresh a
Prerequisite: CE 332
Typically offered in Fall only

CE 755 Highway Pavement Design (3 credit hours)
Theoretical analysis and design of highway pavements with critical evaluation of current design practices. Pavement materials characterization; stresses and strains in pavements; traffic consideration; pavement performance models; and actual thickness
Prerequisite: CE 342
Typically offered in Fall only

CE 757 Pavement Management Systems (3 credit hours)
Fundamental concepts in process of pavement management at both network level and project level. Distress identification and evaluation; concepts and methods for rehabilitation and maintenance techniques; nondestructive testing of pavements; performance
Prerequisite: CE 755
Typically offered in Spring only

CE 758 Multiscale Characterization of Asphalt Materials (3 credit hours)
Multiscale characterization of asphalt concrete. Chemical, rheological, and damage characterization of asphalt binder; asphalt binder oxidative aging; asphalt modification; asphalt emulsions; asphalt mastics; fine aggregate matrix; coarse aggregate structure. Graduate course on Asphalt and Bituminous Materials or consent by the instructor.
Typically offered in Spring only

CE 759 Inelastic Behavior Of Construction Materials (3 credit hours)
Application of principles of linear and nonlinear viscoelasticity, fracture mechanics and damage mechanics to modeling inelastic behavior of construction materials. Mechanical analog of time-dependent response; linear and nonlinear elastic-viscoelastic correspondence principles; time-temperature superposition; stress intensity factor; energy release rate; J-integral; and continuum damage mechanics.
Prerequisite: CE 515
Typically offered in Spring only

CE 761 Design Of Temporary Structures in Construction (3 credit hours)
Computer-based analysis of temporary structures in construction and their design, safety and control. Emphasis on concrete formwork, falsework, earth support, cofferdams, underpinning, lifting and rigging.
Prerequisite: CE 522 or CE 744 or CE 766
Typically offered in Fall only

CE 762 Construction Productivity (3 credit hours)
Methods of collecting, assembling and analyzing construction productivity data in order to increase construction productivity. Applications of methods improvement techniques such as time-lapse photography, flow charts, process charts and time standards to improvement of construction productivity. Safety and human factors in construction and their relation to construction productivity.
Prerequisite: CE 463
Typically offered in Spring only

CE 763 Materials Management In Construction (3 credit hours)
Fundamental concepts and methods; construction specific models for integrated materials management; computer usage; vendor analysis and “best-buy;” materials requirement planning and control; management of material waste; automated materials tracking;
Prerequisite: CE 463, CE 465

CE 765 Construction Equipment Systems (3 credit hours)
Analysis of heavy construction processes as systems in order to optimize the selection and employment of construction equipment. Considerations in system design, cost and productivity estimation, operational procedures, safety and maintenance. Computer applications utilizing analytical and simulation techniques.
Prerequisite: CE 761 or 762
Typically offered in Spring only

CE 766 Building Construction Systems (3 credit hours)
Prerequisite: CE 466 or CE 327 or Graduate standing in ARC
Typically offered in Fall and Spring
CE 771 Physical-Chemical Water Treatment Processes (3 credit hours)
Physical-chemical treatment processes for the treatment of water, including sedimentation, flotation, filtration, coagulation, oxidation, disinfection, precipitation, adsorption, and membrane treatment processes. Current issues in drinking water quality and treatment are discussed.
Prerequisite: CE 574, Corequisite: CE 571
Typically offered in Spring only

CE 772/NE 772 Environmental Exposure and Risk Analysis (3 credit hours)
Course covers the identification, transport, and fate of hazardous substances in the environment; quantification of human exposures to such substances; dose-response analysis; and uncertainty and variability analysis. The general risk assessment framework, study design aspects for exposure assessment, and quantitative methods for estimating the consequences and probability of adverse health outcomes are emphasized.
Prerequisite: ST 511 or 515
Typically offered in Spring only

CE 774 Environmental Bioprocess Technology (3 credit hours)
Principles of microbiological, biochemical, and biophysical processes used in environmental waste treatment and remediation processes, with particular emphasis on water quality control processes.
Prerequisite: CE 573, CE 574
Typically offered in Spring only

CE 775 Modeling and Analysis Of Environmental Systems (3 credit hours)
Prerequisite: CE 339 and CE 282
Typically offered in Fall only

CE 776 Advanced Water Management Systems (3 credit hours)
Application of systems analysis methods to design, analysis and management of water resources and environmental engineering.
Prerequisite: CE 339, CE 775
Typically offered in Spring only

CE 777 Stochastic Methods in Water Resources and Environmental Engineering (3 credit hours)
Stochastic modeling, water resources and environmental data analysis. Dimension reduction, estimation and detection of periodicities in water resources and environmental data, parametric and non-parametric methods in water and environmental modeling.
Prerequisite: CE 586 or ST 515
Typically offered in Spring only

CE 779 Advanced Air Quality (3 credit hours)
Local, regional and global scale chemical interactions, transport and behavior of trace gases (sulfur carbon, nitrogen, hydrocarbon, and photochemical oxidants) in the atmosphere. Covers three primary elements of air quality: anthropogenic and natural emissions of trace gases; interactions of the pollutants in the atmosphere; and monitoring and sampling of gaseous and particulate pollutants.
Prerequisite: (CH 201 or CH 203) and MEA(CE) 479
Typically offered in Spring only

CE 784 Ground Water Contaminant Transport (3 credit hours)
Introduction to movement and attenuation of contaminants in the subsurface. Common contaminant sources; advection and dispersion; numerical modeling of contaminant transport; chemical and biological processes in the subsurface; and ground water restoration.
Prerequisite: CE 584 and 574
Typically offered in Spring only

CE 786 Hydroclimatology (3 credit hours)
Hydroclimatology, El-Nino southern oscillation, climate and streamflow forecasting, forecast verification measures, downscaling, Budyko's Framework, long-term water balance, data assimilation, ensemble Kalman Filter.
Prerequisite: CE 586
Typically offered in Spring only

CE 790 Advanced Topics In Civil Engineering (1-3 credit hours)
New or special course on advanced developments in some phase of civil engineering. Specific topics and prerequisites identified for each section and varied from term to term.
Typically offered in Fall and Spring

CE 791 Advanced Topics in Civil Engineering Computing (1-3 credit hours)
Typically offered in Fall and Spring

CE 792 Advanced Topics in Construction Engineering (1-3 credit hours)
Typically offered in Fall and Spring

CE 793 Advanced Topics in Geotechnical Engineering (1-3 credit hours)
Typically offered in Fall and Spring

CE 794 Advanced Topics in Structures and Mechanics (1-3 credit hours)
Typically offered in Fall and Spring

CE 795 Advanced Topics in Transportation Engineering (1-3 credit hours)
Typically offered in Fall and Spring

CE 796 Advanced Topics in Water Resource and Environmental Engineering (1-3 credit hours)
Typically offered in Fall and Spring

CE 803 Advanced Construction Engineering Seminar (1 credit hours)
Typically offered in Fall and Spring

CE 805 Advanced Structures and Mechanics Seminar (1 credit hours)
Typically offered in Fall and Spring
CE 807 Advanced Water Resource and Environmental Engineering Seminar (1 credit hours) 
Typically offered in Fall and Spring

CE 839 Advanced Reading In Civil Engineering (1-3 credit hours)
Directed reading of advanced topics in some phase of civil engineering.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

CE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Summer only

CE 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Summer only

CE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Summer only

CE 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CE 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

CE 899 Doctoral Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall and Summer

College of Natural Resources (CNR)

CNR 250 Diversity and Environmental Justice (3 credit hours)
Differences between people can impact how they see one another and engage with one another. In this class we talk about those differences and address numerous facets of diversity to pique the curiosity of the students. As we learn together, we investigate content that can influence dynamics (how we feel) and we explore different ways to investigate environmental justice issues. This course is designed to create a safe learning environment for reflection, engagement, risk-taking, and the development of personal awareness while looking at how each individual can improve environmental justice. 75% of the seats will be restricted for CNR students.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall and Spring

CNR 295 Special Topics in College of Natural Resources (1-3 credit hours)
Special topics in the College of Natural Resources at the 200 level for offering of courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

CNR 490 Senior Honors Seminar (2 credit hours)
Oral presentations of the results of the senior honors projects. Additional special seminars and group discussions to enrich and broaden student perspectives.

Prerequisite: 4 credit hours of Independent Study
Typically offered in Fall, Spring, and Summer

College of Sciences (COS)

COS 100 Science of Change (2 credit hours)
This course will examine change, both scientific and personal. Students will reflect on change in the past and looking forward as they transition to college life and scientific careers. Case studies, readings and discussions about global change topics will be used to highlight the scientific approaches of disciplines represented in the College of Sciences. In-class activities and out-of-class reflections will be used to practice skills necessary for success in college and career.

Restriction: New freshmen (NFR) in the College of Sciences only
GEP Interdisciplinary Perspectives
Typically offered in Fall only

COS 295 Special Topics in the College of Sciences (1-3 credit hours)
Special topics in the College of Sciences at the early undergraduate level. Available as directed individual or group study.

Typically offered in Fall, Spring, and Summer

COS 498 Spec Topics in the College of Sciences 2 (3 credit hours)
Special Topics for advanced undergraduates will be selected from the mathematical, physical, and biological sciences.
Communication (COM)

COM 110 Public Speaking (3 credit hours)
Research skills, topic selection, speech organization, skills in speech delivery. Listening for analysis and evaluation of in-class speech presentation.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

COM 112 Interpersonal Communication (3 credit hours)
Interpersonal communication competence: self-concept, language and culture, self-disclosure, active listening, verbal and nonverbal communication, and conflict management.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

COM 200 Communication Media in a Changing World (3 credit hours)
Traces ongoing evolution of communication media. Examines the place and influence of the major media companies that control access to and the content of the contemporary mediascape. Challenges students to examine their use of media from cellphone, to computer, to music and gaming platforms. Restricted to non-Communication majors.

R: Non-COM majors only
GEP Humanities
Typically offered in Fall, Spring, and Summer

COM 201 Introduction to Persuasion Theory (3 credit hours)
Impacts of persuasive communication on attitudes and behavior. Uses humanistic and social scientific theories to explain the persuasive process.

Typically offered in Fall, Spring, and Summer

COM 202 Small Group Communication (3 credit hours)
Theory and practice of effective communication in small groups, including: stages of group development, role emergence, leadership functions, decision making strategies, conflict management, and the significance of power.

Typically offered in Fall and Spring

COM 211 Argumentation and Advocacy (3 credit hours)
Theory-based analysis of public argument in specialized settings of law, politics, academic debate, business and organizations, and interpersonal relations.

GEP Humanities
Typically offered in Fall, Spring, and Summer

COM 226 Introduction to Public Relations (3 credit hours)
Public relations as a communication function of organizations. Public relations process, principles, history, and practice. Analysis of environmental, organizational, communication, and audience influences on public relations practice; career opportunities.

Typically offered in Fall, Spring, and Summer

COM 230 Introduction to Communication Theory (3 credit hours)
Micro- and macro-analytic theories used in the study of human communication: perspectives and assumptions of major theories; utility and application of major theories; contexts, cultures, and media.

R: Communication Majors
Typically offered in Fall, Spring, and Summer

COM 240 Communication Inquiry (3 credit hours)
Qualitative and quantitative methods of inquiry in communication: types of questions; strategies for answering questions; nature of evidence; advantages and disadvantages of different methods; reference tools in the field; and channels of distribution

Prerequisite: Communication Majors
Typically offered in Fall, Spring, and Summer

COM 250 Communication and Technology (3 credit hours)
Examination of past, current, and future intersections of technology, culture, and communication in everyday life. Impact of communication technology policies. Analysis of communication technologies in interpersonal, organizational, societal, and global contexts. Development of technology skills for the competent communicator.

Prerequisite: Communication Majors. Credit is not allowed for both COM 250 and COM 200
Typically offered in Fall, Spring, and Summer

COM 257 Media History and Theory (3 credit hours)
Historical development and social implications of telecommunication, print, photography, film, broadcasting, and computer-mediated communication. Theoretical and methodological approaches to the field of communication media: media history; media economics and policy; media effects and power; media as producers of meaning; media audiences; media technologies; and roles of the media in social, cultural, and political change.

Prerequisite: COM 230
Typically offered in Fall and Spring

COM 267 Electronic Media Writing: Theory and Practice (3 credit hours)
Media writing as a social practice. Roles of writing and writers in media production processes. Social, political, economic, and professional conditions that enable or constrain writing and the writer. Specific media writing genres and formats. Research and preparation for media writing. Students write research-based scripts for news, commentary, and fictional genres in radio, television, film, and emerging media.

Prerequisite: COM 230
Typically offered in Fall, Spring, and Summer
COM 289 Science Communication and Public Engagement (3 credit hours)
This course is an introduction to the principles and practices of communicating scientific and technological issues to public audiences, through interpersonal discussion, mass media, social media, and other means. It is open to students in all majors who want to deepen and broaden their understanding of how citizens make sense of science and technology in their everyday lives. The course features a mixture of theory-based readings and discussion with practical skill-building for communication in real-world contexts. Equal emphasis is given to humanities and social science perspectives. The application of communication concepts to controversial science contexts is emphasized, including case studies of issues such as GMOs, climate change, vaccines, and gene editing. Theoretical perspectives covered include argumentation and debate; audience analysis (through quantitative survey data and metrics); philosophy and ethics of communicating science; using narratives, framing, and metaphors to communicate science; and the cultural image of science in popular media.

GEP Humanities, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

COM 292 Language, Communication, and Culture (3 credit hours)
We use different modes of communication depending on whether we are participating in classroom discussion, talking with our parents or boss, hanging out with our friends, or visiting a different country. However, rarely do we have the opportunity to consciously reflect upon our communicative behaviors. In this class we will unpack some of the ways culture and society influence our communication, as well as how our communication affects the culture and the society in which we live. Becoming aware of the effect that our words, shared meanings, and contexts have on how we express ourselves can be the difference between positive and negative communicative experiences.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

COM 296 Communication Internship-Non-Local (1 credit hours)
Non-local directed work experience for Communication majors with supervision from the work site and the University. COM 296 may be taken more than once only with the permission of the Internship Director and the Assoc. Dept. Head. Individualized/Independent

R: Communication Majors
Typically offered in Fall, Spring, and Summer

COM 298 Special Projects in Communication (1-3 credit hours)
A special projects course to be utilized for guided research or experimental classes at the sophomore level, topic determined by instructor.

Typically offered in Fall and Spring

COM 301 Presentational Speaking (3 credit hours)
Design, organization and delivery of oral presentations for policy determination, policy implementation, and sales.

Prerequisite: COM 110
Typically offered in Spring only

COM 307 Digital Audio Production (3 credit hours)
Basic principles of digital audio production, including studio operation, performing, writing and producing.

Prerequisite: COM 267
Typically offered in Fall and Spring

COM 316 Public Relations Writing (3 credit hours)
Communication processes and procedures of public relations programs. Media techniques, preparation of materials, channels of distribution.

Prerequisite: COM 226 and ENG 316
Typically offered in Fall and Spring

COM 317 Television Production (3 credit hours)
Basic techniques of television studio production, including producing, writing, directing and electronic graphics production.

Prerequisite: COM 267
Typically offered in Fall and Spring

COM 321/ENG 321 Survey of Rhetorical Theory (3 credit hours)
Principles of rhetorical theory from its classical origins through the modern period to the present time. Key concepts and theories that provide a critical understanding of the processes of persuasive symbol use.

Prerequisite: Sophomore standing and above

COM 322 Nonverbal Communication (3 credit hours)
Theory and research in nonverbal communication, including: environment; space; physical appearance, movement; eyes and facial expressions; and vocal cues. Nonverbal communication in personal, workplace and cross-cultural setting.

Prerequisite: COM 112
Typically offered in Fall and Spring

COM 327 Critical Analysis of Communication Media (3 credit hours)
Theoretical frameworks, methods, and aims of various approaches to critical analysis of the media. Critiques of power over media production; social biases of informational, fictional, and hybrid media content; and historical forms of audiences and the public. Critical awareness of the media’s effects in politics, public culture, and everyday life.

Prerequisite: COM 240 and COM 257, Corequisite: COM 240
Typically offered in Fall and Spring

COM 332 Relational Communication (3 credit hours)
Communication patterns in the development and deterioration of interpersonal relationships. Functional and dysfunctional communication behaviors in family relationships.

Prerequisite: COM 112
Typically offered in Fall and Spring

COM 336 Newsletter Writing and Production (3 credit hours)
Newsletters are an important part of the corporate, non-profit, government, and small business portfolio of communication tools. Just about all organizations use newsletters - print or electronic - to reach their audiences with their key messages. Many young public relations practitioners start their careers working on newsletters for their organization or their clients. Students in this course will work collaboratively to write and produce a newsletter as well as other public relations publications.

Typically offered in Fall and Spring
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 342</td>
<td>Qualitative Research Methods in Communication</td>
<td>3</td>
<td>Introduction to qualitative methods in communication research. Research paradigms, research ethics, research design, qualitative data collection, data analysis and interpretation, written and multimedia reporting of research results. Students are responsible for providing their own transportation to research sites for fieldwork. Prerequisite: COM 240 Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>COM 346</td>
<td>Case Studies in Public Relations</td>
<td>3</td>
<td>Application of theory, principles, and problem-solving techniques used in public relations to organizational case studies. Prerequisite: COM 226 and COM 230 Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>COM 357</td>
<td>Digital Video Production</td>
<td>3</td>
<td>Principles of producing, directing, and editing techniques for digital video. Students script, storyboard, shoot, and edit short video projects. Prerequisite: COM 267 Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>COM 362/WS 362</td>
<td>Communication and Gender</td>
<td>3</td>
<td>Effects of gender on the interpersonal communication process. Construction of gendered identities via communication practices. Examination of theories of gender and the role of gender in organizational, institutional, and media communication practices. Prerequisite: Junior standing, COM 112 Typically offered in Fall only</td>
</tr>
<tr>
<td>COM 364/ENG 364</td>
<td>History of Film to 1940</td>
<td>3</td>
<td>Technological developments and aesthetic movements that shaped international cinema production from the beginning of the industry to 1940. Formal evolution in camera movement, editing, sound, narrative form, and the documentary. The rise to prominence of Hollywood and international cinemas in historical, economic, and cultural contexts. Prerequisite: Sophomore standing and above GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall only</td>
</tr>
<tr>
<td>COM 367</td>
<td>Multimedia Production and Digital Culture</td>
<td>3</td>
<td>Production lab and seminar combined. Digital production of visual images, audio, and video for the web. Readings in theories of visual communication and electronic culture. Critical analysis of assumptions underlying development and deployment of electronic media, and their social, economic and political impact. Development of practical skills and critical thinking. Prerequisite: COM 267 Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>COM 374/ENG 374</td>
<td>History of Film From 1940</td>
<td>3</td>
<td>Technological developments and aesthetic movements that have shaped international cinema production from 1940 to the present. Evolution in camera movement, editing, sound, narrative form, and the documentary. Post-war Hollywood cinema and international film industries (both established and emerging) in historical, economic and cultural context. Prerequisite: Sophomore standing and above GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Spring only</td>
</tr>
<tr>
<td>COM 386</td>
<td>Quantitative Communication Research Methods</td>
<td>3</td>
<td>Design and implementation of communication research methods, including experimental and survey research procedures. Use of computer software for statistical analysis. Prerequisite: COM 240 Typically offered in Fall, Spring, and Summer</td>
</tr>
<tr>
<td>COM 392/HSS 392</td>
<td>International and Crosscultural</td>
<td>3</td>
<td>Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics and crosscultural communication. Impact on communication of differing cultural practices. GEP Global Knowledge, GEP Social Sciences, GEP U.S. Diversity Typically offered in Fall and Summer</td>
</tr>
<tr>
<td>COM 395/ENG 395</td>
<td>Studies in Rhetoric and Digital Media</td>
<td>3</td>
<td>Study of the influence of emerging technologies on rhetorical theory and practice. Rhetorical analysis of texts, including visual and audio texts. Invention and construction of digital media texts as a means of engaging rhetorical theory and analysis. Topics vary to adapt to emerging technologies and changing vernacular practices. Prerequisite: ENG 101 GEP Humanities Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>COM 402</td>
<td>Advanced Group Communication</td>
<td>3</td>
<td>Communication processes and outcomes in groups with complex, strategic, and critical public or corporate functions. Focus on participating in, intervening in, leading, and constructing group processes. Advanced theory with application. Prerequisite: COM 202 Typically offered in Spring only</td>
</tr>
<tr>
<td>COM 407</td>
<td>Advanced Digital Audio</td>
<td>3</td>
<td>Advanced multichannel techniques for audio production. Studio acoustics, audio signal processing, and advanced microphone techniques, writing, and performing. Prerequisite: COM 307 Typically offered in Fall only</td>
</tr>
<tr>
<td>COM 411/ENG 411</td>
<td>Rhetorical Criticism</td>
<td>3</td>
<td>Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramatic analysis, content analysis, fantasy theme analysis. Prerequisite: Junior standing</td>
</tr>
<tr>
<td>COM 417</td>
<td>Advanced Topics in Communication and Race</td>
<td>3</td>
<td>Advanced topics seminar examining construction of racial and ethnic identities through communication practices. Exploration of theories of race and identity and the ways communication works to construct, undermine, and reinforce understanding across social groups. Prerequisite: COM 257, Corequisite: COM 250 GEP U.S. Diversity Typically offered in Fall and Spring</td>
</tr>
</tbody>
</table>
COM 421 Communication Law (3 credit hours)
Explores the historical, philosophical, and legal foundations of communication rights and responsibilities. Philosophies and regulations affecting sources, messages, channels, receivers, and situations provide the central focus of the course.
Prerequisite: Junior standing.
Typically offered in Fall only

COM 427 Game Studies (3 credit hours)
Exploration of inter-relations among mobile technologies (cell phones, PDAs), location-based activities, and playful/social spaces. Investigates three main areas: (1) the definition of basic gaming concepts (community, narrative, play, and space); (2) the history of games as social events, with particular emphasis on multi-user domains (MUDs); and (3) the definition of games, which use the physical space as the game environment, such as pervasive games, location-based games, and hybrid realitygames. Discussion of inter-connections among games, education, and art. Jr/Sr Standing.
Prerequisite: COM 250 or STS 214
Typically offered in Fall only

COM 431 Communication in Political Campaigns (3 credit hours)
Roles of analysis and criticism of oral communication in political campaigns; analysis of special political communication situations; ghostwriting, news conferences, negative advertising.
Prerequisite: COM 110 or COM 201
Typically offered in Fall only

COM 436 Environmental Communication (3 credit hours)
Critical analysis of environmental discourse in organizational, mass media, political, cultural, and international contexts. Investigates public participation in environmental advocacy and deliberation; environmental conflict management; rhetorical constructions of nature and human relationships with nature; environmental justice; environmental risk communication; and competing ecological paradigms.
Prerequisite: COM 230 or STS 214
Typically offered in Fall only

COM 437 Advanced Digital Video (3 credit hours)
Hands-on experience in digital video production. Production of instructional videotapes. Practical experience in all phases of production process, including pre-production organization and critical analysis of final product.
Prerequisite: COM 357
Typically offered in Spring only

COM 441 Ethical Issues in Communication (3 credit hours)
Critical analysis of ethical problems in interpersonal and public communication practices.
Prerequisite: COM 110, 112
Typically offered in Fall and Spring

COM 442 Communication and Conflict Management (3 credit hours)
Examination of conflict styles and theories; conflict management strategies such as negotiation and third party intervention; and relevant contexts for conflict such as workplace, families, and interpersonal relationships. Practical, theoretical and critical analyses of conflict and negotiation in variety of contexts.
Prerequisite: COM 112
Typically offered in Fall only

COM 444 Film Production (3 credit hours)
Prerequisite: COM 267 or ENG 330
Typically offered in Fall and Spring

COM 447 Communication and Globalization (3 credit hours)
History and current trends in globalization of media, information, and telecommunications technologies, organizations, policies, and contents. Political cultural implications of globalization, including debates over corporate vs. public control of global communication, U.S. dominance vs. international cooperation, and the global influence of American culture. Internet-based group research projects on globalization in collaboration with students in other countries.
Corequisite: COM 327 or instructor's permission
GEP Global Knowledge
Typically offered in Summer only

COM 451 Visual Rhetoric (3 credit hours)
Examine the rhetorical strategies employed in various primarily visual forms of communication including advertising, photography, digital images, visual art, and public commemorative artifacts and sites. Explore the concepts and methods used to rhetorically analyze and interpret visual images and artifacts. Includes one or more required field trips to which students will provide own transportation.
Prerequisite: COM 201 or COM 321
Typically offered in Spring only

COM 455 Organizational Communication (3 credit hours)
Role of human communication in organizations, the assumptions inherent in management philosophies about effective communication, and an investigation of the relationships among communication, job satisfaction, productivity, development, and employee motivation.
Prerequisite: COM 230
Typically offered in Fall and Spring

COM 457 Media and the Family (3 credit hours)
Impact of mediated messages upon children and the family unit. Origins of the empirical literature and continuing research. Assessment of the qualitative literature. Implications of commercial structure of the media industries on the structure and di
COM 466 Nonprofit Leadership & Development (3 credit hours)
Nonprofit Leadership and Development is a service-learning course in which students will be expected to make a commitment to service in a local nonprofit organization for 30-hours. Students will critically examine theories of communication and leadership with concentration on issues pertaining to nonprofits such as working with executive boards, volunteer management, and resource development. Students are responsible for transportation and purchase of internship insurance.
Typically offered in Fall and Spring

COM 467 Advanced Topics in Gender and Communication (3 credit hours)
Advanced Topics seminar examining construction of gender identities through communication practices. History and analysis of gender representations. Theoretical and critical approaches to social, political, and economic impact of gender constructions.
Prerequisite: COM 327 or COM 362
Typically offered in Fall and Spring

COM 476 Public Relations Campaigns (3 credit hours)
Management of the public relations function in organizations and public relations counseling; communication theory and nature of materials emanating from public relations departments and counseling firms, practical analysis and development of public relations publicity and campaigns.
Prerequisite: COM 226, COM 316, COM 386 and Corequisite: COM 346
(Note: COM 346 may be taken as a prerequisite or co-requisite)
Typically offered in Fall and Spring

COM 477 Mobile Communication (3 credit hours)
Mobile communication technologies and their influence on communication patterns and social behavior. Conceptualization of cell phones beyond mobile telephones, as internet access points and gaming devices. History, current uses and future perspectives for the social use of mobile interfaces. The creation of new mobile communities. The influence of mobile images on communication and the creation of mobile networks. Use of mobile phones across cultures and places, such as Asia, Scandinavia, Africa, and Latin America.
Prerequisite: COM 250 or STS 214
Typically offered in Fall only

COM 479/COM 579 Climate Change Communication (3 credit hours)
An exploration of the communication successes and failures surrounding climate change and public opinion. Topics addressed include: agenda setting, media effects, framing, data visualizations, fear responses, naming, risk communication and theory, argumentation and refutation, and persuasion as well as issues and current events related to the challenges associated with communicating climate change to multiple stakeholders.
Typically offered in Fall only

COM 484 Advanced Television Production (3 credit hours)
Television program production utilizing advanced production techniques. Emphasis on refinement of writing, producing, and directing skills through work in TV studio on production of sophisticated program formats.
Prerequisite: COM 317
Typically offered in Spring only

COM 487 Internet and Society (3 credit hours)
Exploration of major issues involved in the growth of computer-mediated communication and information technologies. Construction of self and body; relation of information technology to social, civic, and political life; gender, race, and class as continuing critical points; knowledge and intellectual property; the implications of software and design on the nature of communication, knowledge, and information.
Prerequisite: COM 250 or COM 257 or STS 214
Typically offered in Spring only

COM 493 Advanced Topics in Public Relations (3 credit hours)
This course addresses current trends and recent development in the public relations profession through extensive analysis of industry practices. Course content will change each semester subject to faculty availability, but may include topics such as social media, media relations, crisis communication, international public relations, and other public relations specializations. Juniors and Seniors only.
Typically offered in Fall and Spring

COM 496 Communication Internship (3 credit hours)
Directed work experience for Communication majors with supervision from the work site and the University. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the
Prerequisite: Junior standing, Communication Majors
Typically offered in Fall, Spring, and Summer

COM 497 Advanced Topics in Media Studies (3 credit hours)
This course examines special topics in media studies through intensive study of media history, theory, research, methods and/or practice. Course content will change each semester depending on faculty areas of expertise.
Prerequisite: COM 250 or COM 257 or COM 357
Typically offered in Fall and Spring

COM 498 Advanced Topic in Communication (1-3 credit hours)
Advanced study of contemporary theories, methods, practices, processes, or issues related to the field of communication. Topic varies.
Prerequisite: Junior or senior standing
Typically offered in Fall and Spring

COM 499 Advanced Independent Research (1-3 credit hours)
Special projects in communication developed under the direction of a faculty member on a tutorial basis. Must have permission of department to enroll. May enroll only twice. Individualized/Independent Study and Research courses require a Course Agreement
Prerequisite: Nine credits in Communication courses. Junior standing or Senior standing in Communication
Typically offered in Fall and Spring

COM 506/ENG 506 Verbal Data Analysis (3 credit hours)
Research strategies for understanding how spoken and written language shapes activities (e.g., design, instruction, counseling, gaming interactions, e-commerce, etc.). Tracking patterned uses of language as verbal data (e.g., grammatically topically, thematically), formulating research questions, and designing studies to answer those questions through quantitative descriptive means. Sampling, collecting and managing data, developing coding schemes, achieving reliability, using descriptive statistical measures, and reporting the results.
Typically offered in Fall only
COM 508/GES 508  Emerging Technologies and Society  (3 credit hours)
Provides frameworks for understanding emerging technologies and their social, political, and cultural contexts. Presents historical case studies, ethnographic accounts, and theoretical perspectives that introduce students to ways of thinking about science and technology, nature and culture, and democracy and expertise. Graduate standing is required.

Typically offered in Spring only

COM 514/ENG 514  History Of Rhetoric  (3 credit hours)
Historical development of rhetorical theory with attention to contemporaneous rhetorical practice and philosophical trends. Major focus on the classical period with briefer coverage of medieval, Renaissance, 18th-century, and 19th-century developments. Implications for contemporary theory and practice, including pedagogical practice.

Typically offered in Fall only

COM 516/ENG 516  Rhetorical Criticism: Theory and Practice  (3 credit hours)
Development, achievements, limitation of major critical methods in the 20th century, including neo-Aristotelian, generic, metaphoric, dramatistic, feminist, social-movement, fantasy-theme and postmodern approaches. Criticism of political discourse, institutional discourse, discourses of law, medicine, religion, education, science, the media. Relations between rhetorical and literary criticism and other forms of cultural analysis.

Prerequisite: Graduate Standing or the equivalent of COM/ENG 321 or COM/ENG 411
Typically offered in Spring only

COM 521  Communication and Globalization  (3 credit hours)
Economic, political, cultural dimensions of globalization. Role of information and communication technologies, networks, institutions, and practices in human social organization.

Prerequisite: Graduate standing
Typically offered in Summer only

COM 522  Critical Approaches to Organizational Communication  (3 credit hours)
Overview of critical and interpretive organizational communication research studies. Application of insights to enriching and transforming working lives.

Prerequisite: Graduate standing
Typically offered in Spring only

COM 523  International and Intercultural Communication  (3 credit hours)
Survey of intercultural, cross-cultural, and international communication theories and issues.

Prerequisite: Graduate standing
Typically offered in Spring only

COM 525  Group/Team Communication  (3 credit hours)
Comprehensive review of principles, theory, research, and practices involving group/team communication; associated with decision making, conflict management, relationship building, and evaluation of group/team effectiveness. Emphasis on guidelines for effective communication in groups and teams. Graduate standing required.

Prerequisite: Graduate standing
Typically offered in Fall only

COM 526  Media Economics  (3 credit hours)
This course provides an overview of economic perspectives on media and communication, particularly examining cases, topics, and controversies that stem from the many linkages between media and the economy. It reviews a range of perspectives on the economy of media, including the critical political economic approaches commonly employed in the field of communication, but also emerging neoclassical, behavioral, institutional, and heterodox approaches to economics, as applied to a range of possible topics. These may include: media ownership and the economics of journalism; labor and social media; data and surveillance economies; copyright and intellectual property; piracy, sharing, and collaboration; digital gift economies; social media celebrity and influencers; bitcoin and other virtual currencies; debt, credit, and algorithmic calculation; microfinance apps; “on-demand” platforms such as Uber and Lyft; automation and the future of employment; global supply chains in the manufacture of technology; the disposal of waste; consumerism and unsustainable energy use.

Prerequisite: Graduate standing
Typically offered in Spring only

COM 527  Seminar in Organizational Conflict Management  (3 credit hours)
Examination of conflict antecedents, interventions, outcomes through multiple texts, journal articles. Emphasis on workplace conflict, organizational outcomes, dispute system design. Evaluation through participation in class discussion, independent papers, research project, presentation.

Prerequisite: Graduate standing
Typically offered in Summer only

COM 528  Communication Culture and Technology  (3 credit hours)

Prerequisite: Graduate standing
Typically offered in Spring only

COM 529  Communication Campaigns  (3 credit hours)
Prepares students to design, implement, monitor, and evaluate a successful communication campaign for a health, public relations, or political organization that is grounded in sound theoretical approaches. The students conduct focus groups for audience research and successful communication campaign for a health, public relations, or political organization that is grounded in sound theoretical approaches. The students conduct focus groups for audience research and professionally present a campaign plan to a real client for any of the mentioned types of organizations. The course emphasizes theoretical and hands on practical skills to developing successful communication campaigns.

Typically offered in Spring only

COM 530  Interpersonal Communication in Science and Technology Organizations  (3 credit hours)
Blends theory and research to understand and analyze interpersonal communication practices and issues within organizations, including managing impressions and conversations, engaging in active listening, managing conflict, influencing others, and communicating in teams. Focus on developing and maintaining effective interpersonal at work and improving student's communication competence.

Prerequisite: Graduate standing
Typically offered in Summer only
COM 532 Communication Consulting (3 credit hours)
This course provides an introduction to the art and methods of consulting particularly as applied to communication problems in organizational settings. It also provides students the opportunity to develop and/or refine training and facilitation skills.

Typically offered in Fall only

COM 536 Environmental Communication (3 credit hours)
Critical analysis of environmental discourse in organizational, mass media, political, cultural, and international contexts. Investigates public participation in environmental advocacy and deliberation; environmental conflict management; rhetorical constructions of nature and human relationships with nature; environmental justice; environmental risk communication; and competing ecological paradigms. Must hold graduate standing.

Typically offered in Spring only

COM 537 Gaming and Social Networks (3 credit hours)
Exploration of inter-relations among mobile technologies (cell phones, PDAs), location-based activities, and playful/social spaces. Investigates: (1) the definition of basic gaming concepts (community, narrative, play, and space); (2) the history of games as social environments, with particular emphasis on multi-user domains (MUDs); and (3) the definition of games, which use the physical space as the game environment, such as pervasive games, location-based games, and hybrid reality games. Discussion of inter-connections among games, education, and art. By permission of department.

Typically offered in Fall only

COM 538 Risk Communication (3 credit hours)
Comprehensive review of principles, theory, research, and practices involving consensus building; associated with environmental, health and safety; enabling analysis and management of risks. Emphasis on risks associated with emerging science and technology. No quantitative experience necessary. Graduate standing required.

Typically offered in Fall only

COM 539/PA 539 Fund Development (3 credit hours)
Identifies and assesses techniques and best practices of fund development, annual giving, capital campaigns, endowments. Topics include setting achievable goals, organizing and staffing a fund development campaign, and identifying donors. Discusses links between fund development and organization mission and governance, ethical issues, and government regulations. PBS status or Graduate standing.

Typically offered in Fall only

COM 540 Critical and Interpretive Inquiry in Communication (3 credit hours)
Theoretical foundations and analytical techniques in critical and interpretive communication research. Analysis of culture and power in communicative practices, texts, technologies, production, and reception. Historical, political economic, archival, contextual, interpretive, rhetorical, and cultural modes of analysis and critique are highlighted. Graduate standing required.

Typically offered in Fall and Spring

COM 541 Quantitative Research Methods in Applied Communication (3 credit hours)
Introduction to research methods in applied communication. Knowledge of design, implementation, and analysis of various quantitative research methods.

Prerequisite: Graduate standing
Typically offered in Spring only

COM 542 Qualitative Research Methods in Applied Communication (3 credit hours)
Theoretical and practical dimensions of conducting qualitative research. Issues include asking good questions, field observation, ethics, focus groups, interviews, representation of data, analyzing texts and discourse, writing qualitative reports.

Prerequisite: Graduate standing
Typically offered in Spring only

COM 543 Visual Content Analysis (3 credit hours)
Research methods class in social science-oriented quantitative or qualitative analysis. Students will advance visual research by developing and/or testing theoretical concepts for visual media. Readings will focus on analytic techniques and concepts for still or moving images in digital or traditional media. Contexts include social media, organizational websites, blogs, online news sites, films, games, mobile media, and more. Students use qualitative and quantitative analysis software. Graduate standing required

Typically offered in Fall only

COM 546 Nonprofit Marketing and Public Relations (3 credit hours)
Survey of the marketing and public relations principles and practices applicable to nonprofit organizations.

COM 547 Mobile Media and Communication (3 credit hours)
Mobile communication technologies and their influence on communication patterns and social behavior. Conceptualization of cell phones beyond mobile telephones, as Internet access points and gaming devices. History, current uses and future perspectives for the social use of mobile interfaces. The creation of new mobile communities. The influence of mobile images on communication and the creation of mobile networks. Use of mobile phones across cultures and places, such as Asia, Scandinavia, Africa, and Latin America. Permission of department.

COM 554/ENG 554 Contemporary Rhetorical Theory (3 credit hours)
Contemporary rhetorical theory covering the 20th and 21st centuries. Conceptual connections with and disruptions of the classical tradition and its successors; relationship between rhetorical theory and philosophical trends, institutional histories, socioeconomic circumstances, and pedagogical needs. Attention to current issues such as the revival of invention, rhetorical agency, and ethics.

Typically offered in Spring only

COM 556 Seminar in Organizational Communication (3 credit hours)
Theoretic and applied approaches for studying communication perspectives of organizational behavior. Topics relate communication with organizational theories, research methods, leadership, power, attraction, conflict and theory development.

Prerequisite: Advanced Undergraduate standing or Graduate standing
Typically offered in Spring only

COM 561 Human Communication Theory (3 credit hours)
The role of theory in study of human communication. General social scientific theories as well as context-based theories including interpersonal, public, group, organizational and mass communication contexts.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall only
COM 562 Communication and Social Change (3 credit hours)
Examine persuasive theories and methods including compliance gaining techniques. Evaluate effectiveness of public communication campaigns directed at social change.

Prerequisite: Graduate standing
Typically offered in Fall only

COM 563 Public Relations Theory (3 credit hours)
Study the theoretical body of knowledge in public relations and its application to practice. Graduate Standing required.

Typically offered in Spring only

COM 566 Seminar In Crisis Communication (3 credit hours)
Working within theoretical perspectives of communication, conflict management and organizational designs, a theoretical understanding for crisis communication, including thorough guidelines for strategic communication planning for, managing and evaluating crises.

Typically offered in Spring only

COM 579/COM 479 Climate Change Communication (3 credit hours)
An exploration of the communication successes and failures surrounding climate change and public opinion. Topics addressed include: agenda setting, media effects, framing, data visualizations, fear responses, naming, risk communication and theory, argumentation and refutation, and persuasion as well as issues and current events related to the challenges associated with communicating climate change to multiple stakeholders.

Typically offered in Fall only

COM 581/ENG 581 Visual Rhetoric: Theory and Criticism (3 credit hours)
Application of visual theory to rhetoric and of rhetorical theory to visual forms of communication. Discussion and analysis may include advertising, photography, news and informational media, political communication, instructional material, scientific visualization, visual arts, public commemorative artifacts, internet and other digital media.

R: Graduate Students Only
Typically offered in Spring only

COM 585 Teaching College Communication (3 credit hours)
Introduction to communication education theory and research. Course divided into primary parts: 1) education theory and philosophy and 2) instructional design theory and practice.

Prerequisite: Graduate standing
Typically offered in Fall only

COM 587 Internet & Society (3 credit hours)
Overview of the development of the internet and its social uses, including the historical context that led to the development of the ARPANET and the World Wide Web. Analysis of the transition from mainframes to personal computers, to the internet of things. Treatment of principal social and communication issues related to the use of the internet, such as digital privacy, digital divide, net neutrality, and civic engagement. Development of mobile internet, social networking sites and location-based social networks.

Typically offered in Fall only

COM 598 Special Topics In Communication (1-6 credit hours)
Detailed investigation of a special topic in communication. No more than 6 hrs. may be used as credit toward graduation with master's degree.

Typically offered in Fall, Spring, and Summer

COM 630 Independent Study in Communication (1-3 credit hours)
Special projects course to be utilized for guided research at graduate level. Topic determined by instructor. No more than 6 hrs. may be used as credit toward graduation with master's degree.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

COM 650 Communication Internship (1-6 credit hours)
The internship experience provides the students the opportunity to practice professional communication skills in a workplace setting under the supervision of a communication practitioner. Restricted to MS in Communication students.

Prerequisite: Acceptance into MS in Communication Program
Typically offered in Fall, Spring, and Summer

COM 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall and Summer

COM 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Fall and Spring

COM 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall and Spring

COM 695 MR Thesis Research (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

COM 696 Summer Thesis Res (1 credit hours)
Typically offered in Summer only
COM 798  Special Topics in Communication (3-6 credit hours)
Intensive exploration of specialized or emerging topics in an area of communication theory, rhetoric, media, or other aspect of Communication studies. Emphasis on student research and writing. May be used to test and develop new courses. May be repeated for credit. Doctoral students only.

Typically offered in Fall and Spring

COM 810  Directed Readings in Communication (1-6 credit hours)
Intensive study of a specific topic from various specializations of the Communication faculty. Negotiation between the student and the director for variable credit and approved by Director of Graduate Studies. May be repeated for credit. Doctoral students only.

Typically offered in Fall, Spring, and Summer

COM 896  Summer Dissertation Res (1 credit hours)

Communication Rhetoric & Digital Media (CRD)

CRD 701  History and Theory of Media Technologies (3 credit hours)
Foundational study of media and technology through examination of historical perspectives on technological change. Discussion of media theory, media archaeology, feminist theory, political economy, cultural studies, and functionalist perspectives on technology. Examination of media and power, social movements, alternative media, technology and development, participatory communication, technological diffusion. Research paper and seminar presentation.

Prerequisite: Doctoral student

Typically offered in Fall only

CRD 702  Rhetoric and Digital Media (3 credit hours)
Critical study and evaluation of the conceptual vocabulary of rhetoric and its relationship to digital communication and digital media.

Prerequisite: COM/ENG 514 or 516 or ENG 515, Doctoral student

Typically offered in Fall only

CRD 703  Communication Networks (3 credit hours)
Intensive study of theories, histories, and practices of networked communication. Emergence, development, acceptance, and dissolution of a variety of networks organized around information and communication technologies. Survey of network theory and methods for studying networks, networked communication practices, and their effects on issues such as identity, labor, organization, power, etc. Research/applications project developed in consultation with the instructor.

Restriction: CRDM students only

Typically offered in Spring only

CRD 704  Communication, Technologies, and Pedagogy (3 credit hours)
History, theory, research, and practice of integrating technology in higher education. Design, implementation, and critique of instructional strategies; ethical and professional issues; effects on the practices of teaching and learning and the development of communication abilities.

Prerequisite: Doctoral student

Typically offered in Fall only

CRD 790  Scholarly and Professional Paths in Disciplinary and Interdisciplinary Research (3 credit hours)
This seminar aims to 1) foster discussion about disciplinarity and interdisciplinarity, particularly in fields relevant to research in communication, rhetoric and digital media; and 2) develop and sharpen participants’ theoretical and methodological positionings as they prepare to pursue their professional goals.

Prerequisite: CRD 701, 702, 703, 704, Doctoral student

Typically offered in Spring only

CRD 791  Special Topics in Communication, Rhetoric, and Digital Media (3-6 credit hours)
An intensive seminar examining a particular topic or issue in the communication and rhetoric of digital media.

Prerequisite: CRD 701

Typically offered in Fall and Spring

CRD 809  Colloquium in Communication, Rhetoric, and Digital Media (1 credit hours)
Professional development, ethical inquiry, and discussion and evaluation of interdisciplinary research in a colloquium setting. In successive fall semesters, students participate in three one-credit colloquia that include faculty and students from across the program.

Prerequisite: Doctoral student

Typically offered in Fall only

CRD 885  Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

CRD 890  Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

CRD 893  Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Typically offered in Fall, Spring, and Summer

CRD 895  Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

CRD 896  Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student

Typically offered in Summer only
CRD 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Comparative Biological Science (CBS)

CBS 493 Undergraduate Research in Biomedical Sciences (1-3 credit hours)
A learning experience in College of Veterinary Medicine within an academic framework that utilizes campus facilities and resources for supervised undergraduate research. Arrangements must be initiated by the student and be approved by a faculty adviser, the college Undergraduate Research Coordinator, and the Associate Dean of Research Training and Graduate Programs. Students who enroll in this course are required in this course to complete and submit an Agreement for Non-Standard Courses form through Registration and Records.

Requisite: Sophomore Standing or Above
Typically offered in Fall and Spring

CBS 510 Animal Production Topics (1-3 credit hours)
Students will be provided with experience in management of production animals with an emphasis on the veterinary aspects of population health. Experience will come in the form of hands-on experiences and working through relevant literature to specific a

Typically offered in Fall and Spring

CBS 550 Population Medicine Forum (1 credit hours)
Population medicine forum is a seminar-based class during which current topics in population health are presented and discussed. Topics covered include: Outbreak investigation, observational epidemiologic research, risk analysis, spatial analysis, the application of unique diagnostic technologies and epidemiologic modeling.

Typically offered in Fall and Spring

CBS 565 Fundamentals of Biomedical Sciences (3 credit hours)
Introductory course for students interested in gaining a broad understanding of: comparative genomics, comparative immunology, comparative physiology, pharmacokinetics, emerging zoonotic diseases, epidemiology and translational research models and methods. This course also provides an overview of current technologies relevant to comparative biomedical research and a foundation for implementing the scientific method (e.g. experimental design, data analyses, statistics). Priority will be given to first-year students in CBS graduate program; enrollment of all students requires consent of instructor.

Typically offered in Fall only

CBS 570 Methods in Biomedical Sciences (1 credit hours)
Introductory course for students interested in gaining a broad understanding of various laboratory methods used in molecular, cellular and "omics" based biomedical research.

Typically offered in Fall only

CBS 579 Advanced Specialty Training (1-3 credit hours)
This course is designed to give students clinical experience and training to understand basic health management strategies, handle clinical evaluations, use diagnostic tools to facilitate accurate diagnosis, and develop prevention and/or treatment plans for health management. This course is restricted to students in the SVM program.

Typically offered in Fall and Spring

CBS 580 Clinical Veterinary Epidemiology (3 credit hours)
To expose students to the concepts and principles of epidemiology from the perspective of assessing health and disease in animal and human populations, and the measures to control disease status. Specifically to study the principles and concepts of veterinary epidemiology, to learn basic epidemiology methodology, critically review major veterinary care studies, and enhance oral and written communication skills.

Prerequisite: ST 511
Typically offered in Fall only

CBS 586 One Health: From Philosophy to Practice (2 credit hours)
Graduate/professional seminar (with team project) addressing intersections of veterinary medicine, human medicine, and environmental health. Co-listed at UNC CH Gillings School of Global Public Health and Duke University School of Medicine. Includes participants from these three institutions, plus related private-sector members, non-governmental organizations, and government professionals. Its purpose is to facilitate understanding of one health as a system of systems, and promote cross-campus and cross-discipline interactions. Weekly evening course held at NC Biotechnology Center, RTP. Requires graduate student standing at NCSU or professional student standing within the College of Veterinary Medicine. Limit: 15 students per university.

Typically offered in Fall only

CBS 595 Special Topics (1-6 credit hours)

CBS 611 Principles of Collaboration and Team Science (2 credit hours)
The focus of this course is exploring how to effectively communicate as a member of a cross-disciplinary team. Specifically, this course offers strategies and techniques about engaging in team science to pursue complex research questions, work effectively with team members, identify and address unconscious bias, and assess team performance in order to produce high impact research outcomes. To that end, we will examine aspects of group process and communication related to professional relationship development, teamwork, leadership, and conflict resolution.

Typically offered in Spring only

CBS 615 Advanced Animal Production Topics (1-3 credit hours)
Students will be provided with practice and experience in advanced topics related to management of production animals with an emphasis on the veterinary aspects of population health. Actual in-the-field, hands-on practice and investigation of relevant literature will provide the basis for study of advanced animal production topics. Course is restricted to students in the SVM program.

Prerequisite: SVM 510
Typically offered in Fall and Spring
CBS 624 Special Problems in Gastrointestinal Physiology (1 credit hours)
1 credit for a 1-hour in depth discussion session of current journal articles presented by students on the subject of gastrointestinal physiology. Journals recommended include the American Journal of Physiology, Gut and Gastroenterology. Each session will focus on one student's selected paper. MS students are expected to present 1 paper, and PhD students are expected to present up to 2 papers each semester. Students should be enrolled in a graduate course of study in a field related to or focused on physiology. Undergraduate students require special permission.

Typically offered in Fall and Spring

CBS 635 MR Advanced Reading (1-3 credit hours)
Typically offered in Fall and Spring

CBS 649 Issues in Preventive Medicine and Public Health (1 credit hours)
Issues in Preventive Medicine and Public Health is a literature review course designed to assist students with their preparation for careers in public health, ecosystem health, biosecurity and public policy, disaster management, and application for Board Certification in the American College of Preventive Veterinary Medicine. Permission by course instructor required for enrollment.

Prerequisite: A prior degree in veterinary medicine or public health

CBS 650 Population Medicine Forum (1 credit hours)
Population medicine forum is a seminar-based class during which current topics in population health are presented and discussed. Topics covered include: Outbreak investigation, observational epidemiologic research, risk analysis, spatial analysis, the application of unique diagnostic technologies and epidemiologic modeling.

Typically offered in Fall and Spring

CBS 662 Professional Conduct in Biomedical Research (1 credit hours)
Plagiarism, authorship, fraud, safety, sexual harassment, IACUC, consulting agreements, serving as an expert witness, contacting elected officials, working with press, human subjects committee, and related topics.

Typically offered in Spring only

CBS 680 MR Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

CBS 681 MR Seminar (1-3 credit hours)
Typically offered in Fall and Spring

CBS 682 Seminar - Poultry Medicine (1-3 credit hours)
Typically offered in Fall, Spring, and Summer

CBS 683 MR Other Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

CBS 684 Internship (1-3 credit hours)
Credit for internships in fields related to the comparative biomedical sciences.

Typically offered in Fall, Spring, and Summer

CBS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CBS 686 Food Animal Health Teachings (1-3 credit hours)

CBS 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CBS 695 Master's Thesis Research (1-9 credit hours)
Thesis research

Prerequisite: Master's student
Typically offered in Summer only

CBS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student

CBS 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.

Prerequisite: Master's student

CBS 705/BIO 705 Fundamentals of Neuroscience (3 credit hours)
This is a fundamental course that will provide the student with an up-to-date coverage of molecular, cellular, physiological, and circuit-based aspects of Modern Neurosciences in the Comparative Biomedical Sciences Graduate Program. Being a graduate-level class, the instructors will assume that the students have acquired some background in basic biology and biochemistry. The most important goal of this course is to train PhD students in neuroscience function and disorders, preparing them for neuroscience research. Emphasis will be placed on the systems and skills needed to pursue experimental neuroscience activities. Important components of the learning process will be presentations from neuroscience experts, class discussions, exams and in class activities.

P: BIO 488 or permission of instructor
Typically offered in Fall only

CBS 711 Applications in Reproductive Physiology (2 credit hours)
Students with advanced interests in Theriogenology will meet weekly to discuss a wide range of current topics surrounding animal reproduction, including comparative physiology and endocrinology, reproductive management, reproductive pharmacologic/technologic advances in Theriogenology. Each student will be expected to present 2-3 topics with typed, referenced notes and an oral presentation. All students will be expected to actively participate in group discussions and briefly present a review of one topic-related article from the past 5 years during each lecture.

Typically offered in Fall only
CBS 712 Reproductive Management and Disease in Domestic Animals (1 credit hours)
Students will meet every other week to review current literature and discuss a wide range of topics surrounding animal reproduction, focused on clinical causes of infertility and their treatments in domestic and non-domestic species. Students will explore 3-5 preassigned questions surrounding a particular topic and prepare an in-depth handout answering those questions prior to arrival. Each student will be expected to actively participate in group discussions

Typically offered in Fall and Spring

CBS 713 Zoonoses and Public Health (3 credit hours)
Enrollment to graduate veterinarians, MVPH, MPH, or other graduate students. Veterinary students will be considered for enrollment after consultation with the course coordinator.

Prerequisite: VPH 580 or equivalent, ST 511 or equivalent

CBS 750 Techniques in Pharmacological Research (2 credit hours)
Theory and applications of modern scientific instrumentation to analysis of tissues, body fluids and drugs in pharmacological research. Discussion of appropriate aspects of the pharmacological use of spectroscopy, microscopy, chromatography, electrophoresis, radioisotope usage and centrifugation.

Prerequisite: BCH 452B or CH 315 or Equivalent and Graduate standing
Typically offered in Spring only

CBS 754 Epidemiology II (3 credit hours)
Study design, data management, and statistical analysis including applications of logistic regression and survival analysis. Main focus on descriptive, analytical and experimental epidemiology pertinent to disease etiology and prevention.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

CBS 760 Molecular Technologies for Epidemiologic Investigation (3 credit hours)
The course is designed to help students refine their ability to select and interpret molecular diagnostic technologies for epidemiologic disease surveillance and investigation.

Prerequisite: Introductory Epidemiology
Typically offered in Spring only

CBS 762 Principles of Pharmacology (3 credit hours)
The action of drugs in animals and man including basic principles of drug disposition, pharmacokinetics, drug resistance, and signal transduction. Modification of physiological processes by drugs influencing nervous, renal, cardiovascular, and endocrine systems and the antimicrobial and antineoplastics agents.

Typically offered in Spring only

CBS 764/NTR 764/PHY 764 Advances in Gastrointestinal Pathophysiology (3 credit hours)
This course will focus on advanced gastrointestinal physiology and the pathophysiology of diseases of relevance to scientists involved in animal-related research. In particular, the course will cover the pathophysiology of ulceration, infectious diarrhea, ischemia, motility disorders, and inflammatory diseases of the gut. An in-depth review paper will be required based on recent literature regarding a specific gastrointestinal disease.

Prerequisite: PHY 503, PHY 504
Typically offered in Fall only

CBS 770 Cell Biology (3 credit hours)
Advanced cell and organelle structure and function and recent advances in molecular biology. Emphasis on current literature and application of research procedures.

Prerequisite: BCH 451 and BIO 183 and (CH 223 or CH 227)
Typically offered in Spring only

CBS 773 Advanced Developmental Biology (2 credit hours)

Typically offered in Fall and Spring

CBS 774 Epidemiology Of Infectious Diseases Of International Importance (3 credit hours)
Discussion of infectious diseases and epidemiological principles. Stress on selected enteric, zoonotic, nosocomial diseases of worldwide importance. Consideration of population dynamic techniques related to host-vector-agent.

Typically offered in Fall only

CBS 780 Veterinary Production Epidemiology (2 credit hours)
Examination of tools, limits, advantages and disadvantages specific to veterinary epidemiology and its execution. Assessment of means of disease prevention and outbreak investigation; mathematical simulation and economics; plus monitoring and evaluation of disease control programs; use of a multiple-species orientation. Application of the above epidemiologic techniques and their roles in assisting producers, practitioners and regulators.

Typically offered in Spring only
CBS 783/IMM 783/MB 783  Advanced Immunology  (3 credit hours)
In depth study of the basic cellular and molecular mechanisms of immunity, including antigen processing and presentation, T cell development, initiation of the immune response, effector mechanisms, and immunological memory. The course is designed for advanced graduate students who wish to focus on the current concepts in immunology.

Prerequisite: MB (IMM) 751
Typically offered in Fall only

CBS 785  Advanced and Molecular Pharmacology  (2 credit hours)
A course for graduate students providing a comprehensive investigation of current topics in Pharmacology with an emphasis on molecular and cellular approaches in lecture and discussion formats. Faculty will introduce each subject area and students will read recent articles, present seminars, and write professional-grade papers.

Typically offered in Fall only

CBS 787  Pharmacokinetics  (3 credit hours)
Mathematical models to describe disposition of drugs and toxic chemicals in the animal body. Areas including classic compartmental and nonlinear models as well as physiological approaches. Discussion of application of these techniques to toxicologist study.

Typically offered in Fall only

CBS 795  Special Topics in Comparative Biomedical Sciences  (1-6 credit hours)
Special Topics in Comparative Biomedical Sciences

Prerequisite: Graduate Students, DVM or equivalent degree

Typically offered in Fall only

CBS 800  CBS Seminar  (1 credit hours)
Presentation and discussions on ongoing research and current topics in biomedical sciences.

Typically offered in Fall only

CBS 803  Seminar in Surgical Pathology  (1 credit hours)
Description and interpretation of microscopic changes in tissues from diseased domestic and laboratory animals. Students attend and participate in a one-hour weekly seminar where microscopic lesions described, interpreted and discussed.

Typically offered in Fall and Spring

CBS 804  Seminar in Necropsy Pathology  (1 credit hours)
Description and interpretation of gross changes in tissues from diseased domestic animals. Students attend daily (M-F) 15-to 30-minute review of necropsy lesions presented by a member of the graduate staff.

Typically offered in Fall and Spring

CBS 805/BIO 805  Special Topics in Neuroscience  (1 credit hours)
Topics in neuroscience. This course will provide an opportunity for students to integrate and apply knowledge and skills gained from their graduate studies. Emphasis will be placed on primary literature, scientific practice, and on effective, professional communication and presentations. Topics and instructors will vary from semester to semester. Priority will initially be given to graduate students participating in the neuroscience concentration; other students with the necessary prerequisites will be admitted on a space available basis.
R: Grad Standing or Instructor Approval
Typically offered in Spring only

CBS 810  Special Topics  (1-6 credit hours)
Designed to present new or special subject matter within the scope of pathology, veterinary microbiology, morphology or pharmacology. The studies may include independent investigations, seminars and/or formal lectures.

Prerequisite: Senior standing or Graduate standing
Typically offered in Fall and Spring

CBS 812  Special Topics Pathology  (1-6 credit hours)
Specific topics of study assigned in various laboratories involved in veterinary microbiology investigation. Students conduct in-dept studies of assigned problem areas.

Typically offered in Fall and Spring

CBS 813  Special Topics Laboratory Pharmacology  (1-6 credit hours)
Involvement in practical participation in the normal research activities of different laboratories working in pharmacological research. Students pursue a semi-independent project.

Typically offered in Fall and Spring

CBS 816  Advanced Topics In Immunology  (1 credit hours)
Selected topics of current interest in immunology. A different topic will be covered each semester to focus on the most recent developments in the field.

Typically offered in Fall and Spring

CBS 817  Advanced Topics In Zoological Medicine I  (2 credit hours)
Selected topics of current interest in clinical zoological medicine focused on marine mammals, fish, reptiles, amphibians, waterfowl, raptors, and medical issues in free-ranging wildlife. Review of current clinical and basic science literature, student-lead discussion sessions and participation in faculty-lead discussions.

Typically offered in Fall only
CBS 818 Advanced Topics in Zoological Medicine (2 credit hours)
This course provides breadth and depth of knowledge in zoological medicine to prepare Zoological Medicine residents to pass American College of Zoological Medicine (ACZM) boards. Veterinary students are exposed to more in depth information related to zoological medicine than covered in their core curriculum. Each Fall (CBS 817) and Spring (CBS 818) semesters, different aspects of zoological medicine are covered. Topics rotate every 3 years so that all major groups of animals within the sub-groups, avian, aquatic, herptile, wildlife, and zoo are addressed.

Prerequisite: Graduate standing or enrollment in DVM curriculum
Typically offered in Spring only

CBS 820 Special Problems (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in CBS.

Typically offered in Fall and Spring

CBS 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CBS 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CBS 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CBS 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CBS 896 Summer Dissertation Research (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

CBS 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Comparative Literature (CL)

CL 495 Special Topics in Comparative Literature (3 credit hours)
Detailed investigation of a topic in comparative literature. Topic and mode of study determined by faculty member(s) in consultation with Comparative Literature Committee and heads of departments of English and Foreign Languages.

Computer Science (CSC)

CSC 110 Computer Science Principles - The Beauty and Joy of Computing (3 credit hours)
This course explores the principles of computer science while emphasizing the relevance of computing to students and to society. Students will learn about beautiful computing applications that have changed the world and how computing empowers discovery and innovation. Students will learn the joy of programming a computer using a friendly, graphical language capable of creating apps, simulations, and games. Students who complete the course will be able to solve meaningful problems with computers, apply design processes to take an idea from concept to implementation, develop a computer program, and analyze computing artifacts from both design and computing perspectives. Students will complete a substantial team programming project related to their interests. 20% of seats will be restricted to Computer Science or CS-Intended students. Enrolling students must not have received credit for or a grade in CSC 116 or CSC 200.

Restriction: Cannot have taken CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or CSC 200
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

CSC 111 Introduction to Computing: Python (3 credit hours)
Computation problem solving through writing Python programs. Particular elements include: careful development of Python programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstractions and verification; engineering applications. Most seats reserved for Civil, Construction, and Environmental Engineering majors.

Co-requisite: E 115 or COS 100 and MA 121 or MA 131 or MA 141
Typically offered in Fall and Spring

CSC 112 Introduction to Computing-FORTRAN (3 credit hours)
Problem solving through writing FORTRAN programs. Particular elements include: careful development of FORTRAN programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstractions and verification; engineering applications.

Co-requisite: E 115 or COS 100 and MA 121 or MA 131 or MA 141
Typically offered in Fall, Spring, and Summer

CSC 113 Introduction to Computing - MATLAB (3 credit hours)
Problem solving through writing MATLAB programs. Particular elements include: careful development of MATLAB programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; abstractions and verification; engineering applications. Most seats reserved for Aerospace, Mechanical, and Biomedical Engineering majors.

Co-requisite: E 115 or COS 100 and MA 121 or MA 131 or MA 141
Typically offered in Fall and Spring
CSC 116 Introduction to Computing - Java (3 credit hours)
An introductory course in computing in Java. Emphasis on algorithm development and problem solving. Careful and methodical development of Java applications from specifications; document and style; appropriate use of control structures; classes and
Co-requisite: E 115 or COS 100 and MA 121 or MA 131 or MA 141
Typically offered in Fall, Spring, and Summer

CSC 200 Introduction to Computers and Their Uses (3 credit hours)
Survey of basic principles of computer hardware, communications, operating systems, microcomputer issues, security, impact on society, system development, and use in organizations. Hands-on use of software, including operating system commands, wordprocessing, spreadsheets, and database managers. Demonstration and application of current end-user applications. May not be used by CSC major as a restricted elective.

Typically offered in Fall, Spring, and Summer

CSC 216 Software Development Fundamentals (3 credit hours)
The second course in computing, intended for majors and minors. Emphasis is on exploring encapsulation; polymorphism; composition; inheritance; finite state machines; linear data structures (including array lists, linked lists, stacks, queues, and the tradeoffs in implementation); and recursion (including recursive linked lists) in the context of the software development lifecycle including the processes and practices for designing, implementing, and testing high quality software.

Prerequisite: CSC 116 with a grade of C or better; Corequisite: CSC 217
Typically offered in Fall, Spring, and Summer

CSC 217 Software Development Fundamentals Lab (1 credit hours)
Laboratory course to accompany CSC 216 lecture course. Application of the software processes and practices to design, implement, and test the development of software solutions requiring composition; inheritance; finite state machines; and linear data structures, including recursive linked lists.

Prerequisite: CSC 116 with a C or better; Corequisites: CSC 216
Typically offered in Fall, Spring, and Summer

CSC 226 Discrete Mathematics for Computer Scientists (3 credit hours)

Typically offered in Fall, Spring, and Summer

CSC 230 C and Software Tools (3 credit hours)
Details of C programming as compared with Java; Lexical structure, syntax, semantics, and pragmatics (idioms, common uses) of C; Stages of compilation, linking and execution; Strings, arrays, structures, pointers, and memory management; C libraries; Tools for design, maintenance, and debugging of programs; Separate compilation, modular programming; Integrated development environments.

Prerequisite: CSC 216 with a C or better.
Typically offered in Fall, Spring, and Summer

CSC 236 Computer Organization and Assembly Language for Computer Scientists (3 credit hours)
Computer architecture topics required by professional software developers, including binary and hexadecimal numbers, hardware component organization, machine instruction sets, assembler language programming, linking assembly language with high-level languages, program testing, computer hardware design issues, computer software design issues, and trends in current computer design.

Prerequisite: CSC 230 or ECE 209
Typically offered in Fall, Spring, and Summer

CSC 246 Concepts and Facilities of Operating Systems for Computer Scientists (3 credit hours)
Fundamental concepts of computer operating systems for computer scientists, including memory management, file systems, process management, distributed systems, deadlocks, and basic security and system accounting.

Prerequisite: CSC 230 or ECE 209; Corequisite: CSC 236 or ECE 109
Typically offered in Fall, Spring, and Summer

CSC 251 Web Page Development (1 credit hours)
Syntax and semantics of HTML (HyperText Markup Language). Students will learn necessary skills to develop web pages on their EOS/Unity account. In addition to mechanics, design aspects and bandwidth conservancy are covered. Several pages will be created including a final project.

Prerequisite: E 115 or equivalent knowledge of EOS/Unity system
Typically offered in Spring only

CSC 255 String Processing Languages (1 credit hours)
Syntax and semantics of a string manipulation language, currently SNOBOL 4. Application of the language to programming problems in non-numeric areas. Discussion of other string processing languages such as PERL.

Prerequisite: Programming knowledge
Typically offered in Fall only

CSC 281 Foundations of Interactive Game Design (3 credit hours)
Surveys history, technology, narrative, ethics, and design of interactive computer games. Work in teams to develop novel game designs and computer games. Introduction to the interplay of narrative, technology, rule systems, play and culture in the creation of interactive games. Programming experience not required. Enrollment restricted to students with at least sophomore status.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

CSC 295 Special Topics in Computer Science (1-3 credit hours)
Special topics in CSC at the early undergraduate level.

CSC 302 Introduction to Numerical Methods (3 credit hours)
Numerical computations with digital computers; floating point arithmetic and implications of round-off error. Algorithms and computer techniques for the numerical solution of problems in: function evaluation; zeros of functions; interpolation; numerical

Prerequisite: CSC 116 with a grade of C or higher and MA 305 or MA 405
Typically offered in Fall only
CSC 316  Data Structures and Algorithms  (3 credit hours)  
Abstract data types; abstract and implementation-level views of data types. Linear and branching data structures, including stacks, queues, trees, heaps, hash tables, graphs, and others at discretion of instructor. Best, worst, and average case asymptotic time and space complexity as a means of formal analysis of iterative and recursive algorithms. 
Prerequisite: CSC 216 with a grade of C or better and (CSC 226 or MA 225) with a grade of C or better  
Typically offered in Fall, Spring, and Summer

CSC 326  Software Engineering  (4 credit hours)  
Application of software engineering methods to develop complex products, including the following skills: quality assurance, project management, requirements analysis, specifications, design, development, testing, production, maintenance, security, privacy, configuration management, build systems, communication, and teaming.  
Prerequisite: CSC 230 or ECE 209 and CSC 316 or ECE 309  
Typically offered in Fall and Spring

CSC 333  Automata, Grammars, and Computability  (3 credit hours)  
Study of three classical formal models of computation--finite state machines, context-free grammars, and Turing machines--and the corresponding families of formal languages. Power and limitations of each model. Parsing. Non-determinism. The Halting Problem and undecidability. The classes P and NP, and NP-completeness.  
Prerequisite: Grade of C or better in either MA 225 or CSC 226  
Typically offered in Fall, Spring, and Summer

CSC 342  Applied Web-based Client-Server Computing  (3 credit hours)  
This course explores client-server computing on the World Wide Web. The course focuses on the architecture of web-based client-server applications and accepted industry practices. Students work in teams to develop web applications with dynamic content  
Prerequisite: Grade of C or better in CSC 216

CSC 379  Ethics in Computing  (1 credit hours)  
Discussion of the concern for the way in which computers pose new ethical questions or pose new versions of standard moral problems and dilemmas. Study of ethical concepts to guide the computer professional. Computer professional codes of ethics. Use of 
Requirement: Junior Standing  
Typically offered in Fall and Spring

CSC 401  Data and Computer Communications Networks  (3 credit hours)  
This course provides an introduction to fundamental concepts in the design and implementation of computer networks, their protocols, and applications with a particular emphasis on the Internet's TCP/IP, OSPF/ BGP, Ethernet, IEEE 802.11 protocol suite. Topics to be covered include: network architectures, packet/circuit switching, network applications, sockets, reliable data transport, flow control, congestion control, routing, link protocols, addressing, local area networks, wireless networks, mobility, management, network security, software defined networking and the design of network services. Credit is not allowed for both CSC 401 and ECE 407.  
Prerequisite: ST 370 and CSC 246  
Typically offered in Fall, Spring, and Summer

CSC 402  Networking Projects  (3 credit hours)  
Through a series of hands-on networking labs, students will gain experience in practical topics such as network configuration, troubleshooting, and static and dynamic routing. The course prepares students sufficiently for an industry certification.  
Prerequisite: CSC 401  
Typically offered in Spring only

CSC 405  Computer Security  (3 credit hours)  
Basic concepts and techniques in information security and management such as risks and vulnerabilities, applied cryptography, program security, malicious software, authentication, access control, operating systems security, multilevel security, trusted operating systems, database security, inference control, physical security, and system assurance and evaluation. Coverage of high-level concepts such as confidentiality, integrity, and availability applied to hardware, software, and data.  
Prerequisite: CSC 246  
Typically offered in Spring only

CSC 406/CSC 506/ECE 506/ECE 406  Architecture Of Parallel Computers  (3 credit hours)  
The need for parallel and massively parallel computers. Taxonomy of parallel computer architecture, and programming models for parallel architectures. Example parallel algorithms. Shared-memory vs. distributed-memory architectures. Correctness and performance issues. Cache coherence and memory consistency. Bus-based and scalable directory-based multiprocessors. Interconnection-network topologies and switch design. Brief overview of advanced topics such as multiprocessor prefetching and speculative parallel execution. Credit is not allowed for more than one course in this set: ECE 406, ECE 506, CSC 406.  
Typically offered in Fall and Spring

CSC 411  Introduction to Artificial Intelligence  (3 credit hours)  
Overview and definitions of Artificial Intelligence (AI). Search, including depth-first and breadth-first techniques with backtracking. Knowledge representation with emphasis on logical methods, Horn databases, resolution, quantification, unification, skolemization and control issues; non-monotonic reasoning; frames; semantic nets. AI systems, including planning, learning, natural language and expert systems. An AI programming language may be taught at the instructor's discretion.  
Prerequisite: CSC 316 or ECE 309  
Typically offered in Spring only

CSC 412/CSC 512  Compiler Construction  (3 credit hours)  
The course will concentrate on the theory and practice of compiler-writing. Topics to be covered will include techniques for parsing, code generation, and optimization. Furthermore, the theoretical underpinnings of compilers such as LR parsing will be covered. Finally, the students will be exposed to compiler construction tools, and will obtain hands-on experience in building a compiler for a small programming language. Besides the listed prerequisite courses, other helpful courses include CSC 253, CSC 224, CSC 234, and MA 121.  
Prerequisites: Graduate standing and CSC 316 and CSC 333 or equivalent classes.  
Typically offered in Fall only
CSC 414/CSC 514/MA 414/MA 514 Foundations of Cryptography (3 credit hours)
Cryptography is the study of mathematical techniques for securing digital information, systems and distributed computation against adversarial attacks. In this class you will learn the concepts and the algorithms behind the most used cryptographic protocols: you will learn how to formally define security properties and how to formally prove/disprove that a cryptographic protocol achieves a certain security property. You will also discover that cryptography has a much broader range of applications. It solves absolutely paradoxical problems such as proving knowledge of a secret without ever revealing the secret (zero-knowledge proof), or computing the output of a function without ever knowing the input of the function (secure computation). Finally, we will look closely at one of the recent popular application of cryptography: the blockchain technology. Additionally, graduate students will study some of the topics in greater depth.
Prerequisite: (CSC 226 AND CSC 333) OR MA 225
Typically offered in Fall only

CSC 415 Software Security (3 credit hours)
Introduces students to the discipline of designing, developing, and testing secure and dependable software-based systems. Students will learn about risks and vulnerabilities, and effective software security techniques. Topics include common vulnerabilities, access control, information leakage, logging, usability, risk analysis, testing, design principles, security policies, and privacy. Project required.
Corequisite: CSC 326
Typically offered in Fall only

CSC 416/MA 416 Introduction to Combinatorics (3 credit hours)
Basic principles of counting: addition and multiplication principles, generating functions, recursive methods, inclusion-exclusion, pigeonhole principle; basic concepts of graph theory: graphs, digraphs, connectedness, trees; additional topics from: Polya theory of counting, Ramsey theory; combinatorial optimization - matching and covering, minimum spanning trees, minimum distance, maximum flow; sieves; mobius inversion; partitions; Gaussian numbers and q-analogues; bijections and involutions; partially ordered sets.
Prerequisite: Grade of C or better in either MA 225 or CSC 226
Typically offered in Spring only

CSC 417 Theory of Programming Languages (3 credit hours)
Theory of programming languages with emphasis on programming language semantics and implementation issues. Formal models of syntax and semantics. Static versus dynamic scoping. Parameter passing mechanisms. Garbage collection. Programming in alternate paradigms such as applicative, functional, logic, and object-oriented programming languages.
Prerequisite: CSC 316 or ECE 309
Typically offered in Fall and Spring

CSC 422/CSC 522 Automated Learning and Data Analysis (3 credit hours)
Introduction to the problems and techniques for automated discovery of knowledge in databases. Topics include representation, evaluation, and formalization of knowledge for discovery; classification, prediction, clustering, and association methods. Selected applications in commerce, security, and bioinformatics. Students cannot get credit for both CSC 422 and CSC 522.
Prerequisite: ST 370 and MA 305, and a grade of C- or better in either CSC 226 or LOG 201
Typically offered in Spring only

CSC 427/MA 427 Introduction to Numerical Analysis I (3 credit hours)
Theory and practice of computational procedures including approximation of functions by interpolating polynomials, numerical differentiation and integration, and solution of ordinary differential equations including both initial value and boundary value problems. Computer applications and techniques.
Prerequisite: (MA 341 or MA 301) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or MA 116 or PY 251 or ST 114 or ECE 209)
Typically offered in Fall only

CSC 428/MA 428 Introduction to Numerical Analysis II (3 credit hours)
Computational procedures including direct and iterative solution of linear and nonlinear equations, matrices and eigenvalue calculations, function approximation by least squares, smoothing functions, and minimax approximations.
Prerequisite: (MA 305 or MA 405) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or MA 116 or PY 251 or ST 114 or ECE 209)
Typically offered in Spring only

CSC 431 File Organization and Processing (3 credit hours)
Hardware characteristics of storage devices. Basic file organizations including sequential, direct, and indexed sequential; hashing and collision resolution; perfect hashing; signatures; bloom filters; sorting and other bit level structures. Tree structures including binary search trees, B-trees, and trees. Dynamic hashing techniques. Structures including grid files. Applying file structures to practical problems.
Prerequisite: CSC 230 or ECE 209 and CSC 316 or ECE 309
Typically offered in Fall and Spring

CSC 433 Privacy in the Digital Age (3 credit hours)
Privacy is a growing concern in our modern society. We interact and share our personal information with a wide variety of organizations, including financial and healthcare institutions, web service providers and social networks. Many times such personal information is inappropriately collected, used or shared, often without our awareness. This course introduces privacy in a broad sense, with the aim of providing students an overview of the challenging and emerging research topics in privacy. This course will expose students to many of the issues that privacy engineers, program managers, researchers and designers deal with in industry. ST 370 is recommended.
P: CSC 316
Typically offered in Spring only
**CSC 440 Database Management Systems** (3 credit hours)
Introduction to database concepts. This course examines the logical organization of databases: the entity-relationship model; the relational data model and its languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity, concurrency control, transaction processing, and distributed database systems.

Prerequisite: CSC 316 or ECE 309
Typically offered in Fall only

**CSC 442/ST 442 Introduction to Data Science** (3 credit hours)
Overview of data structures, data lifecycle, statistical inference. Data management, queries, data cleaning, data wrangling. Classification and prediction methods to include linear regression, logistic regression, k-nearest neighbors, classification and regression trees. Association analysis. Clustering methods. Emphasis on analyzing data, use and development of software tools, and comparing methods.

Prerequisite: (MA 305 or MA 405) and (ST 305 or ST 312 or ST 370 or ST 372 or ST 380) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or ST 114 or ST 445)
Typically offered in Fall only

**CSC 450 Web Services** (3 credit hours)
Concepts, theories, and techniques for Web services. This course examines architectures for Web applications based on the classical publish, find, and bind triangle. It considers the description, discovery, and engagement of Web services. It emphasizes Web service composition. Key topics include semantics, transactions, processes, agents, quality of service, and compliance.

Prerequisite: CSC 316 or ECE 309
Typically offered in Fall only

**CSC 453 Introduction to Internet of Things (IoT) Systems** (3 credit hours)
CSC 453: Introduction to Internet of Things (IoT) Systems is a senior-level CSC restricted undergraduate elective on the concepts, protocols, techniques and design methodology underlying current and emerging networked wireless sensor/actuator systems coming to be known as IoT systems, at the intersection of physical computing, semantics and analytics, wireless communications, and networked distributed systems. Design considerations of such systems include diverse metrics such as delay, stability, privacy, expandability. The course includes (i) descriptive material on basic concepts and techniques appropriate to sensor networks, and analytics and semantics concepts appropriate to IoT systems, and (ii) hands-on work with a sampling of representative sensors and actuators, small format computers, networked application programming, and validation in real physical environments. The course includes a term project with assigned teams and project areas to design and implement a complete small IoT system. Students will be expected to purchase equipment for the course, costing about $70-$130.

Prerequisite: CSC 246 or ECE 306 and CSC 230 or ECE 209 and CSC 316 or ECE 309
Typically offered in Spring only

**CSC 454 Human-Computer Interaction** (3 credit hours)
A survey of concepts and techniques for user interface design and human computer interaction. Emphasizes user-centered design, interface development techniques, and usability evaluation.

Prerequisite: CSC 316 or ECE 309
Typically offered in Fall only

**CSC 455 Social Computing and Decentralized Artificial Intelligence** (3 credit hours)
This course surveys the field of social computing, introducing its key concepts, paradigms, and techniques. Specific topics are selected from the following list: social media and social network analytics, sociological underpinnings, crowdsourcing and surveys, human computation, social mobilization, human decision making, voting theory, judgment aggregation, prediction markets, economic mechanisms, incentives, organizational modeling, argumentation, contracts, norms, mobility and social context, sociotechnical systems, and software engineering with and for social computing. This course incorporates ideas from diverse disciplines (including sociology, psychology, law, economics, political science, logic, statistics, philosophy, business) to provide essential background for future computer science careers in industry and research.

Prerequisite: CSC 226 and CSC 316
Typically offered in Fall only

**CSC 456 Computer Architecture and Multiprocessors** (3 credit hours)
Major components of digital computers and the organization of these components into systems. Begins with single processor systems and extends to parallel systems for multiprocessing. Topics include computer organization, instruction set design, cache memory, pipelined processors, and multiprocessors. Recent developments in PC and desktop architectures are also studied.

Prerequisite: CSC 236 and CSC 316
Typically offered in Fall only

**CSC 461 Computer Graphics** (3 credit hours)
Principles of computer graphics with emphasis on two-dimensional and aspects of three-dimensional raster graphics. Topics include: graphics hardware devices, lines and polygons, clipping lines and polygons to windows, graphical user interface, vectors, projections, transformations, polygon fill. Programming projects in C or C++.

Prerequisite: MA 305 or MA 405 and CSC 230 or ECE 209 and CSC 316 or ECE 309
Typically offered in Fall only

**CSC 462 Advanced Computer Graphics Projects** (3 credit hours)
Principles of computer graphics with emphasis on three-dimensional graphics. Topics include: 3-D projections and transformations, curves and surfaces, color and texture, animation, visualization, and global illumination techniques. Programming project required.

Prerequisite: CSC 461
Typically offered in Spring only

**CSC 467 Multimedia Technology** (3 credit hours)
Methods of creating, recording, compressing, parsing, editing and playing back on a computer the following media: sound, music, voice, graphics, images, video, and motion. Introduction to basic principles: signal processing, information theory, real-time scheduling. Also includes discussion of standards, programming tools and languages, storage and I/O devices, networking support, legal issues, user interfaces, and applications. Includes significant hands-on experience.

Prerequisite: CSC 246
Typically offered in Spring only
CSC 472 Cybersecurity Projects  (3 credit hours)
Application of cybersecurity principles and basic computer science to solve a cybersecurity problem. Project with comprehensive written and oral project report is required. Enrollment is open to CSC majors only.
Prerequisite: CSC 471 and Senior Status
Typically offered in Spring only

CSC 474 Network Security  (3 credit hours)
Basic concepts and techniques in information security and management such as risks and vulnerabilities, applied cryptography, authentication, access control, multilevel security, multilateral security, network attacks and defense, intrusion detection, physical security, copyright protection, privacy mechanisms, security management, system assurance and evaluation, and information warfare. Coverage of high-level concepts such as confidentiality, integrity, and availability applied to hardware, software, and data. Credit not allowed for both CSC 474 and CSC 574.
Prerequisite: CSC 230 or ECE 209
Typically offered in Fall only

CSC 481 Game Engine Foundations  (3 credit hours)
An introduction to game engines, the technologies underlying computer and console game development. This course will cover engine components, architectures, and designs. Topics include asset management, resource management, event management, memory management, timelines, multithreading, network architectures, and game object models. A sequence of programming assignments will lead students through the implementation of their own game engine, which they will use to design their own game.
Prerequisite: CSC 316 or ECE 309
Typically offered in Fall only

CSC 482 Advanced Computer Game Projects  (3 credit hours)
Principles of computer game development with emphasis on 3D first-person game engines. Topics include: advanced character behavior control, procedural content generation, large scale multi-player game design and infrastructure, serious games for education, training and other applications, the game production pipeline and project built on top of a commercial game engine. Consideration of the game production pipeline, including project pitches, requirements and design detail. Programming project with written and oral reporting is required. Enrollment open to CSC majors only.
Prerequisite: CSC 481
Typically offered in Fall only

CSC 484/CSC 584 Building Game AI  (3 credit hours)
In this course we will examine Artificial Intelligence (AI) techniques that are used in the design of computer games. We will look at techniques for game playing as well as the design of AI opponents tasked with creating "good experiences" for players. The course will begin with a discussion of general AI, common algorithms, data structures, and representations. From there, we will cover topics in character movement, pathfinding, decision making, strategy, tactics, and learning. In a sequence of programming assignments students will create increasingly sophisticated AI implementations. Students will also critically review the projects conducted by graduate students enrolled in CSC584. CSC majors only. Students cannot get credit for both CSC 484 and CSC 584.
Prerequisite: CSC 316
Typically offered in Spring only

CSC 492 Senior Design Project  (3 credit hours)
Application of software engineering principles and basic computer science to the total development of a software system. Consideration of the software system design process, including requirements and design detail. Development and evaluation of a prototype accomplished through design team activity. Comprehensive written and oral project report is required. Open to CSC majors. Restricted to students with 6 hours of Computer Science Restricted Elective.
Prerequisite: CSC 326
Typically offered in Fall and Spring

CSC 495 Special Topics in Computer Science  (1-6 credit hours)
Used for the following types of study: readings in the literature of computer science, introductory research projects, major computer programming projects, seminars, or new course development. Work may be done in any CSC area such as software, hardware utilization, programming languages, numerical methods or telecommunications. Departmental Approval Required.
Typically offered in Fall, Spring, and Summer

CSC 499 Independent Research in Computer Science  (1-6 credit hours)
Independent investigation of a research problem under faculty supervision. Departmental Approval Required. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student.
Typically offered in Fall, Spring, and Summer

CSC 501 Operating Systems Principles  (3 credit hours)
Fundamental issues related to the design of operating systems. Process scheduling and coordination, deadlock, memory management and elements of distributed systems.
Prerequisite: CSC 246, CSC 316 and MA 421
Typically offered in Fall and Spring

CSC 503 Computational Applied Logic  (3 credit hours)
Introduction to the conceptual and formal apparatus of mathematical logic, to mathematical concepts underlying the process of logical formalization, and to the applications of various logics across a broad spectrum of problems in computer science and artificial intelligence.
Prerequisite: CSC 333 of LOG 335 or LOG 435
Typically offered in Fall only

CSC 505 Design and Analysis Of Algorithms  (3 credit hours)
Algorithm design techniques: use of data structures, divide and conquer, dynamic programming, greedy techniques, local and global search. Complexity and analysis of algorithms: asymptotic analysis, worst case and average case, recurrences, lower bounds, NP-completeness. Algorithms for classical problems including sorting, searching and graph problems (connectivity, shortest paths, minimum spanning trees).
Prerequisite: CSC 316 and CSC 226
Typically offered in Fall, Spring, and Summer
CSC 506/ECE 506/ECE 406/CSC 406  Architecture Of Parallel Computers  (3 credit hours)
The need for parallel and massively parallel computers. Taxonomy of parallel computer architecture, and programming models for parallel architectures. Example parallel algorithms. Shared-memory vs. distributed-memory architectures. Correctness and performance issues. Cache coherence and memory consistency. Bus-based and scalable directory-based multiprocessors. Interconnection-network topologies and switch design. Brief overview of advanced topics such as multiprocessor prefetching and speculative parallel execution. Credit is not allowed for more than one course in this set: ECE 406, ECE 506, CSC 406.

Typically offered in Fall and Spring

CSC 510  Software Engineering  (3 credit hours)
An introduction to software life cycle models; size estimation; cost and schedule estimation; project management; risk management; formal technical reviews; analysis, design, coding and testing methods; configuration management and change control; and software reliability estimation. Emphasis on large development projects. An individual project required following good software engineering practices throughout the semester.

Prerequisite: CSC 316 and CSC 226
Typically offered in Fall and Spring

CSC 512/CSC 412  Compiler Construction  (3 credit hours)
The course will concentrate on the theory and practice of compiler-writing. Topics to be covered will include techniques for parsing, code generation, and optimization. Furthermore, the theoretical underpinnings of compilers such as LR parsing will be covered. Finally, the students will be exposed to compiler construction tools, and will obtain hands-on experience in building a compiler for a small programming language. Besides the listed prerequisite courses, other helpful courses include CSC 253, CSC 224, CSC 234, and MA 121.

Prerequisites: Graduate standing and CSC 316 and CSC 333 or equivalent classes.
Typically offered in Fall only

CSC 513  Electronic Commerce Technology  (3 credit hours)
Exploration of technological issues and challenges underlying electronic commerce. Distributed systems; network infrastructures; security, trust, and payment solutions; transaction and database systems; and presentation issues. Project required. No Audits.

Prerequisite: CSC 501
Typically offered in Spring only

CSC 514/MA 414/MA 514/CSC 414  Foundations of Cryptography  (3 credit hours)
Cryptography is the study of mathematical techniques for securing digital information, systems and distributed computation against adversarial attacks. In this class you will learn the concepts and the algorithms behind the most used cryptographic protocols: you will learn how to formally define security properties and how to formally prove/disprove that a cryptographic protocol achieves a certain security property. You will also discover that cryptography has a much broader range of applications. It solves absolutely paradoxical problems such as proving knowledge of a secret without ever revealing the secret (zero-knowledge proof), or computing the output of a function without ever knowing the input of the function (secure computation). Finally, we will look closely at one of the recent popular application of cryptography: the blockchain technology. Additionally, graduate students will study some of the topics in greater depth.

Prerequisite: (CSC 226 AND CSC 333) OR MA 225
Typically offered in Fall only

CSC 515  Software Security  (3 credit hours)
Introduces students to the discipline of designing, developing, and testing secure and dependable software-based systems. Students will learn about risks and vulnerabilities, and effective software security techniques. Topics include common vulnerabilities, access control, information leakage, logging, usability, risk analysis, testing, design principles, security policies, and privacy. Project required.

Prerequisite: CSC 510
Typically offered in Fall only

CSC 517/ECE 517  Object-Oriented Design and Development  (3 credit hours)
The design of object-oriented systems, using principles such as the GRASP principles, and methodologies such as CRC cards and the Unified Modeling Language (ULM). Requirements analysis. Design patterns Agile Methods. Static vs. dynamic typing. Metaprogramming. Open-source development practices and tools. Test-first development. Project required, involving contributions to an open-source software project.

Prerequisite: CSC 326 or ECE 309
Typically offered in Fall and Spring

CSC 519  DevOps: Modern Software Engineering Practices  (3 credit hours)
Modern software development organizations require entire teams of DevOps to automate and maintain software engineering processes and infrastructure vital to the organization. In this course, you will gain practical exposure to the skills, tools, and knowledge needed in automating software engineering processes and infrastructure. Students will have the chance to build new or extend existing software engineering tools and design a DevOps pipeline.

Prerequisite: CSC 510 or (graduate or senior standing with at least a 3.0 GPA) and good knowledge of at least one high level programming language
Typically offered in Fall and Spring
CSC 520 Artificial Intelligence I (3 credit hours)
Introduction to and overview of artificial intelligence. Study of AI programming language such as LISP or PROLOG. Elements of AI problem-solving technique. State spaces and search techniques. Logic, theorem proving and associative databases. Introduction to knowledge representation, expert systems and selected topics including natural language processing, vision and robotics.
Prerequisite: CSC 316 and either CSC 226 or LOG 201 or LOG 335 or background in symbolic logic
Typically offered in Fall and Spring

CSC 522/CSC 422 Automated Learning and Data Analysis (3 credit hours)
Introduction to the problems and techniques for automated discovery of knowledge in databases. Topics include representation, evaluation, and formalization of knowledge for discovery; classification, prediction, clustering, and association methods. Selected applications in commerce, security, and bioinformatics. Students cannot get credit for both CSC 422 and CSC 522.
Prerequisite: ST 370 and MA 305, and a grade of C- or better in either CSC 226 or LOG 201
Typically offered in Fall and Spring

CSC 530 Computational Methods for Molecular Biology (3 credit hours)
Computer algorithms supporting genomic research: DNA sequence comparison and assembly, hybridization mapping, phylogenetic reconstruction, genome rearrangement, protein folding and threading.
Prerequisite: CSC 316, Corequisite: CSC 505
Typically offered in Fall only

CSC 533 Privacy in the Digital Age (3 credit hours)
Privacy is a growing concern in our modern society. We interact and share our personal information with a wide variety of organizations, including financial and healthcare institutions, web service providers and social networks. Many times such personal information is inappropriately collected, used or shared, often without our awareness. This course introduces privacy in a broad sense, with the aim of providing students an overview of the challenging and emerging research topics in privacy. This course will expose students to many of the issues that privacy engineers, program managers, researchers and designers deal with in industry. ST 370 is recommended but not mandatory.
Prerequisite: CSC 316
Typically offered in Fall only

CSC 540 Database Management concepts and Systems (3 credit hours)
Advanced database concepts. Logical organization of databases: the entity-relationship model; the relational data model and its languages. Functional dependencies and normal forms. Design, implementation, and optimization of query languages; security and integrity, concurrency control, transaction processing, and distributed database systems.
Prerequisite: CSC 316
Typically offered in Fall and Spring

CSC 541 Advanced Data Structures (3 credit hours)
Complex and specialized data structures relevant to design and development of effective and efficient software. Hardware characteristics of storage media. Primary file organizations. Hashing functions and collision resolution techniques. Low level and bit level structures including signatures, superimposed coding, disjoint coding and Bloom filters. Tree and related structures including AVL trees, B*trees, tries and dynamic hashing techniques.
Prerequisite: CSC 316
Typically offered in Spring only

CSC 544/ECE 544 Management Decision and Control Systems (3 credit hours)
Planning, design, and development and implementation of comprehensive computer-based information systems to support management decisions. Formal information systems principles; information requirements analysis; knowledge acquisition techniques; information modeling. Information resource management for quality operational control and decision support; system evaluation, process improvement and cost effectiveness.
Prerequisite: CSC 423 or BUS 541
Typically offered in Fall only

CSC 546/ECE 546 Cloud Computing Technology (3 credit hours)
Study of cloud computing principles, architectures, and actual implementations. Students will learn how to critically evaluate cloud solutions, how to construct and secure a private cloud computing environment based on open source solutions, and how to federate it with external clouds. Performance, security, cost, usability, and utility of cloud computing solutions will be studied both theoretically and in hands-on exercises. Hardware-, infrastructure-, platform-, software-, security-, - "as-a-service".
Prerequisites: CSC 501 and either ECE/CSC 570 or ECE/CSC 573
Typically offered in Spring only

CSC 547/ECE 547 Parallel Systems (3 credit hours)
Basic concepts of parallel computation; parallel programming models and algorithm design; load balancing and performance optimization; parallel I/O and high-end storage systems; high performance parallel applications.
Prerequisite: CSC 246 or CSC 451 or CSC 501
Typically offered in Fall only

CSC 554 Human-Computer Interaction (3 credit hours)
Prerequisite: CSC 316
Typically offered in Spring only
CSC 555  Social Computing and Decentralized Artificial Intelligence  (3 credit hours)
This course surveys the field of social computing, introducing its key concepts, paradigms, and techniques. Specific topics are selected from the following list: social media and social network analytics, sociological underpinnings, crowdsourcing and surveys, human computation, social mobilization, human decision making, voting theory, judgment aggregation, prediction markets, economic mechanisms, incentives, organizational modeling, argumentation, contracts, norms, mobility and social context, sociotechnical systems, and software engineering with and for social computing. This course incorporates ideas from diverse disciplines (including sociology, psychology, law, economics, political science, logic, statistics, philosophy, business) to provide essential background for future computer science careers in industry and research.

Typically offered in Fall only

CSC 561  Principles of Computer Graphics  (3 credit hours)
Fundamentals of the OpenGL API. 2D and 3D transformations, perspective and orthographic projection, and the mathematical foundations that underlie these concepts. Geometric primitives, clipping, depth buffering, scan conversion, and rasterization. Lighting, shadows, and texture mapping. Curves and surfaces.

Prerequisite: CSC Majors
Typically offered in Fall only

CSC 562  Introduction to Game Engine Design  (3 credit hours)
This course offers an advanced discussion of topics in computer graphics, with an emphasis on rendering techniques and GPU shader programming used in computer game engine design. Students are required to implement a medium-size game program that includes modeling and rendering, 2D physics, and animation of dynamic objects. Students will learn about GPU basics, mathematics of transformations, visual appearance properties, texturing, global illumination, and toon shading in computer games.

Prerequisites: CSC 561 or CSC 461 or equivalent course from a previous university
Typically offered in Spring only

CSC 563  Visual Interfaces for Mobile Devices  (3 credit hours)
The conception and creation of effective visual interfaces for mobile devices, including ideation and prototyping for useful mobile applications, the industry and architecture of mobile devices, mobile usage context, computer graphics and interfaces for mobiles, and mobile programming.

Prerequisite: CSC 554 or CSC 561
Typically offered in Spring only

CSC 565/MA 565/OR 565  Graph Theory  (3 credit hours)

Prerequisite: CSC 226 or MA 351.
Typically offered in Spring only

CSC 568  Enterprise Storage Architecture  (3 credit hours)
An introduction to storage systems architecture in an enterprise. Begins with a review of the individual components of a system (eg, hard disk drives, network interfaces), and shows how to aggregate those into storage systems. Tradeoffs involving factors such as cost, complexity, availability, power and performance. Discussion of information management strategies, including data migration. Guest lectures by representatives from local industry. Students work in teams on a semester-long project.

Prerequisite: CSC 246 and CSC 401 and CSC 316
Typically offered in Spring only

CSC 570/ECE 570  Computer Networks  (3 credit hours)
General introduction to computer networks. Discussion of protocol principles, local area and wide area networking, OSI stack, TCP/IP and quality of service principles. Detailed discussion of topics in medium access control, error control coding, and flow control mechanisms. Introduction to networking simulation, security, wireless and optical networking.

Prerequisite: ECE 206 or CSC 312, ST 371, CSC 258 and Senior standing or Graduate standing
Typically offered in Fall and Spring

CSC 573/ECE 573  Internet Protocols  (3 credit hours)
Principles and issues underlying provision of wide area connectivity through interconnection of autonomous networks. Internet architecture and protocols today and likely evolution in future. Case studies of particular protocols to demonstrate how fund

Prerequisite: CSC/ECE 570
Typically offered in Fall, Spring, and Summer

CSC 574/ECE 574  Computer and Network Security  (3 credit hours)
Security policies, models, and mechanisms for secrecy, integrity, and availability. Basic cryptography and its applications; operating system models and mechanisms for mandatory and discretionary controls; introduction to database security; security in distributed systems; network security (firewalls, IPsec, and SSL); and control and prevention of viruses and other rogue programs.

Prerequisite: (CSC 316) and (CSC 401 or CSC/ECE 570)
Typically offered in Fall and Spring

CSC 575/ECE 575  Introduction to Wireless Networking  (3 credit hours)
Introduction to cellular communications, wireless local area networks, ad-hoc and IP infrastructures. Topics include: cellular networks, mobility management, connection admission control algorithms, mobility models, wireless IP networks, ad-hoc routing, sensor networks, quality of service, and wireless security.

Prerequisite: ECE/CSC 570
Typically offered in Spring and Summer
CSC 576/ECE 576 Networking Services: QoS, Signaling, Processes (3 credit hours)
Topics related to networking services, signaling for setting up networking services, such as SIP and IMS, networking architectures for providing QoS for networking services, such as MPLS, DiffServ and RAC, signaling protocols for setting up QoS connections in the transport stratum, such as LDP and RSVP-TE, video-based communications, and capacity planning models for dimensioning services.
Prerequisite: CSC/ECE 570
Typically offered in Fall and Spring

CSC 577/ECE 577 Switched Network Management (3 credit hours)
Topics related to design and management of campus enterprise networks, including VLAN design; virtualization and automation methodologies for management; laboratory use of open space resource and commercial tools for managing such networks.
Typically offered in Fall only

CSC 579/ECE 579/OR 579 Introduction to Computer Performance Modeling (3 credit hours)
Workload characterization, collection and analysis of performance data, instrumentation, tuning, analytic models including queuing network models and operational analysis, economic considerations.
Prerequisite: CSC 312 or ECE 206 and MA 421
Typically offered in Fall and Spring

CSC 580/MA 580 Numerical Analysis I (3 credit hours)
Algorithm behavior and applicability. Effect of roundoff errors, systems of linear equations and direct methods, least squares via Givens and Householder transformations, stationary and Krylov iterative methods, the conjugate gradient and GMRES methods, convergence of method.
Prerequisite: MA 405; MA 425 or MA 511; high-level computer language
Typically offered in Fall only

CSC 582 Computer Models of Interactive Narrative (3 credit hours)
A theoretical and practical study of the computational models supporting the creation of interactive narrative systems. Topics include basic introductions to cognitive, linguistic and film theoretic models of narrative; representations and reasoning techniques from artificial intelligence related to the creation of storylines, dialog, camera control and other features of narrative in text-based and/or 3D virtual worlds; mechanisms for controlling character behavior in multi-agent multi-user stories; and applications of these techniques ranging from interactive entertainment to educational software to training simulations.
Typically offered in Fall only

CSC 583/MA 583 Introduction to Parallel Computing (3 credit hours)
Introduction to basic parallel architectures, algorithms and programming paradigms; message passing collectives and communicators; parallel matrix products, domain decomposition with direct and iterative methods for linear systems; analysis of efficiency, complexity and errors; applications such as 2D heat and mass transfer.
Prerequisite: CSC 302 or MA 402 or MA/CSC 428 or MA/CSC 580
Typically offered in Spring only

CSC 584/CSC 484 Building Game AI (3 credit hours)
In this course we will examine Artificial Intelligence (AI) techniques that are used in the design of computer games. We will look at techniques for game playing as well as the design of AI opponents tasked with creating “good experiences” for players. The course will begin with a discussion of general AI, common algorithms, data structures, and representations. From there, we will cover topics in character movement, pathfinding, decision making, strategy, tactics, and learning. In a sequence of programming assignments students will create increasingly sophisticated AI implementations. Students will also critically review the projects conducted by graduate students enrolled in CSC584. CSC majors only. Students cannot get credit for both CSC 484 and CSC 584.
Prerequisite: CSC 316
Typically offered in Spring only

CSC 591 Special Topics In Computer Science (1-6 credit hours)
Topics of current interest in computer science not covered in existing courses.
Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

CSC 600 Computer Science Graduate Orientation (1 credit hours)
Introduction for new graduate students to (a) information about graduate program, department, and university resources, and (b) research projects conducted by CSC faculty.
Typically offered in Fall and Spring

CSC 630 Master's Independent Study (1-3 credit hours)
Individual investigation of topics under the direction of member(s) of the graduate faculty.
Typically offered in Fall, Spring, and Summer

CSC 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
CSC 690  Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 695  Master's Thesis Research  (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

CSC 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CSC 705  Operating Systems Security  (3 credit hours)
Fundamentals and advanced topics in operating system (OS) security. Study OS level mechanisms and policies in investigating and defending against real-world attacks on computer systems, such as self-propagating worms, stealthy rootkits and large-scale botnets. OS security techniques such as authentication, system call monitoring, as well as memory protection. Introduce recent advanced techniques such as system-level randomization and hardware virtualization.
Prerequisite: CSC 501
Typically offered in Spring only

CSC 707  Automata, Languages and Computability Theory  (3 credit hours)
Formal models of language and computation: finite automata and regular languages, pushdown automata and context-free languages, Turing machines. Relative power of models, Chomsky hierarchy. Inherent complexity of problems: undecidability, computational complexity, intractable problems.
Prerequisite: CSC 226 required, CSC 333 recommended
Typically offered in Fall only

CSC 710  Software Engineering as a Human Activity  (3 credit hours)
This course addresses the human aspect of software engineering, by studying the people who practice it. Students will explore software engineering as traditionally defined, and also consider techniques that transform how we understand software engineering, such as methods from psychology and sociology. Students will study the usability of software engineering tools, the psychology of programming, performance of software developers, experimental methods in observing software engineers, distributed development and coordination, and cultural differences between software developers.
Prerequisite: CSC 510
Typically offered in Spring only

CSC 711/GIS 711  Geospatial Data Management  (3 credit hours)
Data management principles and technologies for efficient implementation of geospatial applications. This course introduces students to: spatial and temporal data types, data models, geometry models, spatial predicates, spatial access methods, and spatial query processing. In addition, students will be exposed to modern data management systems for geospatial application development and data integration principles. Prior GIS programming knowledge and knowledge of database management systems and SQL is preferred.
Typically offered in Fall only

CSC 712  Software Testing and Reliability  (3 credit hours)
An advanced introduction to software testing and reliability. The course is a balanced mixture of theory, practice, and application. Methods, techniques, and tools for testing software and producing reliable and secure software are used and analyzed. Software reliability growth models and techniques for improving and predicting software reliability are examined, and their practical use is demonstrated. Good knowledge of C++ or Java. Knowledge of the basics of statistics, calculus, and linear algebra.
Prerequisite: CSC 510
Typically offered in Fall only

CSC 714  Real Time Computer Systems  (3 credit hours)
Design and implementation of computer systems required to provide specific response times. Structure of a real-time kernel, fixed and dynamic priority scheduling algorithms, rate monotonic scheduling theory, priority inheritance protocols, real-time benchmarks, case study of a real-time kernel.
Prerequisite: CSC 451 or CSC 501
Typically offered in Spring only

CSC 720  Artificial Intelligence II  (3 credit hours)
A second course in artificial intelligence emphasizing advanced concepts of AI including logic programming, automatic programming, natural language understanding, visual perception by machine, learning and inference, intelligent computer-aided instruction, knowledge representation, robotics and other topics to be chosen by instructor. Students asked to write programs in AI programming language such as LISP and PROLOG.
Prerequisite: CSC 520
Typically offered in Spring only
CSC 722  Advanced Topics in Machine Learning  (3 credit hours)
A broad range of advanced topics in machine learning, the building of computer-based systems that can adapt to their environment and learn from their own experience. Theory of learnability, technical details of various learning methods, combination of multiple methods, evaluation of methods, and related topics (at the discretion of the instructor).
Prerequisite: CSC 520
Typically offered in Fall only

CSC 724  Advanced Distributed Systems  (3 credit hours)
Principles in the design and implementation of modern distributed systems; recent techniques used by real-world distributed systems such as peer-to-peer file sharing, enterprise data center, and internet search engines; state-of-the-art architectures, algorithms, and performance evaluation methodologies in distributed systems.
Prerequisite: CSC 501 or equivalent. Programming in C++ or Java in Unix environments
Typically offered in Spring only

CSC 742  Database Management Systems  (3 credit hours)
Prerequisite: CSC 431 or 541
Typically offered in Spring only

CSC 743  Secure Data Management  (3 credit hours)
Advanced topics in secure data management with techniques in traditional database management systems as well as in recent advances in emerging areas. Emphasis on new security issues and challenges imposed by the Internet and the Web on cross-organization data sharing and management. Example topics include XML, data management in P2P, trust management, data authorship, and the integration of security and privacy policies with information systems.
Prerequisite: CSC/ECE 574 and (CSC 440 or CSC 540). Background in databases and basic security concepts required.
Typically offered in Fall only

CSC 750  Service-Oriented Computing  (3 credit hours)
Concepts, theories, and techniques for computing with services. This course examines architectures for Web applications based on the classical publish, find, and bind triangle, but formulates it at a higher level. It considers sophisticated approaches for the description, discovery, and engagement of services, especially over the Web and the Grid. This course emphasizes service composition. Key topics include semantics, transactions, processes, agents, quality of service, compliance, and trust.
Prerequisite: CSC 540: Database Management Concepts and Systems
Typically offered in Fall only

CSC 761  Advanced Topics in Computer Graphics  (3 credit hours)
Understanding and discussing current advances and research topics in computer graphics. Possible topics include nonphotorealistic rendering, modeling natural phenomena, illumination and rendering techniques, model simplification, animation, visualization, graphics hardware. Learning to critique research papers from important venues in the computer graphics field. Learning to read, interpret, and present computer graphics research papers in a conference-type environment.
Prerequisite: ST 512 and a scientific programming language
Typically offered in Fall only

CSC 762/OR 762/ISE 762  Computer Simulation Techniques  (3 credit hours)
Basic discrete event simulation methodology: random number generators, simulation designs, validation, analysis of simulation output. Applications to various areas of scientific modeling. Simulation language such as SLAM and GPSS. Computer assignments and projects.
Prerequisite: ST 512 and a scientific programming language
Typically offered in Spring only

CSC 766  Code Optimization for Scalar and Parallel Programs  (3 credit hours)
Advanced research issues in code optimization for scalar and parallel programs; program analysis, scalar and parallel optimizations as well as various related advanced topics.
Prerequisite: CSC 512, or CSC 548, or CSC 501
Typically offered in Spring only

CSC 772  Survivable Networks  (3 credit hours)
Principles of network and service continuity and related metrics; the theory of network availability, survivability, and restoration; a comprehensive coverage of network architectures, protocols, algorithms, and related technology for survivability; advanced topics in network survivability; hands-on experience in the implementation of protocols and software for survivable systems and the operation of survivable networks.
Typically offered in Spring only

CSC 773/ECE 773  Advanced Topics in Internet Protocols  (3 credit hours)
Cutting-edge concepts and technologies to support internetworking in general and to optimize the performance of the TCP/IP protocol suite in particular. Challenges facing and likely evolution for next generation internetworking technologies. This course investigates topics that include, but may be not limited to: Internet traffic measurement, characterization and modeling, traffic engineering, network-aware applications, quality of service, peer-to-peer systems, content-distribution networks, sensor networks, reliable multicast, and congestion control.
Prerequisite: CSC/ECE 573
Typically offered in Spring only

CSC 774/ECE 774  Advanced Network Security  (3 credit hours)
A study of network security policies, models, and mechanisms. Topics include: network security models; review of cryptographic techniques; internet key management protocols; electronic payments protocols and systems; intrusion detection and correlation; broadcast authentication; group key management; security in mobile ad-hoc networks; security in sensor networks.
Prerequisite: CSC/ECE 570, CSC/ECE 574
Typically offered in Spring only
CSC 775/ECE 775 Advanced Topics in Wireless Networking (3 credit hours)
Reviews the current state of research in wireless networks, network architectures, and applications of wireless technologies; students will design, organize, and implement or simulate systems in a full-semester research project. For students with background in networking and communications who wish to explore research and development topics.
Prerequisite: ECE/CSC 575
Typically offered in Fall only

CSC 776/ECE 776 Design and Performance Evaluation of Network Systems and Services (3 credit hours)
Introduction to the design and performance evaluation of network services. Topics include top-down network design based on requirements, end-to-end services and network system architecture, service level agreements, quantitative performance evaluation techniques. Provides quantitative skills on network service traffic and workload modeling, as well as, service applications such as triple play, internet (IPTV), Peer-to-peer (P2P), voice over IP (VoIP), storage, network management, and access services.
Prerequisite: CSC(ECE) 570 and CSC(ECE) 579
Typically offered in Spring only

CSC 777/ECE 777 Telecommunications Network Design (3 credit hours)
Analytic modeling and topological design of telecommunications networks, including centralized polling networks, packet switched networks, T1 networks, concentrator location problems, routing strategies, teletraffic engineering and network reliability.
Prerequisite: CSC(ECE) 570
Typically offered in Spring only

CSC 780/MA 780 Numerical Analysis II (3 credit hours)
Approximation and interpolation, Fast Fourier Transform, numerical differentiation and integration, numerical solution of initial value problems for ordinary differential equations.
Prerequisite: MA 580
Typically offered in Spring only

CSC 791 Advanced Topics in Computer Science (1-6 credit hours)
Advanced topics of current interest in computer science not covered by existing courses.
Typically offered in Fall and Spring

CSC 801 Seminar in Computer Science (1-3 credit hours)
Faculty and graduate student research presentations and discussions centered around current research problems in Computer Science and advanced theories in these areas. Students are expected to make presentations of published works and, depending on the course credit received and their academic degree progress, present their own research results. Critical discussions of the various research approaches and results and their relationships based on the presentations and additional readings and research. Departmental Approval Required.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

CSC 830 Doctoral Independent Study (1-3 credit hours)
Individual investigation of advanced topics under the direction of member(s) of the graduate faculty.
Typically offered in Fall, Spring, and Summer

CSC 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CSC 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CSC 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

CSC 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research
Prerequisite: Doctoral student
Typically offered in Summer only

CSC 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

COP 100 Co-Op Work 1st Alt (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 101 Co-Op Work 1st Par (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 200 Co-Op Work 2nd Alt (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 201 Co-Op Work 2nd Par (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 300 Co-Op Work 3rd Alt (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 301 Co-Op Work 3rd Par (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 400 Co-Op Work 4th Alt (0 credit hours)
Typically offered in Fall, Spring, and Summer

COP 401 Co-Op Work 4th Par (0 credit hours)
Typically offered in Fall, Spring, and Summer

Cooperative Education (COP)
Typically offered in Fall and Spring

GEP Global Knowledge, GEP Humanities, GEP U.S. Diversity

Sophomore standing or above.

among, and between groups of people domestically and internationally.

gain an overview of historical and psychological conceptual frameworks students participate in reflective and experiential activities. Students introduces multicultural and international diversity concepts while having culturally-appropriate strategies in the workplace and life. This course

This course engages students in the process to work effectively with reaction papers and project are required.

discussion, group activities, role playing, relevant readings and video are
theory as well as shared professional experiences are presented. Class

Relevant student development, psychology and counseling research and

For new student peer mentors of primarily African American freshmen.

Upon successful completion, students will be ready to be a Movement

Lesbian, bisexual, and transgender community. They are taught to be social activists and learn skills to be confident and active bystanders as well as knowledgeable and effective facilitators. Topics include learning about the objectification of women and men in the media, masculinity and patriarchy, pornography, and how these all contribute to a rape culture. Upon successful completion, students will be ready to be a Movement peer educator. Student must complete application and interview process and have been approved by the instructor prior to registration in the course.

Typically offered in Fall only

This course trains students to educate their peers about sexual and relationship violence and stalking. Students will explore how this violence impacts people of varying cultures including people of color and the gay, lesbian, bisexual, and transgender community. They are taught to be social activists and learn skills to be confident and active bystanders as well as knowledgeable and effective facilitators. Topics include learning about the objectification of women and men in the media, masculinity and patriarchy, pornography, and how these all contribute to a rape culture. Upon successful completion, students will be ready to be a Movement peer educator. Student must complete application and interview process and have been approved by the instructor prior to registration in the course.

Typically offered in Spring only

ECD 221 Career Planning and Personal Development (3 credit hours)
Knowledge, attitudes, self-understanding, and skills needed to enhance career planning and foster personal development. Study of self-understanding, self-talk, goal setting, the environment, and decision making as ways to adapt more effectively to the challenges of life.

Typically offered in Spring only

ECD 222 Sexual Violence Prevention for Peer Educators (3 credit hours)
This course trains students to educate their peers about sexual and relationship violence and stalking. Students will explore how this violence impacts people of varying cultures including people of color and the gay, lesbian, bisexual, and transgender community. They are taught to be social activists and learn skills to be confident and active bystanders as well as knowledgeable and effective facilitators. Topics include learning about the objectification of women and men in the media, masculinity and patriarchy, pornography, and how these all contribute to a rape culture. Upon successful completion, students will be ready to be a Movement peer educator. Student must complete application and interview process and have been approved by the instructor prior to registration in the course.

Typically offered in Fall only

ECD 224 Student Development and Peer Mentoring (2 credit hours)
For new student peer mentors of primarily African American freshmen. Relevant student development, psychology and counseling research and theory as well as shared professional experiences are presented. Class discussion, group activities, role playing, relevant readings and video are employed. Reaction papers and project are required.

Prerequisite: Selection as a Peer Mentor
Typically offered in Fall only

ECD 225 Foundations of Cultural Competence (3 credit hours)
This course engages students in the process to work effectively with diverse populations to develop cross-cultural competencies and identify culturally-appropriate strategies in the workplace and life. This course introduces multicultural and international diversity concepts while having students participate in reflective and experiential activities. Students gain an overview of historical and psychological conceptual frameworks and models for understanding cultural differences and similarities within, among, and between groups of people domestically and internationally.

Sophomore standing or above.

GEP Global Knowledge, GEP Humanities, GEP U.S. Diversity

Typically offered in Fall and Spring

ECD 296 Special Topics in Education: Counselor Education (1-3 credit hours)
Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the students.

Typically offered in Fall, Spring, and Summer

ECD 310 Caldwell Fellows Honors Seminar: Foundations in Self-Development (3 credit hours)
Students are selected as Caldwell Fellows on the basis of their potential for effective leadership. The Caldwell seminar is the foundational experience for all Fellows, grounding them the essential grounding of leadership - self-understanding. The course employs theory and practice for psychosocial development, grounding in the servant-leader philosophy of leadership, and practice in engaged social issues leadership through service-learning and reflection.

Requisite: Caldwell Fellows Only
GEP U.S. Diversity
Typically offered in Fall only

ECD 510 Orientation to Professional Counseling, Identity, and Ethics (3 credit hours)
This course examines (1) the purpose of counseling, (2) the historical context for counseling, (3) the basic principles of major counseling theories, and (4) the practice of counseling in various professional settings.

Prerequisite: 6 credits in ED or PSY
Typically offered in Spring and Summer

ECD 524 Career Counseling and Development (3 credit hours)
Knowledge and skills needed to: (a) provide professional career counseling to individuals and (b) design, implement and evaluate career development programs for particular groups. Theories of career development and decision making; career guidance programs in educational, agency and industrial setting; career information sources and delivery systems; and assessment in career counseling.

Prerequisite: 6 credits in ED or PSY
Typically offered in Fall, Spring, and Summer

ECD 525 Multicultural Counseling (3 credit hours)
Theory and practice of counseling culturally diverse clients. Client populations include African Americans, Asian-Americans, American Indians and Hispanics. Cultural assumptions, cultural values, counselor credibility, prejudice and racism in context of counseling.

Prerequisite: Six hrs. in ED or PSY, Corequisite: ECD 530
Typically offered in Fall, Spring, and Summer

ECD 530 Theories and Tech of Counseling (4 credit hours)
Theory, philosophy, roles, professional ethics, and techniques of counseling. Eleven major counseling approaches including behavioral, psychoanalytic, client-centered, existential, family and post-modern approaches, and related counseling strategies are discussed. Students have opportunities to practice related strategies through role-plays.

Prerequisite: 6 credits in ED or PSY
Typically offered in Fall and Spring
ECD 533  Int Sch Counseling  (4 credit hours)
An examination of the conceptual framework for the role and functions of school counselors, prevention and treatment strategies, program development and evaluation. Focus is on the school-college-community collaboration model, preparing counselors who can work effectively across different counseling settings by collaborating with other counselors and mental professionals. Graduate standing required.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ECD 534  Guidance and Counseling In Elementary and Middle Schools  (4 credit hours)
Examination of (1) theoretical framework for roles and functions of elementary and middle school counselors, (2) primary and secondary prevention strategies and (3) evaluation and administration procedures to develop and implement model programs for elementary and middle schools.

Prerequisite: Graduate standing
Typically offered in Fall only

ECD 535  Introduction to College Counseling and Student Development  (4 credit hours)
College Counseling and student development theory, research and practice as well as overview of profession. Discussion of counselor roles, professional ethics, history, identity, and development. Instruction in and design of structured group work in laboratory.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

ECD 536  Introduction to Clinical Mental Health Counseling  (4 credit hours)
Issues, functions and scope of work being done in various clinical mental health programs; overview of helping approaches with selected client populations; related professional concerns. Instruction in and design of structured group work in laboratory.

Prerequisite: Graduate Standing
Typically offered in Fall and Spring

ECD 539  Group Counseling  (3 credit hours)
Theory and practice of group counseling. Theoretical positions include client-centered, behavioral and rational-emotive. Aspects of group process include group leadership, group membership, establishing and maintaining a group.

Prerequisite: ECD 530 and one of the following: ECD 510, 534, 535 or 536
Typically offered in Fall, Spring, and Summer

ECD 540/WGS 540  Gender Issues In Counseling  (3 credit hours)
Exploration of gender as primary identity and social construct. Emphasis on gender dynamics in counseling, client empowerment and preventive approaches.

Prerequisite: Graduate standing or Six hrs. in ED or PSY
Typically offered in Summer only

ECD 541  Substance Abuse and Counseling  (3 credit hours)
This course explores counseling as it relates to working with clients with substance abuse disorders. Ethical and legal issues, theoretical models, assessment and diagnosis, treatment planning, techniques and individual/family/group interventions with diverse populations will be discussed throughout class sessions. This course is distinctively geared towards students who are training to be counselors. Substance abuse issues that clients might present within counseling are addressed by way of assigned readings, class discussions, video segments, case studies, internet resources and assignments.

Prerequisite: 6 hours of Graduate Coursework
Typically offered in Fall and Summer

ECD 542  Research in Counseling  (3 credit hours)
This introductory graduate level course in research in counseling is intended to provide students with an overview of the fundamentals of research methods and program evaluations in the field. Students will be able to identify various research approaches.

Prerequisite: 6 hours of ECD Graduate Courses
Typically offered in Fall and Summer

ECD 543  Introduction to College Counseling  (3 credit hours)
A course designed for investigation of college counseling services and strategies. Assessment and research in student development, and students design and implement a developmental intervention based on Knefelkamp and Wells’ Practice-to-Theory-to-Practice model.

Prerequisite: ECD 535 or Doctoral student
Typically offered in Spring only

ECD 544  Counseling Couples and Families  (3 credit hours)
This elective course explores counseling as it relates to working with couples and families. Theoretical models, techniques and interventions will be discussed throughout class sessions. This course is distinctively geared towards students who are training to be counselors. Family and couples issues that clients might present within counseling are addressed by way of class discussions, assigned readings, video segments, case studies, role plays and Internet resources.

Prerequisite: 6 hours of ECD Graduate Courses
Typically offered in Spring and Summer

ECD 545  Crisis Interventions in Counseling  (3 credit hours)
An overview of crisis intervention and theoretical models. Crisis situations are described across developmental age-span across a variety of service delivery settings. Students will develop conceptual competency for professional counselors to engage in

Prerequisite: 6 hours of ECD Graduate Courses
Typically offered in Fall and Summer
ECD 547 Counseling Children and Adolescents (7 credit hours)
Counseling children and adolescents can be very different from working with adults. This course will explore some key developmental considerations, as well as creative approaches to working with this population (ages 0-18). Some topics that will be covered include early interventions, developmental milestones, working with parents, transitions, behavioral changes, peer relationships, sexuality, crisis counseling, ethics, advocacy, and collaborating with other professionals. In addition, common diagnoses and disorders corresponding with each stage of development will also be explored, as well as evidence-based interventions for working with each developmental stage (e.g., bibliotherapy, play therapy, music and art as adjunctive tools, behavior interventions, etc.).

Prerequisite: 6 hours of ECD Graduate Courses
Typically offered in Summer only

ECD 560 Research and Assessment In Counseling (3 credit hours)
Research and assessment issues in counseling. Emphasis on writing research proposals in counseling and critiquing articles in counseling research. Exploration of meaning and importance of assessment in counseling. Examination of research designs in coun

Prerequisite: Graduate standing
Typically offered in Spring and Summer

ECD 561 Strategies for Clinical Assessment in Counseling (3 credit hours)
Exploration of meaning and importance of assessment in the counseling process. The utilization of counseling assessments based on legal and ethical guidelines and cultural considerations. Identify, interpret, and explain assessments in clinical, college, and school counseling settings.

Typically offered in Spring and Summer

ECD 562 Techniques in Counseling (4 credit hours)
In this course students work towards mastery of counseling skills, review relevant theories, and prepare for Practicum. Students will practice counseling skills in class and spend their out of class lab hours practicing skills in partnering schools. Students will do some limited video taping of counseling sessions and receive feedback on tapes from Counselor Education doctoral students taking their supervision theory class.

Prerequisite: ECD 530
Typically offered in Fall only

ECD 575/EDP 575 Multicultural Lifespan Development (3 credit hours)
This course surveys theories, principles, and issues of psychological development throughout the lifespan. Emphasis will be placed on understanding current developmental research and its application to the enhancement of development from birth to late adulthood. Implications for helping professionals working in multicultural contexts will be provided.

Prerequisite: Six Hours of Graduate Study
Typically offered in Fall, Spring, and Summer

ECD 590 Special Problems In Guidance (1-6 credit hours)
For individual or group studies of one or more of major problems in guidance and personnel work. Problems selected to meet interests of individuals. Workshop procedure used whereby special projects, reports and research developed by individuals and by groups.

Prerequisite: Six hrs. grad. work in dept.
Typically offered in Fall and Spring

ECD 620 Special Problems In Guidance (1-6 credit hours)
For individual or group studies of one or more of major problems in guidance and personnel work. Problems selected to meet interests of individuals. Workshop procedure used whereby special projects, reports and research developed by individuals and by groups.

Prerequisite: Six hrs. grad. work in dept.
Typically offered in Fall, Spring, and Summer

ECD 641 Introductory Practicum in Counseling (1 credit hours)
Student participation in introductory supervised individual and group counseling experiences in laboratory setting.

Prerequisite: ECD 530, 525
Typically offered in Spring only

ECD 642 Practicum In Counseling (3 credit hours)
Student participation in individual and group counseling and consultation experiences under supervision in a school, college or agency setting. Prerequisite: 1. Completion of all ECD, PSY, and STAT courses with the exception of ECD 539 Group Counseling that may be taken concurrently. [Other classes that could be taken concurrently PSY 535,582, 584, 475, 476] 2. Consent of concentration coordin

Prerequisite: ECD 641
Typically offered in Spring only

ECD 651 Internship in School Counseling (6-12 credit hours)
A 600-hour internship for school counselors in training in a school setting under the supervision of qualified professionals. Students perform a variety of activities expected of school counselors. Weekly meetings with faculty and on-site supervisors.

Prerequisite: ECD 642
Typically offered in Fall and Spring

ECD 652 Internship In College Counseling and Student Development (6-12 credit hours)
A 600-hour internship. Professional experience in student affairs department with on-site supervision from qualified professional. Expectations including employment of broad repertoire of skills in roles of counselor, student development educator and administrator. Weekly student meetings with faculty and on-site supervisors.

Prerequisite: ECD 642
Typically offered in Fall and Spring

ECD 653 Internship In Clinical Mental Health Counseling (6-12 credit hours)
A 600-hour internship for community agency counselors in agency counseling setting under supervision of qualified professional. Employment of broad repertoire of primary and secondary prevention approaches to individual and group techniques, workshop leadership skills, consultation techniques and advocacy methods. Weekly meetings with faculty and on-site supervisors.

Prerequisite: ECD 642
Typically offered in Fall and Spring
ECD 692  Research Projects in Counselor Education  (1-3 credit hours)
Project or problem in research in education for graduate students, supervised by members of graduate faculty. Research chosen on basis of individual students’ interests and not to be part of thesis or dissertation research.

Prerequisite: ELP 532
Typically offered in Fall, Spring, and Summer

ECD 693  Master’s Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master’s student
Typically offered in Fall and Spring

ECD 695  Master’s Thesis Research  (1-9 credit hours)
Thesis research.

Prerequisite: Master’s student
Typically offered in Summer only

ECD 699/ECI 699/ELP 699/EMS 699/EOE 699/EAC 699  Master’s Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master’s degree and are writing and defending their theses.

Prerequisite: Master’s student
Typically offered in Fall and Spring

ECD 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master’s student
Typically offered in Summer only

ECD 701  Career Development Theory and Research  (3 credit hours)
Analysis of theory and research in career development and work adjustment as basis for intervention (career counseling, curricular, organizational) as research.

Prerequisite: ECD 524, ELP 532 and PSY 535
Typically offered in Fall and Spring

ECD 702  Advanced Multicultural Counseling  (3 credit hours)
Course focuses on the personal and professional development of the students as human beings, global citizens, counselors, and pre-service counselor educators. It is intentionally designed to promote critical self-analysis, cultural understanding, and personal and collective growth and change through honest and respectful discussions, readings, and assignments. The course is grounded in the study of multicultural and counseling theories that emphasize the relevance of social and cultural context and advocacy roles of counselors.

P: ECD 525 or equivalent
Typically offered in Fall only

ECD 733  Cognitive-Behavioral Theory, Research, and Practice  (3 credit hours)
Behavioral and cognitive behavioral change methods and research supporting their efficacy in counselor education. Major focus on synthesis of cognitive-developmental and cognitive-behavioral methods.

Prerequisite: ECD 737, Corequisite: ST 700
Typically offered in Spring only

ECD 735  Counseling Supervision: Theory and Research  (3 credit hours)
Examination of conceptual and methodological issues relating to supervision and evaluation of novice counselors. Special emphasis on developmental supervision approaches.

Prerequisite: Doctoral student
Typically offered in Fall only

ECD 736  Advanced Assessment in Counseling  (3 credit hours)
Doctoral students will have learning experiences beyond the entry-level master’s degree models and methods of assessment. Content focuses on advanced applications of assessment principles in clinical counseling and supervision practice, program evaluation, and outcome and action research studies. Students will demonstrate mastery of foundations of tests and measurement, present advanced assessment content modules during class sessions, and present documented and oral reports on personal quests for advanced knowledge in chosen assessment domains.

Prerequisite: PSY 535 or equivalent
Typically offered in Fall only

ECD 737  Cognitive Developmental Theory, Research and Practice  (3 credit hours)

Prerequisite: Doctoral student : PSY 535, ST 507, Corequisite: ST 508
Typically offered in Fall only

ECD 738  Research in Counselor Education  (3 credit hours)
Instruction in required skills and knowledge to conduct research in counselor education, including narrative and quantitative integration of research, experimental and quasi-experimental designs, analogue and process research, single subject and descriptive designs, and qualitative research. Preparation of narrative and meta-analytic research review and research proposal with oral presentation.

Prerequisite: Doctoral student : ST 507; PSY 535, Corequisite: ST 508
Typically offered in Spring only

ECD 740  Advanced Psycho-Social Identity Development: Race, Gender, and Culture  (3 credit hours)
Meanings and intersections of gender, race and culture. Advanced theories and research related to counseling practice. Sexuality, disability and class and implications for counseling. Case study, personal narratives and video segments expand on course readings.

Prerequisite: ECD 540; ECD 525 ; Post-master's degree students
Typically offered in Fall and Spring
ECD 886 Internship in Teaching in Counselor Education (4 credit hours)
Using the participant-observer role, this course requires participation in selected educational situations with emphasis upon development of observational skills, ability to record relevant observations by means of written journals, skills in analyzing counseling and teaching experiences, identifying critical incidents in counseling and teaching, and predicting consequences of counseling and teaching interventions.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ECD 892 Doctoral Research Projects (1-3 credit hours)
Project or problem in research in education for graduate students, supervised by members of graduate faculty. Research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.

Typically offered in Fall, Spring, and Summer

ECD 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ECD 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ECD 896 Summer Dissertation Research (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

ECD 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

**Crop Science (CS)**

CS 101 Field Crop and Turfgrass Management Orientation (1 credit hour)
Introduction to NCSU and the Agricultural Institute with an emphasis on areas related to Field Crops Technology and Turfgrass Management. Students will explore university, college, and departmental resources, academic policies and procedures, career opportunities, and current trends and issues in our related disciplines. Students cannot receive credit for both CS 10 and AGI 10. FCT or TGM only.

Requisite: Agricultural Institute Only
Typically offered in Fall only
CS 111  Field Crop Production  (4 credit hours)
Management of field crops, including growth and development, establishment, pest management, environmental considerations, rotations of crops and chemicals, harvesting, storage and marketing. SPEARS
Requisite: Agricultural Institute Only
Typically offered in Fall and Spring

CS 116 Agronomic Crops - Cotton, Peanuts, and Tobacco  (3 credit hours)
Fundamental agronomic practices associated with the production of cotton, peanuts, and tobacco. Discussions will include crop growth and development stages, how to choose the best varieties and hybrids, planting strategies, fertility and pest management programs, harvest and storage options, and the use of technologies associated with the production and maintenance of a quality commodity.
Restriction: AGI Only
Typically offered in Fall and Spring

CS 118 Agronomic Crops - Corn, Small Grains and Soybeans  (3 credit hours)
Fundamental agronomic practices associated with the production of corn, small grains and soybean. Discussions will include crop growth and development stages, how to choose the best varieties and hybrids, planting strategies, fertility and pest management programs, harvest and storage options, and the use of technologies associated with the production and maintenance of a quality commodity.
Restriction: AGI Only
Typically offered in Fall and Spring

CS 121 Turfgrasses and Their Uses  (3 credit hours)
An introduction to turfgrass species and their uses. Emphasis on: size and scope of the turfgrass industry, basic concepts of grass growth and development, characteristics of cool- and warm-season turfgrasses and their use for golf courses, lawns, athletic fields, and other applications. Techniques for successful establishment and maintenance of turfgrass areas.
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 122 Principles of Turfgrass Management  (3 credit hours)
An examination of cultural practices essential for management of high quality turfgrass areas. Topics include: function of plant nutrients, fertilizer characteristics and application techniques, irrigation programming, construction of high use turfgrass areas, calibration of spreaders and sprayers, aeration, pesticide fate and developing effective management systems. ERICKSON
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 151 Forage Production  (3 credit hours)
Characteristics of major forage crops and their response to agronomic and animal management factors. Utilization methods, growth and quality characteristics related to animal performance. GREEN
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 152 Weed Control in Field Crops  (3 credit hours)
Principles involved in development of weed control programs and practical application of weed management techniques for major North Carolina cropping systems. Emphasis on proper use of herbicides. Laboratory includes weed identification and herbicide application.
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 153 Turfgrass and Ornamental Weed Control  (3 credit hours)
General principles in development of turfgrass and ornamental weed prevention and management programs. Different weeds and their life cycles and management techniques and factors affecting herbicide performance. Laboratory includes weed identification and application methods.
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 154/PP 154 Turf Weed and Disease Management  (3 credit hours)
General principles in turfgrass weed and disease development and management programs. Different weeds, their life cycles, management techniques, and factors affecting herbicide application performance will be covered. Students will learn the causes, development, identification and management of turfgrass diseases. Laboratory includes weed identification and herbicide application methods. Certain laboratory exercises will require personal transportation to Lake Wheeler Road Turf Field Lab unless otherwise specified by the lab instructors. The course is restricted to AGI students only.
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 155 Advanced Turf Management  (3 credit hours)
Turfgrass management covering mineral nutrition, water relations, environmental stress responses and management regimes for low maintenance turf, golf courses, athletic fields and other turf settings.
Requisite: Agricultural Institute Only; Prerequisite: CS 121 and CS 122
Typically offered in Fall only

CS 162 Flue-Cured Tobacco Production  (1 credit hours)
Flue-cured tobacco production, with emphasis on crop management practices, variety selection, transplant production, integrated pest management, fertilization, harvesting and curing, competitiveness in the world market, product needs of the tobacco manufacturing industry, and the role of climate and soil on yield and quality. FISHER
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 163 Peanut Production  (1 credit hours)
Principles of modern peanut production. Emphasis on the history and dispersal of peanuts, supply management programs, physiology of peanut growth and development, weed, disease, and insect management, fertility practices, recommended cultural practices including IPM, methods of maturity determination, recommended harvesting, curing, and handling practices. JORDAN
Requisite: Agricultural Institute Only
Typically offered in Fall only
CS 164 Soybean Production (1 credit hours)
Introduction to the production of soybeans in North Carolina and the southeastern United States. Growth and development, tillage, fertility, varieties, seed quality, planting decision, pest management, harvesting, production economics, marketing, environmental quality, and social responsibility. DUNPHY
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 165 Cotton Production (1 credit hours)
Cotton production, marketing, and improvement. Emphasis on current information regarding varieties, fertilization, disease, insect and weed control, cultural practices, equipment, harvesting and marketing. EDMISTEN
Requisite: Agricultural Institute Only
Typically offered in Fall only

CS 166 Corn Production (1 credit hours)
Growth, management, and markets for corn in North Carolina.
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 167 Wheat Production (1 credit hours)
Practical approach to growing wheat and other small grain crops. Topics will include growth, management, and markets for small grains in North Carolina.
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 190 Turf Seminar (1 credit hours)
Discussions of the operations, opportunities, and problems existing in various phases of the turf industry by leaders in the various facets of the industry.
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 191 Field Crops Seminar (2 credit hours)
Guest speakers, students presentations, and outside assignments will address professionalism; professional development; and current challenges, issues, and opportunities facing profitable and sustainable agronomic crop production. A grade of C or better is required. FCT Only.
Requisite: Agricultural Institute Only
Typically offered in Spring only

CS 200 Introduction to Turfgrass Management (4 credit hours)
Turfgrass selection, establishment, maintenance, and pest management in lawns, golf courses, athletic fields, and roadside care; Emphasis on understanding the impact of the environment on management practices and turfgrass performance. Field trips in laboratory.
Prerequisite: BIO 181(preferred) or ZO 160(alternate) BO 200, or CS 213
Typically offered in Fall only

CS 210 Lawns and Sports Turf (3 credit hours)
Utilization of turfgrasses for lawns and recreational areas. Emphasis on: the cultural and environmental benefits of grassed areas, concepts of grass growth and development, selecting adapted grasses for proper use, techniques for successful establishment and management of cool- and-warm-season turfgrasses, fertilization, irrigation, aeration, and pest management. The history and benefit of natural and artificial sports fields will also be discussed. Credit will not be awarded for both CS 200 and CS 210.

GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CS 211 Plant Genetics (3 credit hours)
Fundaments of plant genetics. Genetic basis for plant improvement. Genetic analysis of Mendelian traits, molecular structure and organization of genetic material, crop biotechnology, distribution and behavior of genes in populations.
Prerequisite: BIO 183 or ZO 160
Typically offered in Spring only

CS 213 Crop Science (3 credit hours)
Our basic premise is that to produce field crops successfully we must know how our crops grow and develop and what they require from the production environment - including the farmer - for satisfactory management of the relevant environment, and finally to successful yield and quality of commercially important product. Especially important is to understand the various ways in which producers must respond to ever-changing circumstances on the farm, at the bank (credit), and in the marketplace. A solid understanding of the impact of cropping history on the soil and entire ecosystem to be used for the next crop also is vitally important.
Prerequisite: BIO 181 or BIO 183 or PB 200 or PB 250
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

CS 214 Crop Science Laboratory (1 credit hours)
The laboratory's intent is to provide students enrolled in the CS 213 lecture course opportunity to apply under field and controlled environmental conditions the crop production principles introduced in the lecture course. Using a hands-on approach targeting a variety of crop management approaches, students will examine the growth and development characteristics that relate most directly to final yield and quality of the marketed product. Students will employ a spectrum of treatment combinations aimed at strengthening understanding of the interaction of genotype, environment, and management, with the goal of identifying influential factors of crop yield and quality.
"Co-requisite: CS 213"
Typically offered in Fall and Spring
CS 216 Southern Row Crop Production - Cotton, Peanuts, and Tobacco (3 credit hours)
Crop production systems comprised of cotton, peanuts, and tobacco are unique to the southern United States, and management practices tailored to a successful harvest are vastly different than those employed in the production of grain crops. CS 216 will introduce students to these production standards and provide a basic foundation for the principles of cotton, peanut, and tobacco management. At the conclusion of the course students will be able to describe growth/development patterns, tillage systems, scouting techniques, proper seed/variety selection and planting populations, provide recommendations for pest management, employ Integrated Pest Management strategies, describe harvesting practices, and give marketing approaches for each crop.

Typically offered in Fall and Spring

CS 218 Southern Row Crop Production - Corn, Small Grains and Soybeans (3 credit hours)
Fundamental agronomic practices associated with the production of corn, small grains and soybean. Discussions will include crop growth and development stages, how to choose the best varieties and hybrids, planting strategies, fertility and pest management programs, harvest and storage options, and the use of technologies associated with the production and maintenance of quality commodity.

Typically offered in Fall and Spring

CS 224 Seeds, Biotechnology and Societies (3 credit hours)
An exploration of seeds, how seeds are the delivery system for crop biotechnology and how a specific culture’s perception of science and agriculture influence the acceptance or rejections of modern genetic technologies. Topics include seed germination, survival and preservation; seed industry influence on societies and how societies are influencing the seed industry; seed production - commercially and at home; how our diverse genetic resources are preserved; how biotechnology is applied to agriculture and delivered through seeds; the impact biotech is having on the seed industry and subsequently on us and global agriculture; concerns and potential benefits of biotechnology application to crops.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

CS 230 Introduction to Agroecology (3 credit hours)
This course will examine the biological and physical attributes of farming systems and their associated ecological and social impacts in temperate and tropical regions. It will address the ecological consequences of indigenous food and fiber production systems, conventional agricultural systems and “alternative” systems that incorporate biological pest control and natural nutrient inputs. Students will examine several case studies that integrate their understanding of concepts.

Prerequisite: BIO 105 or BIO 181 or BIO/ZO 160 or BO 200 or BO 250 or HS 201 or CS 213
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

CS 312 Grassland Management for Natural Resources Conservation (3 credit hours)
Basic principles and practices of production and utilization of pasture and forage crops; impact on developing sustainable systems for livestock feed, soil and water conservation; use of computers to assist in whole farm planning and information retrieval.

Prerequisite: BIO 181(preferred) or ZO 160(alternate) CS 213, SSC 200
Typically offered in Spring only

CS 400 Turf Cultural Systems (3 credit hours)
Topics include: golf course design considerations, fertilizer characteristics and application techniques, irrigation programming, construction of high use turfgrass areas, calibration of spreaders and sprayers, aeration, pesticide fate and development of effective management systems.

Prerequisite: C- or better in CS 200
Typically offered in Spring only

CS 410/HS 410 Community Food Systems (3 credit hours)
This course explores the economic, socio-cultural, policy and health perspectives of community food systems using a multidisciplinary and systems-level framework. Students will use a systems framework to critically examine local and global food challenges related to food insecurity, food justice and food sovereignty, food waste and sustainable approaches to addressing food challenges. Novel aspects of this course include student experiential learning opportunities that include service learning with community partners addressing local food challenges, team building through group work and in-class discussion and development of personal food ethic provocative proposition.

Prerequisite: Junior or senior standing
Typically offered in Fall only

CS 411 Crop Ecology (3 credit hours)

Prerequisite: PB 321 or PB 421
Typically offered in Fall only

CS 413 Plant Breeding (2 credit hours)
Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties.

Prerequisite: CS 211 or GN 311
Typically offered in Spring only

CS 414 Weed Science (4 credit hours)
History, current status and fundamentals of weed biology and cultural, biological, and chemical weed control; properties and uses of herbicides; weed identification; proper use of herbicide application equipment; current weed management practices incrops and non-cropland situations.

Typically offered in Fall only

CS 415 Integrated Pest Management (3 credit hours)
History, principles, and application of techniques for managing plant pests. Theory and practice of integrating pest control tactics to manage pests within economic, environmental, and sociological constraints. Topics include pest monitoring methodology, economic aesthetic thresholds, biological control, efficient pesticide use, biotechnology, and global positioning systems.

Prerequisite: BIO 181(preferred) or ZO 160(alternate) or BO 200 or BO 250
Typically offered in Spring only
CS 418/CS 518 Introduction to Regulatory Science in Agriculture (3 credit hours)
This course covers laws, regulations and agencies involved in the registration of conventional, biotechnology and biological crops, crop protectants and growth regulators. US and international laws and regulations will be discussed from technical proof of concept through commercial release.

Typically offered in Fall only

CS 424/CS 524 Seed Physiology (3 credit hours)
This course will explore the physiological processes associated with seed formation, development, maturation, germination, and deterioration of agronomic and horticultural species. We will also study the physiological aspects of seed dormancy, how dormancy is manifested and overcome in cultivated and noncultivated systems and dormancy’s impact on weed seedbank ecology.

Prerequisite: PB 321 or PB 421 or FOR 303
Typically offered in Fall only

CS 428/CS 528 Advanced Regulatory Science in Agriculture (3 credit hours)
This course goes into additional depth and provides hands-on exercises concerning agriculture regulatory topics covered in CS 418/518. The course will introduce laws, regulations and agencies involved in the fertilizer, animal and waste management as well as the role of public policy in the regulatory process. CS 418/518 is a prerequisite for this class.

Prerequisite: CS 418
Typically offered in Spring only

CS 430 Advanced Agroecology (4 credit hours)
This course applies agroecological principles introduced in CS 230 and critical thinking to evaluate various agroecosystems. Students will examine food, fiber, and other commodity production systems for security, productivity, and sustainability and address the simultaneous need to protect natural environments and the biodiversity on which agroecosystems depend. Topics include discussion of national and international government policies, research programs, and education programs that influence the future application of agroecosystem principles.

P: CS 230
Typically offered in Spring only

CS 465/CS 565 Turf Management Systems and Environmental Quality (3 credit hours)
Integration of turfgrass management systems and the use of BMPs and IPM to protect environmental quality. Examination of water quality issues relative to turf. Application of Best Management Practice and Integrated Pest Management strategies. Credit c

Prerequisite: CS 400 and Senior standing
Typically offered in Fall only

CS 470/ENT 470/PP 470 Advanced Turfgrass Pest Management (2 credit hours)
Characteristics and ecology of turfgrass weed, insect, and disease pests; identification and diagnosis of turfgrass pests, strategies for managing pests including cultural, mechanical, biological, and chemical methods; development of integrated pest management programs, characteristics and modes of action for herbicides, insecticides, fungicides, and plant growth regulators; behavior and fate of pesticides in soil; and the development and management of pesticide resistant pest populations.

Prerequisite: C- or better in CS 200
Typically offered in Spring only

CS 480/HS 480 Sustainable Food Production (capstone) (1 credit hour)
This course introduces students to the process of developing a project for presentation in the area of sustainable food production and food systems. Students are to synthesize and integrate knowledge acquired in previous course work and other learning experiences.

Prerequisite: Senior standing and CS 430
Typically offered in Fall only

CS 502/HS 502/PP 502 Plant Disease: Methods & Diagnosis (2 credit hours)
Introduction to the basic principles of disease causality in plants and the methodology for the study and diagnosis of plant diseases caused by fungi. Identification of plant-pathogenic fungi. Research project, disease profiles and field trips are required.

Prerequisite: PP 315
Typically offered in Fall only

CS 518/CS 418 Introduction to Regulatory Science in Agriculture (3 credit hours)
This course covers laws, regulations and agencies involved in the registration of conventional, biotechnology and biological crops, crop protectants and growth regulators. US and international laws and regulations will be discussed from technical proof of concept through commercial release.

Typically offered in Fall only

CS 524/CS 424 Seed Physiology (3 credit hours)
This course will explore the physiological processes associated with seed formation, development, maturation, germination, and deterioration of agronomic and horticultural species. We will also study the physiological aspects of seed dormancy, how dormancy is manifested and overcome in cultivated and noncultivated systems and dormancy’s impact on weed seedbank ecology.

Prerequisite: PB 321 or PB 421 or FOR 303
Typically offered in Fall only

CS 528/CS 428 Advanced Regulatory Science in Agriculture (3 credit hours)
This course goes into additional depth and provides hands-on exercises concerning agriculture regulatory topics covered in CS 418/518. The course will introduce laws, regulations and agencies involved in the fertilizer, animal and waste management as well as the role of public policy in the regulatory process. CS 418/518 is a prerequisite for this class.

Prerequisite: CS 418
Typically offered in Spring only
CS 541/HS 541 Plant Breeding Methods (3 credit hours)
Overview of plant breeding methods for advanced undergraduate and beginning graduate students. Covers principles and concepts of inheritance, germplasm resources, pollen control, measurement of genetic variances, and heterosis. Special topics include heritability, genotype-environment interaction, disease resistance, and polyploidy. In-depth coverage on methods for breeding cross-pollinated and self-pollinated crops. Prepares students for advanced plant breeding courses.
Prerequisite: ST 511, Corequisite: ST 512
Typically offered in Fall only

CS 565/CS 465 Turf Management Systems and Environmental Quality (3 credit hours)
Integration of turfgrass management systems and the use of BMPs and IPM to protect environmental quality. Examination of water quality issues relative to turf. Application of Best Management Practice and Integrated Pest Management strategies. Credit c
Prerequisite: CS 400 and Senior standing
Typically offered in Fall only

CS 590 Special Topics (1-6 credit hours)
The study of special problems and selected topics of current interest in crop science and related fields.

CS 591 Special Problems (1-6 credit hours)
Special problems in various phases of crop science. Problems may be selected or will be assigned. Emphasis on review of recent and current research. Credits Arranged.

CS 601 Seminar (1 credit hours)
Review and discussion of scientific articles, progress reports in research and special problems of interest to agronomists. Maximum of two credits allowed toward master's degree; however, additional credits toward doctorate allowed.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

CS 620 Special Problems (1-6 credit hours)
Special problems in various phases of crop science. Problems may be selected or will be assigned. Emphasis on review of recent and current research. Credits Arranged.
Typically offered in Fall, Spring, and Summer

CS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring

CS 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Spring only

CS 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Spring only

CS 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Spring only

CS 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CS 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Summer only

CS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

CS 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

CS 714 Crop Physiology: Plant Response to Environment (3 credit hours)
Examines interactions between plants and the environment. Light environment, plant canopy development, photosynthesis, source-sink relations, growth analysis, growth regulation, water relations, and environmental stresses are addressed.
Prerequisite: (PB 321 or PB 421) and CH 223 or CH 227
Typically offered in Fall only

CS 716/HS 716 Weed Biology (3 credit hours)
This course analyzes the interactions between human disturbance and dynamics of weed populations and communities. Emphasis is given to factors that drive weed control actions and the ecological and evolutionary processes by which weeds survive and adapt
Prerequisite: CS 414
Typically offered in Spring only
CS 717/HS 717  Weed Management Systems  (1 credit hours)
Weed management systems including integration of cultural, biological, mechanical and chemical methods for vegetables, fruits, ornamentals, turf, small grains, corn, tobacco, cotton, peanuts, aquatic and non-cropland settings. Taught second 5 week of semester. Drop date is by last day of 3rd week of minicourse.
Prerequisite: CS 414
Typically offered in Fall only

CS 720/GN 720/HS 720  Molecular Biology In Plant Breeding  (3 credit hours)
Theory and principles of molecular biology applied to plant breeding. Experimental approaches to induce genetic change, cytoplasmic recombination, haploid utilization and potentials of molecular techniques for solving breeding problems.
Prerequisite: CS(GN, HS) 741, GN 701, GN 702, GN 703
Typically offered in Spring only

CS 725/HS 725/SSC 725/TOX 725  Pesticide Chemistry  (1 credit hours)
Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of minicourse.
Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)
Typically offered in Fall only

CS 726/ANS 726/FOR 726  Advanced Topics In Quantitative Genetics and Breeding  (3 credit hours)
Advanced topics in quantitative genetics pertinent to population improvement for quantitative and categorical traits with special applications to plant and animal breeding. DNA markers - phenotype associations. The theory and application of linear mixed models, BLUP and genomic selection using maximum likelihood and Bayesian approaches. Pedigree and construction of genomic relationships matrices from DNA markers and application in breeding.
Prerequisite: ST 511, Corequisite: ST 512
Typically offered in Fall only

CS 727/HS 727/SSC 727/TOX 727  Pesticide Behavior and Fate In the Environment  (2 credit hours)
Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of minicourse.
Prerequisite: CS(HS, SSC, TOX) 725, SSC 200
Typically offered in Fall only

CS 729/HS 729  Herbicide Behavior In Plants  (2 credit hours)
Chemical, physiological and biochemical actions of herbicides in plants including uptake, translocation, metabolism and mechanism of action.
Prerequisite: BO 751 and BO 752 and CS(HS, SSC) 725
Typically offered in Spring only

CS 745/GN 745/HS 745  Quantitative Genetics In Plant Breeding  (1 credit hours)
Theory and principles of plant quantitative genetics. Experimental approaches of relationships between type and source of genetic variability, concepts of inbreeding, estimations of genetic variance and selection theory.
Prerequisite: CS(GN, HS) 541, ST 712, course in quantitative genetics recommended
Typically offered in Spring only

CS 746/GN 746/HS 746  Cytogenetics in Plant Breeding  (2 credit hours)
Theory and principles of plant breeding methodology including population improvement, selection procedures, genotypic evaluation, cultivar development and breeding strategies.
Typically offered in Spring only

CS 755  Applied Research Methods and Analysis for Plant Sciences  (3 credit hours)
Students will gain understanding of the common principles of scientific method. They will gain knowledge and experience with planning for research, developing research objectives, methodology considerations, experimental design, statistical analyses, and presentation of data. Class will have a heavy focus on experimental methods in applied plant science research.
Prerequisite: ST 511
Typically offered in Fall only

CS 795  Special Topics  (1-6 credit hours)
The study of special problems and selected topics of current interest in crop science and related fields.

CS 801  Seminar  (1 credit hours)
Review and discussion of scientific articles, progress reports in research and special problems of interest to agronomists. Maximum of two credits allowed toward master's degree; however, additional credits toward doctorate allowed.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

CS 820  Special Problems  (1-6 credit hours)
Special problems in various phases of crop science. Problems may be selected or will be assigned. Emphasis on review of recent and current research. Credits Arranged.
Typically offered in Fall, Spring, and Summer

CS 860/GN 860/HS 860  Plant Breeding Laboratory  (1 credit hours)
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.
Prerequisite: CS(GN, HS) 741
Typically offered in Spring only
**Plant Breeding Laboratory (1 credit hours)**
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.

Prerequisite: CS(GN,HS)741

Typically offered in Fall only

**Doctoral Supervised Teaching (1-3 credit hours)**
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

**Doctoral Preliminary Examination (1-9 credit hours)**
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Spring and Summer

**Doctoral Supervised Research (1-9 credit hours)**
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student

Typically offered in Spring only

**Doctoral Dissertation Research (1-9 credit hours)**
Dissertation research.

Prerequisite: Doctoral student

Typically offered in Spring, and Summer

**Summer Dissertation Research (1 credit hours)**
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student

Typically offered in Summer only

**Doctoral Dissertation Preparation (1-9 credit hours)**
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

**Intro to Instructional Technology for Educators (3 credit hours)**
Introduction to effective technology integration in teaching practices across the curriculum for pre-service teachers. Exploration of different technology-based tools commonly integrated in instruction, including desktop, Internet/ Web-based, mobile, and cloud applications. Examination of integration challenges using relevant, real-world examples from current teacher practices. Planning for student-centered, project-based lessons that make use of diverse technologies.

Typically offered in Fall and Spring

**Intro to Teaching Humanities and Social Sciences (3 credit hours)**
For prospective teachers in Middle and Secondary Business and Marketing, English, Foreign Languages, Language Arts, and Social Studies. Emphasis on what it means to be an educator as well as differing aspects and procedures of instruction and analysis of competencies required of teachers. The course has a required fieldwork component in local K-12 school, and students are responsible for their own transportation to and from the schools. students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. This course is restricted to Teacher Education majors.

Prerequisite: Sophomore standing; Corequisite: ED 204

Typically offered in Fall and Spring

**Introduction to Teaching Humanities and Social Sciences (3 credit hours)**
For prospective teachers in secondary and middle years social studies, English, language arts, and foreign languages. An emphasis on differing aspects and procedures of instruction and analysis of competencies required of teachers. Field work in a variety of education settings including an extended period in one curriculum area.

Prerequisite: Sophomore standing

Typically offered in Fall and Spring

**Special Topics in Education (1-3 credit hours)**
Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

Typically offered in Fall and Spring

**Equity and Education (3 credit hours)**
This course examines the intersection of diversity, inclusivity, equity, and P-16 education; specifically by considering multiple identity markers such as: gender, sexuality, race, socioeconomic status, ability, and all aspects of culture. This interdisciplinary course uses a sociological lens to examine educational materials, research studies, memoirs, and media to explore the following essential questions: In what ways do students’ cultural identities impact their experiences in schools?; How are social inequalities perpetuated by and within the educational system?; What types of individual and systemic practices can help disrupt the marginalization of students in P-16 schools? How can schools celebrate and sustain students’ cultural identities?

Prerequisite: ED 204 or AEE 206 or ELM 250 or Junior Status

GEP Interdisciplinary Perspectives, GEP U.S. Diversity

Typically offered in Fall and Spring

**Middle Years Reading (3 credit hours)**
Reading skills in middle years education developed with emphasis on application of the reading process to content area.

Prerequisite: Six hours in ED or PSY

Typically offered in Spring only
ECI 307 Teaching Writing Across the Curriculum (3 credit hours)
For prospective teachers of all disciplines in middle/high school. Practical strategies for writing as a learning tool and for teaching writing. Lesson plans, assignments, experiences appropriate to content areas. Focus on writing, writing instruction, and technology. Separate sections for Middle Grades (MSL) and English (LTN) majors.
Prerequisite: ENG 101
Typically offered in Fall and Spring

ECI 309 Teaching in the Middle Years (3 credit hours)
Nature and purposes of middle grades education. Early adolescent development, curriculum, teaching/learning methods, school organization, and characteristics of effective middle years teachers. Includes field experience.
Prerequisite: Six hours in ED or PSY
Typically offered in Fall and Spring

ECI 332 Health Promotion and Disease Prevention (3 credit hours)
Emphasis on education of the public regarding general health concerns including cancer, cardiovascular disease, accident prevention, nutrition, drugs, alcohol, mental health, sexuality, and environmental hazards.
Prerequisite: For credentialed health professionals only
Typically offered in Spring only

ECI 333 Health Care Delivery (3 credit hours)
The historical basis of health care delivery in the U. S. with emphasis on hospitals, health maintenance organizations, ambulatory care centers, ambulatory surgery, nursing homes, and private care practice. Philosophical issues of funding health care, promoting health care, and the training of health care workers.

ECI 335 Planning Classroom and Clinical Curricula (3 credit hours)
Procedures for planning health occupations curricula for classroom and clinical settings. Practice in writing, updating, and refining health curriculum with emphasis on selection and sequencing. Comparison of styles of writing curricula. Roles and responsibilities of healthy curriculum planner.
Prerequisite: For Certification Majors: EOE 101, 205; For Non-Certification Majors: EOE 101. For credentialed health professionals

ECI 336 Strategies for Teaching a Health Occupations Course (3 credit hours)
Planning and implementation of effective instructional strategies for clinical and classroom settings. The nature of the teaching/learning process, psychological and philosophical aspects of teacher choice of various strategies.
Prerequisite: For credentialed health professionals
Typically offered in Spring only

ECI 405/ENG 405 Literature for Adolescents (3 credit hours)
The history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum.
Prerequisite: Junior standing.
Typically offered in Fall only

ECI 414 Human Relations and Discipline in the Classroom (3 credit hours)
Designed to help prospective teachers foster positive interpersonal relationships in classrooms, build a sense of community and create a purposive environment for learning. Investigates issues such as group building, active listening, and major approaches to discipline. Uses case studies and problem solving methods.
Prerequisite: PSY 304 or EDP 304 and 6 hours of education

ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom (3 credit hours)
Provides classroom teachers in all disciplines and grade levels with a knowledge of various handicapping conditions, as well as with techniques to assist exceptional students within the mainstreamed classroom. Required for MSL majors.
Prerequisite: Six hours in ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 423 Methods for Teaching Modern Foreign Languages K-12 (5 credit hours)
Methodology and pedagogy of teaching Foreign Languages grades K-12 with an emphasis on lesson and unit planning, second language acquisition, diversity, national and state standards, materials, assessment, proficiency oriented teaching, and demonstrations/practice teaching in micro-lessons. This course provides opportunities for prospective Foreign Language teachers to integrate knowledge of their language with effective materials, strategies, and methods of instruction to prepare students for K-12 Foreign Language teaching. The course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools.
Restriction: Open to FLL Education majors or by permission
Typically offered in Fall only

ECI 424 Student Teaching in Modern Foreign Languages (12 credit hours)
Teaching experience for prospective teachers of Modern Foreign Languages in a selected elementary, middle or high school under the supervision of a cooperating teacher and a university faculty supervisor. Additional school observations and on campus seminars are a part of this course. The course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools. Students are covered under the General Statute affording liability protection.
Prerequisite: Admission to Professional semester, ECI 423
Typically offered in Spring only

ECI 427/ECI 527/FL 527/FL 427 Methods and Materials in Teaching English as a Second Language (3 credit hours)
Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools. Students cannot receive credit for both FL/ECI 427 and FL/ECI 527.
Typically offered in Fall only
ECI 430  Methods and Materials for Teaching Language Arts in the Middle Grades  (4 credit hours)
Inquiry, activity-oriented course provides opportunities for prospective language arts middle school teachers to integrate knowledge of English with effective materials, strategies, methods of instruction. Students observe middle school classes, plan lessons, and units, practice varied classroom strategies, technologies in micro-lessons. Prepared students for teaching language arts with other content areas in middle schools.
Prerequisite: ECI 205, ELP 344, PSY 304 or EDP 304, ECI 309, ECI 306, ECI 307, Senior standing, candidacy in Middle Grades Teacher Education, Corequisite: ECI 435
Typically offered in Fall only

ECI 435  Methods and Materials for Teaching Social Studies in the Middle Grades  (4 credit hours)
For preservice middle school social studies teachers. Focus on: teaching and evaluation skills, adaptation of instruction to individual learner differences, identification and creation of instructional materials appropriate for use in social studies teaching.
Prerequisite: Admission to professional semester
Typically offered in Fall only

ECI 436/FL 536/ECI 536/FL 436  Perspectives on English as a New Language  (3 credit hours)
Examination of the complexity of multiculturalism in American society and the challenges faced by immigrant families in adapting to U.S. institutions. Emphasis on understanding historical, legal, cultural and pedagogical issues with respect to learning English as a new language [ENL]. No credit given for both FL/ECI 436 and FL/ECI 536.
Typically offered in Fall only

ECI 438  Medical Law and Ethics  (3 credit hours)
Ethical and legal issues involved in delivering health care, such as euthanasia, reproductive technology, organ transplants, patients' rights, and confidentiality. Classical ethical theories and principles. Systematic review procedures and current medical law used to examine current case dilemmas in the health professions.
Typically offered in Fall only

ECI 442  Field Experience in Business and Marketing Education  (3 credit hours)
Supervised off-campus work experience in an approved business and marketing content related job. The work experience relates on-the-job experiences to the technical competencies taught in the North Carolina Standard Course of Study for business and marketing education programs.
Prerequisite: Junior standing
Typically offered in Fall and Summer

ECI 444  Administration of Business and Marketing Education  (3 credit hours)
Development of successful business and information technology, and marketing education programs. Program promotion, managing cooperative education experiences, managing DECA and FBLA chapters, and determining professional development strategies. Primary roles of the business and information technology and marketing education teachers' classroom instruction. Program management, classroom management, management of career-technical student organizations, cooperative education, and program development.
Prerequisite: ED 204 and ECI 204 and MKE Business and Marketing Education Major
Typically offered in Fall only

ECI 445  New Literacies, Emerging Technologies, and Electronic Portfolios  (2 credit hours)
Inquiry, activity-oriented course designed to engage students in theory and practice related to 21st century skills, new literacies, and emerging technologies, as well as focused support for developing the culminating electronic portfolio. Course provides opportunity for pre-service, English Language Arts/ Social Studies middle School teachers to integrate knowledge of English and Social Studies with emerging technologies and digital literacy applications.
Prerequisite: Senior Standing; Corequisite: ECI 430 and ECI 435
Typically offered in Fall only

ECI 446  Curriculum and Methods of Teaching Business and Marketing Education  (4 credit hours)
Study of the curriculum common to business and information technology and marketing education and the research behind its development. Methods common to instructional planning, implementation, and evaluation of effective business and information technology and marketing education programs are topics included in this course. Twenty hours of field work are required. Student are expected to provide their own transportation to and from assigned public schools. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details in acquiring the insurance and the current charge. MKE students only.
Prerequisite: Admission to Teacher Education Candidacy; MKE Business and Marketing Education Majors
Typically offered in Fall only

ECI 447  Student Teaching in Business and Marketing Education  (9 credit hours)
Fifteen weeks full-time student teaching business and marketing subjects in the public schools under the supervision of a cooperating teacher and university supervisor. Students will develop skills in instruction, evaluation, advising, administration, and observation. Students are expected to provide their own transportation to and from assigned public schools. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. MKE students only.
Prerequisite: Admission to Professional Semester; MKE Business and Marketing Education Majors, Corequisite: ECI 494
Typically offered in Spring only
ECI 448/ECI 548  E-Business Applications in Business and Marketing Education  (3 credit hours)
Emphasis on design and construction of advanced web pages, business and marketing applications of electronic commerce, as well as economic, social, legal, and ethical issues that are related to conducting business in a virtual environment. Content prepares students to apply principles to the business and marketing education curriculum in the public schools. Credit for both ECI 448 and ECI 548 is not allowed.

Typically offered in Fall only

ECI 450  Methods and Materials in Teaching English  (4 credit hours)
Methods and materials of teaching English in grades 9-12, with an emphasis on lesson planning and demonstrations/practice in teaching literature, study skills, speaking, listening, and writing. Taught during the first seven weeks of the semester.

Prerequisite: ECI 204, ELP 344, PSY 304 or EDP 304; Senior standing and admission to Teacher Education candidacy with a Major in English
Typically offered in Spring only

ECI 451  Teaching Reading Across Disciplines  (3 credit hours)
Facilitates study of methods and materials for teaching literacy across disciplines. Develops instructional strategies in the use of print and digital texts and media to support disciplinary learning.

Prerequisite: Six hours in ED or PSY
Typically offered in Fall and Spring

ECI 454  Student Teaching in English/Language Arts  (1-12 credit hours)
Provides the prospective teacher with experience in the techniques and skills involved in teaching English in secondary schools or Language Arts in middle schools in a selected off-campus station. Student interns become familiar with the total school program, eventually carrying a full teaching load, and participate in relevant school and community activities. Students are required to provide their own transportation. TED and MSL majors only.

Prerequisite: Admission to Student Teaching Professional Semester ; For MSL students: ECI 430, 416, 464
Typically offered in Spring only

ECI 460  Methods and Materials in Teaching Secondary Social Studies  (4 credit hours)
Teaching techniques, innovations, and development of teaching and evaluation skills in the area of secondary school social studies. Adaptation of instruction to individual learner differences, and selection and design of instructional materials. Taught during the first six weeks of the semester. Taught during the first six weeks of the semester.

Prerequisite: ECI 205, ELP 344, Sr. standing and admission to professional semester with a major in either history, sociology, political science
Typically offered in Fall only

ECI 464  Student Teaching in Social Studies  (1-8 credit hours)
Skills and techniques in teaching social studies in secondary and middle schools. Each student spends ten weeks in a selected off-campus center. The student demonstrates competencies essential for teaching social studies, becomes familiar with the total school program, and participates in a variety of school and community activities.

Prerequisite: Admission to professional semester, Corequisite: For LTH, LTP, LTS students: ECI 460. For MSL students: ECI 454, 430, 416
Typically offered in Spring only

ECI 471  Educational Implications of Learning and Developmental Theory  (3 credit hours)
Topics related to human psychological development. Cognitive, social, physical changes, and their interaction among adolescence. Departmental Approval Required.

Prerequisite: NC TEACH Participants
Typically offered in Spring and Summer

ECI 472  Interaction of Classroom Management and Instruction  (3 credit hours)
Topics related to teaching in the content area and classroom management. Lesson planning, principles applied to education, measurement and evaluation procedures, behavior therapy, and student motivation. Departmental Approval Required.

Prerequisite: ECI 471 ; NC TEACH Participants
Typically offered in Spring and Summer

ECI 473  Subject Specific Methods  (3 credit hours)
Topics related to cultural factors and how they affect teachers and students in the classroom. Instructional techniques and the development of instructional plans that enhance schooling experiences of culturally diverse students. Departmental Approval Required.

Prerequisite: ECI 472 ; NC TEACH participants, Corequisite: ECI 474
Typically offered in Fall only

ECI 474  Curriculum and Instruction Practices 1  (3 credit hours)
Topics related to essential skills and concepts needed by beginning teachers. The class focuses on questioning, test preparation, discussion skills, familiarity with national standards, multiple teaching strategies, and assessment + evaluation of students. Departmental Approval Required.

Prerequisite: ECI 472 ; NC TEACH participants, Corequisite: ECI 473
Typically offered in Fall only

ECI 475  Peer Mentoring in Alternative Licensure  (3 credit hours)
Topics related to observing and evaluating fellow teachers in relation to the national state teaching competencies. Classroom observations, videotaping, and group evaluations that are shared and discussed with fellow teachers. Departmental Approval Required.

Prerequisite: ECI 474 ; NC TEACH Participants, Corequisite: ECI 475
Typically offered in Spring only

ECI 476  Curriculum and Instruction Practices 2  (3 credit hours)
Topics related to inquiry, activity based instruction, and constructivist principles. Analysis of principles, strategies and application of new teaching approaches. Departmental Approval Required.

Prerequisite: ECE 474 ; NC TEACH Participants, Corequisite: ECI 475
Typically offered in Spring only

ECI 494  Senior Seminar in Business and Marketing Education  (3 credit hours)
Discussion and analysis of problems, trends, and issues experienced while student teaching in the public schools.

Prerequisite: Admission to Professional Semester ; MKE Business and Marketing Education Majors, Corequisite: ECI 447
Typically offered in Spring only
ECI 496/ED 496 Special Topics in Education (1-3 credit hours)
Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

**Prerequisite:** Junior standing or Senior standing
**Typically offered in Fall and Spring**

ECI 500 Theory and Practice In Teaching Diverse Populations (3 credit hours)
Analysis of literature and research in related to impact of cultural factors on teaching and learning in contemporary schools. Exploration of teaching techniques and curricular directions designed to improve school experiences for diverse populations.

**Prerequisite:** Graduate standing
**Typically offered in Fall and Spring**

ECI 501 Foundations of Curriculum (3 credit hours)
Origin, development, and current status of elementary and secondary school curriculum and an evaluation of trends and issues likely to influence the curriculum in the future.

**Prerequisite:** 12 sem. hrs. graduate ED and PSY
**Typically offered in Summer only**

ECI 502 Technology Program Evaluation (3 credit hours)
This course is about evaluation of instructional technology programs, which is the systematic process of collecting and analyzing data in order to determine whether and to what degree program goals have been or are being achieved.

**Prerequisite:** Graduate Standing
**Typically offered in Fall and Spring**

ECI 505/FL 505 Issues and Trends in Foreign Language Education: Theory & Practice (3 credit hours)
An exploration of theory and practice issues related to foreign language teaching. Inquiry into proficiency-oriented instruction, innovative methodological approaches, the National Standards and learning scenarios, integrating culture, options for testing and assessment, content-based instruction, the role of grammar in second language acquisition, teaching foreign language students with learning disabilities, and Foreign Language in the Elementary School (FLES) in North Carolina. Students will examine case studies related to these topics and engage in a classroom action research project.

**Prerequisite:** Graduate standing
**Typically offered in Fall and Summer**

ECI 507 Social Justice Education (3 credit hours)
Introduction to principles of social justice education and their centrality in progressive policies and pedagogies that lead to equity in all teaching contexts. Students will develop strategies for successfully incorporating a social justice education.

**Prerequisite:** ECI 500
**Typically offered in Fall only**

ECI 508 Teachers as Leaders (3 credit hours)
Examines teacher leadership research, theory, and practice. Prepares teachers to assume leadership roles in classrooms, schools, school systems, and the larger educational community. Independent research projects required.

**Prerequisite:** Graduate standing
**Typically offered in Spring only**

ECI 509 Special Problems in Curriculum and Instruction (1-6 credit hours)
In-depth study of topical problems in curriculum and instruction selected from areas of current concern to practitioners in education.

**Prerequisite:** Six hours of ED or PSY
**Typically offered in Fall, Spring, and Summer**

ECI 510 Research Applications In Curriculum and Instruction (3 credit hours)
Focus on current issues and research methods used in the areas of curriculum development and supervision, instructional technology, English education, middle grades education, reading education, social studies education and special education.

**Prerequisite:** ST 507, Doctoral student, C and I Major
**Typically offered in Spring and Summer**

ECI 511 Introduction to Learning Design and Technology (3 credit hours)
Introduction to the Learning, Design, and Technology master's program at North Carolina State University and to the field of instructional design and educational technology, with an investigation of relevant careers, important theories and models guiding practice, and noteworthy research findings by area.

**Restriction:** Graduate Standing
**Typically offered in Fall only**

ECI 512 Emerging Technologies for Teaching and Learning (3 credit hours)
Examination of emerging technologies as applied in educational settings with a focus on related research, case studies, theoretical underpinnings, and strategies for effective integration.

**Typically offered in Spring and Summer**

ECI 513 Teaching and Learning with Digital Video (3 credit hours)
Development and implementation of digital video within educational contexts and situations. Design of educational watching, analyzing, and creating activities with video. Application of conventions and genres of digital video capture and editing to sample technology projects across curricular areas.

**Prerequisite:** Graduate standing
**Typically offered in Summer only**

ECI 514 Developing and Delivering Online Instruction (3 credit hours)
Examination of learning theories and research-based principles to design and apply appropriate digital tools to create maximally effective educational products.

**Prerequisite:** Graduate Standing
**Typically offered in Spring and Summer**

ECI 515 Cultural Investigations and Technical Representations in Education (3 credit hours)
Examination of contemporary approaches that educators can use to help their students construct cultural understanding in education settings through investigations and technical representations of culture with emerging tools (e.g., mapped cultural tours, AR/VR heritage exhibition, documentary, social media, games, fabrication, data analytics and visualization).

**Typically offered in Fall only**
ECI 516 Design and Evaluation Of Instructional Materials (3 credit hours)
Characteristics and selection of various media for instruction and their use in educational settings. Design and production of instructional materials. Analysis of research in the field. Individualized projects and assignments. Application of grounded research.
Prerequisite: Graduate standing
Typically offered in Spring only

ECI 517 Theoretical Foundations of Advanced Learning Environments (3 credit hours)
Examination and application of behavioral, cognitive, and constructivist theoretical frameworks underlying the design and development of advanced technology-enhanced learning environments.
Typically offered in Fall only

ECI 518 Digital Learning Program and Staff Development (3 credit hours)
Study and application of principles related to digital learning program planning, facilities and resource management, and staff development in K-12 settings.
Prerequisite: ECI 511, ECI 514, ECI 515, ECI 642
Typically offered in Spring only

ECI 519 Special Problems in Learning Design and Technology (3 credit hours)
In-depth study of topical problems in Learning Design and Technology selected from areas of current concern to practitioners in education.
Typically offered in Fall, Spring, and Summer

ECI 520 The Teaching Of Composition (3 credit hours)
For classroom teachers. Practical field-tested ideas to help students improve as writers by focusing on composition as a process as well as a product. Activities for teaching prewriting, drafting, revising, proofreading, grammar and evaluating with suggestions for individual and group learning. Writing in content areas and composition research/ theory. To take this course in sum. as part of Capital Area Writing Project, student must apply and be selected.
Prerequisite: 9 hrs. of ED, PSY and/or ENG;
Typically offered in Spring only

ECI 521 Teaching Literature For Young Adults (3 credit hours)
Designed to acquaint in-service and pre-service teachers with breadth and diversity of contemporary literature for adolescents, with emphasis on teaching young adult literature. Addresses history and themes of young adult literature, readability of materials, reading preferences, literary merit, skills that can be taught through literature, censorship, motivating students to read and organizing literature units.
Prerequisite: Senior standing or Graduate standing or PBS status
Typically offered in Fall only

ECI 522 Trends and Issues in English Language Arts Education (3 credit hours)
Consideration of past, current, and future trends and issues in English Language arts instruction, standards, and methodologies. Examination of research, theory, and practice in concert with trends, issues, and questions. Independent research projects required.
Prerequisite: Graduate standing

ECI 523 Teacher as Researcher (3 credit hours)
This course is designed to introduce the methods and skills required for designing, conducting, interpreting, and applying action research - the systematic inquiry into curriculum, instruction, teaching, and learning. This course will focus on reflective inquiry and practical applications.
Prerequisite: Graduate standing
Typically offered in Fall only

ECI 524 Theory and Research in Global Learning (3 credit hours)
An examination of theoretical frameworks for global learning and comparative studies of various national approaches to K-12 education. This course provides students with multiple lenses through which to consider how we teach and learn given the demands.
Typically offered in Spring and Summer

ECI 525 Contemporary Approaches In the Teaching Of Social Studies (3 credit hours)
Analysis of principles, strategies and application of new teaching approaches. Structured projects and practical experiences.
Prerequisite: Advanced Undergraduate standing or Graduate standing
Typically offered in Fall only

ECI 526 Theory and Research On Teaching and Learning Social Studies (3 credit hours)
A critical analysis of the literature relating to the teaching and learning of social studies and the drawing of implications for instructional practices.
Prerequisite: ECI 530 or ECI 525
Typically offered in Spring only

ECI 527/FL 527/FL 427/ECI 427 Methods and Materials in Teaching English as a Second Language (3 credit hours)
Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools. Students cannot receive credit for both FL/ECI 427 and FL/ECI 527.
Typically offered in Fall only

ECI 528 Strategies for Teaching English in Secondary Schools (3 credit hours)
Methods and materials of teaching English in grades 9-12, with and emphasis on lesson planning and demonstrations/practice in teaching literature, study skills, speaking, listening, media literacy, and writing. Some classes and assignments will be completed in a field setting.
Typically offered in Fall only

ECI 530 Social Studies In the Elementary School (3 credit hours)
Advanced professional training in teaching of social studies for middle grades and elementary teachers, including in-depth introduction to research-based teaching strategies, instructional resources and literature of the field.
Prerequisite: Six hrs. in ECI
ECI 531 Advanced Writing in Education (3 credit hours)
Appropriate for any specialty area in Education. Focus on writing required in graduate courses, research reviews for educational reports and National Board Certification, writing for educational journals, theses, and dissertations. Opportunities to gain knowledge, tools, and strategies to meet the academic community's standards. Strategies to develop and/or enhance form, style, content, quality of academic writing, and on researching, composing, revising, and editing. Students will compose, self-evaluate and give feedback on the work of their peers. Graduate status.

ECI 535 Methods and Materials for Teaching Social Studies in the Middle Grades (3 credit hours)
For preservice middle school social studies teachers. Focus on: teaching and evaluation skills, adaptation of instruction to individual learner differences, identification and creation of instructional materials appropriate for use in social studies teaching. Cannot earn credit for ECI 435 and ECI 535.

Typically offered in Fall only

ECI 536/FL 436/ECI 436/FL 536 Perspectives on English as a New Language (3 credit hours)
Examination of the complexity of multiculturalism in American society and the challenges faced by immigrant families in adapting to U.S. institutions. Emphasis on understanding historical, legal, cultural and pedagogical issues with respect to learning English as a new language (ENL). No credit given for both FL/ECI 436 and FL/ECI 536.

Typically offered in Fall only

ECI 537/ELM 537 Teaching Children's Literature (3 credit hours)
Instructions for educators in quality children's literature, specific needs of young reader, genres of children's literature, strategies for instructing children's literature, ways to target reader's interests, and design of literature units.

Typically offered in Summer only

ECI 540 Reading In the Elementary School (3 credit hours)
Theoretical foundations of reading instruction and current methods and materials for teaching reading, with emphasis on planning and implementing reading programs for children in kindergarten through grade six.

Prerequisite: Six hrs. ED or PSY
Typically offered in Fall only

ECI 541 Reading In the Content Areas (3 credit hours)
Methods in instruction for applying reading to content areas, with emphasis on means of improving comprehension, vocabulary and learning strategies in subject matter classrooms.

Prerequisite: Six hours in ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 543 Literacy Assessment and Intensified Instruction I (3 credit hours)
Designed for students to expand their knowledge and skills in diagnostic assessment and instruction in alphabets and word study needed for K-12 Reading Specialist licensure. Topics include assessment and instruction in word recognition, word analysis, spelling, and early reading skills such as phonological awareness, alphabet knowledge, and concepts of print. Emphasis is placed on critical examination of reading intervention practices in these areas and implementation of innovative research-informed approaches for supporting diverse learners when they have difficulties with literacy in school.

Prerequisite: ECI 540 or ECI 541
Typically offered in Spring only

ECI 544 Literacy Assessment and Intensified Instruction II (3 credit hours)
Designed for students to expand their knowledge and skills in diagnostic assessment and instruction in language, comprehension, and inquiry needed for K-12 Reading Specialist licensure. Topics include assessment and instruction in fluency and print processing, comprehension, vocabulary/language, and text-based inquiry. Emphasis is placed on critical examination of reading intervention practices in these areas and implementation of innovative research-informed approaches for supporting diverse learners when they have difficulties with literacy in school.

Prerequisite: ECI 543
Typically offered in Fall only

ECI 545 Theory and Research in Literacy (3 credit hours)
Advanced study of theoretical models of reading, research issues in reading and in other language processes. In-depth theoretical models of reading. Emphasis on critical examination and analysis of research investigating reading acquisition, maturereading behavior and related language processes.

Prerequisite: ECI 540
Typically offered in Spring only

ECI 546 New Literacies & Media (3 credit hours)
Critical analysis of new literacies that are prompted by emerging technologies and participatory media in K-12. Design and application of new literacies and media instructional practices to literacy curriculum and other discipline areas.

Typically offered in Fall only

ECI 547 Knowledge Construction: Implications for Multicultural Education (3 credit hours)
Exploration of sociopolitical factors involved in the construction of knowledge in education as well as the implications for practitioners and learners in schools and other educational settings. Particular emphasis on critiquing traditional epistemologies that limit the production, dissemination, and validation of progressive discourses in education in order to promote the production of knowledge that affirms the principles of social justice education.

Prerequisite: ECI 500
Typically offered in Fall only
ECI 548/ECI 448 E-Business Applications in Business and Marketing Education (3 credit hours)
Emphasis on design and construction of advanced web pages, business and marketing applications of electronic commerce, as well as economic, social, legal, and ethical issues that are related to conducting business in a virtual environment. Content prepares students to apply principles to the business and marketing education curriculum in the public schools. Credit for both ECI 448 and ECI 548 is not allowed.

Typically offered in Fall and Summer

ECI 549 Special Problems in Reading (1-6 credit hours)
In-depth study of topical problems in reading education selected from areas of current concern to practitioners in education.
Prerequisite: Six hours of ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 550 Foundations Of Middle Years Education (3 credit hours)
Examination of five major aspects of middle years education: (a) history and purposes of middle/junior high school, (b) pre- and early adolescent needs, interests and abilities, “curriculum design and content, (d) teaching methods and (e) school organization. Emphasis on both theoretical understandings and effective classroom strategies.
Prerequisite: 6 hours of ED or PSY
Typically offered in Fall and Spring

ECI 551 Teaching/Learning Approaches For Emerging Adolescents (3 credit hours)
Exploration of teaching/learning approaches appropriate to emerging adolescents. Learning styles; interdisciplinary inquiry; community-based curriculum; simulations and games; learning centers; minicourses; design of physical space; all-school activities.
Prerequisite: ECI 550; Graduate standing
Typically offered in Spring only

ECI 552/YFCS 552 Program Development & Evaluation in Youth & Family Settings (3 credit hours)
Historical and contemporary foundations of program development and evaluation in non-formal, community-based family life and youth development settings are examined including theory, research, and three holistic program development constructs: 1) planning; 2) design and implementation; 3) impact evaluation and accountability.
Typically offered in Spring only

ECI 553/YFCS 553 Applied Concepts in Child and Youth Development (3 credit hours)
This course explores the fundamental concepts of child and youth development (including early childhood through adolescence) as applied to programmatic and organizational contexts. A special focus is placed upon the concepts as applied to Community You
Typically offered in Fall only

ECI 554/YFCS 554 Collaborations & Partnerships in Family & Youth Settings (3 credit hours)
To prepare educators (formal and non-formal) to better establish, lead and manage collaborations and partnerships in family settings and those that support holistic community-based youth development organizational systems. Specific foci include: types and levels of partnerships; environmental scanning and socio-organizational linkage contextual factors affecting community collaborations; leadership factors affecting community collaborations; and human, financial and programmatic management in collaborations. Some on-campus meetings are required.
Typically offered in Fall only

ECI 556/YFCS 556 Organizational Systems in Youth and Family Settings (3 credit hours)
Preparation for current and future community family and youth development professionals leading and managing community-based organizations. Course includes: fundamentals of management and leadership; institutional and organizational structures; administrative and strategic planning; working with advisory and governing groups; marketing and program delivery systems; information management systems; and human resource, financial, facilities and risk management systems.
Prerequisite: ECI 506
Typically offered in Fall only

ECI 557/YFCS 557 Volunteerism in Youth and Family Settings (3 credit hours)
Preparation for current and future community-based youth and family professionals to better manage volunteers in local program service delivery. Specific foci include: volunteerism as a social phenomenon; volunteer resource management; new forms of vol
Typically offered in Spring only

ECI 560 Professional Development in Business and Marketing Education (3 credit hours)
Designed to prepare business and marketing educators with the knowledge and skills necessary to design and implement strategies for organizational improvement that will benefit business and marketing education programs. Attendance and participation meaningful, organized professional development activity is an integral component of the course.
Prerequisite: Graduate standing
Typically offered in Summer only

ECI 561 Curriculum and Instruction in Business and Marketing Education (3 credit hours)
Designed to develop competencies needed to be a successful Business and Marketing Education Teacher-Coordinator. Focus primarily on the activities involved in planning and managing the curriculum and instructional skills needed to effectively implement
Prerequisite: Graduate standing
Typically offered in Fall and Spring
**ECI 562** Program Management in Business and Marketing Education (3 credit hours)
This course includes the administration of middle and secondary business and marketing education programs, including career guidance; the management of DECA or FBLA chapter; supervision of work-based learning strategies; and school program promotion and development. ED & MKZ students only. Requires permission of instructor.

Prerequisite: ECI 561
Typically offered in Fall and Spring

**ECI 563** Methods and Materials in Teaching Secondary Social Studies (3 credit hours)
ECI 563 is a course that involves teaching techniques, innovations, development of teaching and evaluation skills, and in-depth subject matter inquiry in the area of secondary school social studies. Adaptation of instruction to individual learner differences, and selection and design of instructional materials will be explored. Must be enrolled in Secondary Social Studies MAT Program.

Typically offered in Fall only

**ECI 566** Advanced Instructional Strategies in Business and Marketing (3 credit hours)
Advanced strategies and techniques related to teaching and learning in the business and marketing education curricula, classrooms, work places, and technology environments in middle and secondary education. MKZ students only.

Prerequisite: ECI 561
Typically offered in Spring only

**ECI 567** Career and Technical Education Fundamentals and Program Administration (3 credit hours)
Emphasis on assisting various school district personnel in acquiring the knowledge and skills needed to effectively provide quality career and technical education (CTE) programming at the district level. Content includes federal CTE legislation, theory and research on educational reform, local and regional economic development, sources of funding for CTE programming and continuous improvement.

Typically offered in Fall only

**ECI 568** Designing College and Career Ready Programs (3 credit hours)
Examination of current school system instructional practices to assist various school district personnel in aligning core academic and career and technical education programming to prepare students for successful post-secondary education, careers, and life-long learning. Content includes an examination of education reform initiatives with an emphasis on foundational theory and research, needed workplace knowledge and skills, innovative education programs/models, and research-based best practices for success in transitioning students to post-secondary success.

Typically offered in Fall and Spring

**ECI 569** Special Problems in Business and Marketing Education (1-6 credit hours)
In-depth study of topical problems in business and marketing education selected from areas of current concern to practitioners in education.

Typically offered in Fall only

**ECI 570** Learning Disabilities (3 credit hours)
Field of learning disabilities, including definitions, prevalence, etiology, characteristics and current educational trends for educating students with learning disabilities.

Prerequisite: ECI 585
Typically offered in Summer only

**ECI 571** Instructional Strategies for Students with Disabilities (3 credit hours)
Methods and materials for teaching students with disabilities in elementary and secondary school. Focus on research-supported instructional strategies for teaching academic skills, Universal Design for Learning, implementation of appropriate academic interventions, and evaluation of instructional outcomes within the context of Response to Intervention and Multi-Tier Systems of Supports.

Prerequisite: Graduate standing
Typically offered in Spring only

**ECI 572** Resource Teaching in Special Education (3 credit hours)
Resource teaching in area of special education, with emphasis on resource teaching with students with special needs. Types of resource programs, establishment and maintenance of a program, selection of students, curriculum and materials.

Prerequisite: ECI 585
Typically offered in Summer only

**ECI 573** Applied Behavior Analysis & Positive Behavior Intervention and Support in Schools (3 credit hours)
Concepts and procedures involved in design and implementation of techniques for managing the behavior of students in classroom setting. Focus on methods for defining, measuring, increasing, decreasing, maintaining, and generalizing classroom behaviors in all learners. An exploration of Multi-Tiered Systems of Support, and Positive Behavior Intervention and Support in school settings.

Typically offered in Fall only

**ECI 574** Intellectual Disabilities (3 credit hours)
Content presented includes definitions, classifications, and assessment of person with intellectual disability from medical, sociological, and educational points of view. Issues related to labeling, etiology, characteristics, levels of severity, litigation, legislation, family and societal issues, history, and controversies are emphasized related to persons with intellectual disability.

Prerequisite: ECI 585
Typically offered in Fall only

**ECI 575** Communication Disorders In the Classroom (3 credit hours)
Occurrence of communication disorders in the school-age population, including types of disorders, prevalence, etiology, characteristics and corrective therapy. Focus on communication disorders among exceptional students and classroom teacher’s role in working with communication disorders.

Prerequisite: ECI 570
ECI 576 Teaching Functional and Life Skills to Students with Disabilities (3 credit hours)
Methods of instruction and materials related to teaching children and persons with mild-moderate levels of disability are emphasized. Effective general pedagogical approaches are stressed, as well as the teaching of functional academic skills, curricula used in instructions, teaching social and adaptive behavior as well as daily living skills, and transition-related skills necessary for independent adult life. Multi-tiered Systems of Support as well as Positive Behavior Intervention and Support are also discussed.

Typically offered in Spring only

ECI 577 Education Of Severely Handicapped (3 credit hours)
Severe and profound mental retardation and autism, including assessment procedures, educational and social/vocational programs, instructional strategies and evaluation. Legal and ethical issues involved in working with severely handicapped.

Prerequisite: ECI 585 or ECI 574

ECI 579 Organization and Behavioral Management of Inclusive Classrooms (3 credit hours)
To increase students' knowledge of persons with high incidence disabilities (i.e., learning disability, mild intellectual disability, and serious emotional disability), and how to manage the behavior of all pupils in educational environments. Characteristics of students with high incidence disabilities will be emphasized, as well as strategies to reduce the likelihood of problem behavior of all pupils in the classroom.

Typically offered in Fall, Spring, and Summer

ECI 580 Transition Program For Students With Mild Disabilities (3 credit hours)
Educational and other procedures involved in providing transition programming to students with mild disabilities. Examination of secondary-level special education service delivery, as well as post-secondary interventions, from critical, practical, empirical and theoretical perspectives.

Prerequisite: ECI 585
Typically offered in Summer only

ECI 581 Educational Diagnosis and Prescription For Children With Exceptionalities (3 credit hours)
Concept of educational diagnosis of students with exceptionalities, including examination of educational diagnostic procedures in current use in special education. Development of informal diagnostic techniques and procedures for adapting curriculum and instruction for learner with exceptionalities.

Prerequisite: ECI 585
Typically offered in Fall only

ECI 583 Behavior Disorders (3 credit hours)
Definitions, etiology, characteristics, philosophies and approaches to educational programming for children and youth with behavior disorders, including emotionally handicapped, autistic and socially maladjusted.

Prerequisite: ECI 585
Typically offered in Fall only

ECI 584 Intervention for Behavior Problems of Students with Disabilities (3 credit hours)
Curriculum materials, instructional strategies and behavior management techniques related to teaching children and youth with behavioral disorders including individualized instruction, group process, organization and evaluation of classroom programs, parent involvement, community resources and teachers' personal and professional growth and development.

Prerequisite: ECI 583
Typically offered in Spring only

ECI 585 Education of Children with Exceptionalities (3 credit hours)
Introduction to field of special education. Focus on historical overview, definitions and terminology in basic areas of exceptionality; etiological factors in exceptionality; developmental and learning characteristics of each area of exceptionality; and educational settings and strategies employed in special education including Multi-Tiered Systems of Support and Positive Behavior Intervention and Support. Review of current educational laws and policies affecting special education.

Prerequisite: 9 hours of ED or PSY
Typically offered in Fall and Spring

ECI 586 Introduction to Learning Analytics (3 credit hours)
As the use of digital resources continues expand in education, an unprecedented amount of new data is becoming available to educational researchers and practitioners. In response, Learning Analytics (LA) has emerged over the past decade as an interdisciplinary field encompassing Learning (e.g. educational technology, learning and assessment sciences), Analytics (e.g. visualization, computer/data sciences), and Human-Centered Design (e.g. usability, participatory design). This course will provide students with an overview of the field, examples of its use in educational contexts, and applied experience with widely adopted tools and techniques for working with and exploring data. As participants gain experience in the collection, analysis, and reporting of data throughout the course, they will be better prepared help educational organizations understand and improve learning and the contexts in which learning occurs.

Typically offered in Fall only

ECI 587 Machine Learning in Education (3 credit hours)
This class is meant to teach the practical side of machine learning for applications in mining educational data. There will be a heavy project focus, and when you have completed the course, you should be fully prepared to attack new problems using machine learning in the field of education.

Typically offered in Spring only

ECI 588 Text Mining in Education (3 credit hours)
This course will provide students with an overview of text mining as an analytical approach in education research, examples of its use in educational contexts, and applied experience with widely adopted tools and techniques (e.g. topic modeling and sentiment analysis). Students develop practical skills in the collection, analysis, and reporting of text data form sources such as Learning Management Systems, social media, and other online sources. Students can complete projects using a programming approach with R, a popular free open source software program for data science, or using non-programming point-and-click tools (i.e., SAS Visual Text Analytics).

Typically offered in Summer only
ECI 589 Analyzing Learning Networks (3 credit hours)
Although social network analysis and its educational antecedents date back to the early 1900s, the popularity of social networking sites like Twitter and Facebook have raised awareness of and renewed interests in networks and their influence. As the use of digital resources continues to expand in education, data collected by these educational technologies has also greatly facilitated the application of network analysis to teaching and learning. This introductory course is designed to prepare researchers and practitioners to apply network analysis in order to better understand and improve student learning and the contexts in which learning occurs. This course will provide students with an overview of social network theory, examples of network analysis in educational contexts, and applied experience with widely adopted tools and techniques. As participants gain experience in the collection, analysis, and reporting of data throughout the course, they will be better prepared to help educational organizations understand and improve both

Typically offered in Summer only

ECI 603 Advanced Seminar in Literacy Research (3-6 credit hours)
Critical analyses of research and methodology in reading comprehension processes and strategies for comprehension and retention of written discourse. Opportunity for design and conduct of a research project in reading or related area.

Prerequisite: ECI 648
Typically offered in Spring only

ECI 606 Seminar on Teacher as Learner: Developmental Theory, Research and Practice (3 credit hours)
Analysis of major contemporary theories and research of learning and development as a basis for individual and organizational change and development in educational settings.

Prerequisite: Graduate standing (6 hrs course work at 500-level)
Typically offered in Fall only

ECI 607 Advanced Seminar in Multicultural Education (3 credit hours)
Application and analysis of research and scholarship in multicultural education and topics related to effective schools for contemporary culturally diverse student populations in K-12 settings.

Prerequisite: Graduate standing and ECI 500
Typically offered in Spring only

ECI 620 Special Problems in Curriculum and Instruction (1-6 credit hours)
In-depth study of topical problems in curriculum and instruction selected from areas of current concern to practitioners in education.

Prerequisite: Six hrs. of ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 630 Independent Study in Curriculum and Instruction (1-3 credit hours)
Independent curriculum or research project in curriculum and instruction.

Typically offered in Fall, Spring, and Summer

ECI 640 Practicum in Curriculum and Instruction (1-6 credit hours)
Supervised practical experiences in schools and area agencies concerned with curriculum and instruction or educational supervision.

Prerequisite: Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 641 Practicum in Mentoring and Coaching (1-6 credit hours)
Supervised practical experiences in which participants become mentor to a student teacher or a teacher in a school system.

Prerequisite: ECI 705, Graduate standing in College of ED and PSY
Typically offered in Fall only

ECI 645 Supervised Practicum in Literacy (3 credit hours)
Supervised teaching experience with school-aged children identified as having reading difficulties. Students use diagnostic assessment data to design, implement, and evaluate individualized literacy instruction. Emphasis is placed on research-informed practices of intensified instruction embedded within engaging and authentic literacy experiences.

Prerequisite: ECI 540, ECI 541 and ECI 543; Graduate standing in College of ED
Typically offered in Spring only

ECI 647 Practicum in Business and Marketing Education (3 credit hours)
Supervised practical experiences in schools and area agencies concerned with business and marketing education.

Prerequisite: ECI 569
Typically offered in Spring only

ECI 648 Practicum in Special Education (1-6 credit hours)
Supervised practical experiences in schools and area agencies concerned with teaching children and adolescents with disabilities.

Prerequisite: Graduate standing in College of ED and PSY
Typically offered in Fall, Spring, and Summer

ECI 650 Internship in Curriculum and Instruction (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with curriculum development and/or educational supervision.

Prerequisite: Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 652 Field-Based Applications of Learning Design and Technology (1-6 credit hours)
Supervised opportunities to design, test, and revise learning design and technology solutions in authentic, field-based settings.

Typically offered in Fall and Spring

ECI 654 Internship in Elementary Education (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with elementary grades education.

Prerequisite: 3 hrs. grad.-level elementary education course work, Graduate standing in Col. of ED and PSY
Typically offered in Spring only

ECI 656 Internship in Middle Grades Education (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with the education of young adolescents.

Prerequisite: ECI 550, ECI 551, Graduate standing in College of ED and PSY
Typically offered in Fall, Spring, and Summer
ECI 657  Internship in Business and Marketing Education  (1-6 credit hours)
Supervised opportunities for advance professional development in contexts concerned with business and marketing education. Requires instructor approval.

Prerequisite: ECI 561
Typically offered in Fall and Spring

ECI 658  Internship In Special Education  (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with special education.

Prerequisite: Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 681  Seminar in Special Education Literacy  (3 credit hours)
A case study approach is used in the seminar that requires the application of assessment techniques and instructional intervention methodologies in literacy for K-12 students with disabilities. Assigned activities require access to and experience in schools and/or related settings. This seminar is designed to be completed during the last half of the graduate program. It is restricted to graduate students in SPE, SPL, SPM, SPB or consent of instructor.

Prerequisite: ECI 540 or ECI 541 and ECI 581, ECI 585

ECI 682  Spe Ed Seminar in Teaching Numerical Concepts  (3 credit hours)
This seminar is designed to prepare special education teachers to provide empirically supported instruction in numerical concepts and skills to students with disabilities in special education and general education settings. Particular attention will be paid to student characteristics that impact learning in arithmetic and mathematics and to addressing state and national curriculum standards using instructional organization and strategies that have been shown through research to be effective for this population. Field work in schools and/or related settings is required. Restricted to students in SPE, SPB, SPL, SPM or by consent of instructor.

Prerequisite: ECI 585
Typically offered in Summer only

ECI 683  Seminar in Special Education Learning Strategies  (3 credit hours)
This seminar is designed to prepare special education teachers to evaluate and teach empirically supported learning strategies to students with disabilities in special education and collaborative settings. Particular attention will be paid to learning strategies shown to help students with disabilities organize, learn, and apply facts, skills and routines that provide access to and mastery of critical information across the curriculum. Field work in schools and/or related settings is required. Restricted to graduate students in SPE, SPB, SPL, SPM or consent of instructor.

Prerequisite: ECI 585

ECI 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ECI 686  Non-Thesis Masters Continuous Registration - Half Time Registration  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Fall only

ECI 688  Non-Thesis Masters Continuous Registration - Full Time Registration  (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall only

ECI 690  Master's Examination  (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student

ECI 692  Research Projects In Curriculum and Instruction  (1-3 credit hours)
Project or problem in research in education for graduate students, supervised by members of graduate faculty. Research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.

Prerequisite: ELP 532
Typically offered in Fall, Spring, and Summer

ECI 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student

ECI 695  Master's Thesis Research  (1-9 credit hours)
Thesis research.

Prerequisite: Master's student

ECI 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student

ECI 699/ELP 699/EMS 699/EOE 699/EAC 699/ECD 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall and Spring
ECI 700  Curriculum Theory and Development (3 credit hours)
Theory and research in behavioral sciences and education designed to provide theoretical background for development of elementary and secondary curricula. Exploration of knowledge base and skills for critical review of curricula and instructional materials.
Prerequisite: 9 sem. hrs. graduate PSY, ECI 502, ECI 514
Typically offered in Fall only

ECI 705  Instructional Coaching and Supervision Of Teachers (3 credit hours)
Theory, research and practice of the professional role of a supervisor in the development of the effective and self-analytic teacher: pre-service (student teacher) and in-service (beginning and experienced teacher). For persons with at least two years of teaching experience in K-12 schools.
Typically offered in Spring only

ECI 709  Special Problems In Curriculum and Instruction (1-6 credit hours)
In-depth study of topical problems in curriculum and instruction selected from areas of current concern to practitioners in education.
Prerequisite: Six hrs. of ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 711  Computer Applications and Curriculum Integration (3 credit hours)
Use and evaluation of existing educational software, research findings with respect to integration of computers and new technologies in instruction.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ECI 714  Multimedia Design and Applications in Instruction (3 credit hours)
Emphasis on use and evaluation of existing educational software and research findings with respect to uses of computers in instruction.
Prerequisite: Six hrs. ED or PSY
Typically offered in Fall and Spring

ECI 715  Internet Applications and Web Page Design in Instruction (3 credit hours)
Instructional design principles underlying development of microcomputer-based instructional software and accompanying materials and programming principles and their implementation in courseware development. Additional topics include authoring languages, programming languages and graphics.
Prerequisite: Six hrs. ED or PSY
Typically offered in Fall only

ECI 716  Design and Evaluation Of Instructional Materials (3 credit hours)
Characteristics and selection of various media for instruction and their use in educational settings. Design and production of instructional materials. Analysis of research in the field. Individualized projects and assignments. Application of grounded theories.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ECI 717  Advanced Multimedia Design and Applications in Instruction (3 credit hours)
Advanced study and application of instructional design principles underlying development, evaluation, and integration of multimedia and hypermedia in K-12 settings.
Prerequisite: ECI 511, ECI 514
Typically offered in Spring only

ECI 718  Digital Learning Program and Staff Development (3 credit hours)
Study and application of principles related to digital learning program planning, facilities and resource management, and staff development in K-12 settings.
Prerequisite: ECI 511, ECI 514, ECI 515, ECI 642
Typically offered in Spring only

ECI 719  Special Problems in Learning Design and Technology (1-6 credit hours)
In-depth study of topical problems in Learning Design and Technology selected from areas of current concern to practitioners in education.
Typically offered in Fall, Spring, and Summer

ECI 720  The Teaching Of Composition (3 credit hours)
For classroom teachers. Practical field-tested ideas to help students improve as writers by focusing on composition as a process as well as a product. Activities for teaching prewriting, drafting, revising, proofreading, grammar and evaluating with suggestions for individual and group learning. Writing in content areas and composition research/ theory.
Prerequisite: 9 hrs. of ED, PSY and/or ENG; to take this course in summ.
As part of Capital Area Writing Project, student must apply and be selected
Typically offered in Spring only

ECI 721  Technology and Informal Learning Environments (3 credit hours)
Survey of theory and research grounding popular informal after-school technology environments, such as computer clubhouses, music studios, video clubs, coding camps, robotics clubs, and makerspaces. Examination of strategies for planning experiential, hands-on activities supportive of informal learning, sourcing necessary materials, outfitting spaces, facilitating student design and collaboration, and engaging the community and other resources to sustain facilities/clubs.
Typically offered in Fall only

ECI 722  Theory and Research in Distance Education (3 credit hours)
Introduction to distance education foundations, models, and underlying theories. Analysis of distance education research findings, research and evaluation methods, and management in varied settings--virtual schools, higher education, continuing education, and corporate e-learning. Application of distance education standards and research-based findings to the design of original course plans and materials prototypes, including appropriate recommendations for online teaching and community building, online student support, and online student assessment.
Typically offered in Spring only
ECI 727 Special Problems in Social Studies Education (1-6 credit hours)
In-depth study of topical problems in social studies education selected from areas of current concern to practitioners in education.

Prerequisite: Six hours of ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 729 Special Problems in English Education (1-6 credit hours)
In-depth study of topical problems in English education selected from areas of current concern to practitioners in education.

Prerequisite: Six hours of ED or PSY
Typically offered in Fall, Spring, and Summer

ECI 745 Literacy Theory and Research (3 credit hours)
Advanced study of theoretical models of reading, research issues in reading and in other language processes. In-depth theoretical models of reading. Emphasis on critical examination and analysis of research investigating reading acquisition, maturing behavior and related language processes.

Prerequisite: ECI 540
Typically offered in Spring only

ECI 801 Seminar in Curriculum and Instruction (1-3 credit hours)
Consideration of contemporary issues, trends and recent research and development findings in curriculum and instruction.

Prerequisite: Doctoral student
Typically offered in Fall only

ECI 803 Advanced Seminar in Literacy (3 credit hours)
Critical analyses of research and methodology in reading comprehension processes and strategies for comprehension and retention of written discourse. Opportunity for design and conduct of a research project in reading or related area.

Prerequisite: ECI 545
Typically offered in Spring only

ECI 804 Seminar on Attention Deficit Hyperactivity Disorder, Research and Treatment (3-6 credit hours)
Critical analysis of theory, research and interventions in Attention-Deficit-Hyperactivity-Disorder. Reading and synthesis of literature and student-led class discussions of such topics as characteristics, diagnosis, etiology, long-term outcomes and management of ADHD.

Prerequisite: 9 hrs. grad. credit in PSY or SPE
Typically offered in Spring only

ECI 806 Seminar on Teacher as Learner: Developmental Theory, Research and Practice (3-6 credit hours)
Analysis of major contemporary theories and research of learning and development as a basis for individual and organizational change and development in educational settings.

Prerequisite: Graduate standing (6 hrs course work at 500-level)
Typically offered in Fall only

ECI 807 Advanced Seminar in Multicultural Education (3 credit hours)
Application and analysis of research and scholarship in multicultural education and topics related to effective schools for contemporary culturally diverse student populations in K-12 settings.

Prerequisite: Graduate standing and ECI 500
Typically offered in Spring only

ECI 820 Special Problems in Curriculum and Instruction (1-6 credit hours)
In-depth study of topical problems in curriculum and instruction selected from areas of current concern to practitioners in education.

Prerequisite: Six hrs. of ED or PSY
Typically offered in Summer only

ECI 830 Independent Study in Curriculum and Instruction (1-3 credit hours)
Independent curriculum or research project in curriculum and instruction.

Typically offered in Fall, Spring, and Summer

ECI 840 Practicum in Curriculum and Instruction (1-6 credit hours)
Supervised practical experiences in schools and area agencies concerned with curriculum and instruction or educational supervision.

Prerequisite: Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 841 Practicum in Mentoring and Coaching (1-6 credit hours)
Supervised practical experiences in which participants become mentor to a student teacher or a teacher in a school system.

Prerequisite: ECI 705, Graduate standing in College of ED and PSY
Typically offered in Fall only

ECI 847 Practicum in Business and Marketing Education (1-6 credit hours)
Supervised practical experiences in schools and area agencies concerned with business and marketing education.

Typically offered in Fall, Spring, and Summer

ECI 850 Internship in Curriculum and Instruction (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with curriculum development and/or educational supervision.

Prerequisite: Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 851 Internship in Mentoring (1-6 credit hours)
Supervised opportunities teaching educational personnel in local school systems how to serve as mentors to their colleagues.

Prerequisite: ECI 845 and ECI 705, Graduate standing in Col. of ED and PSY
Typically offered in Fall and Spring

ECI 880 Directed Study in Curriculum and Instruction (1-6 credit hours)
Curriculum or research project in curriculum and instruction under the direct supervision of a faculty member.

Typically offered in Fall, Spring, and Summer

ECI 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring
ECI 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral
preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

ECI 892  Research Projects In Curriculum and Instruction  (1-3 credit hours)
Project or problem in research in education for graduate students,
supervised by members of graduate faculty. Research chosen on basis
of individual students’ interests and not to be part of thesis or dissertation
research.
Prerequisite: ELP 732
Typically offered in Spring only

ECI 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member
of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ECI 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ECI 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.
Prerequisite: Doctoral student
Typically offered in Summer only

ECI 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment,
preliminary examination, and residency requirements for the doctoral
degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Dance (DAN)

DAN 210  Current Trends in Afrocentric and World Dance  (1 credit hours)
This course provides direct experience in choreographic and performance
processes for members of Panoramic Dance Project, NC State Dance
Program’s student company dedicated to Afrocentric and other culturally
driven dance works. The course includes study of dance technique,
choreographic craft, and the examination of content and identity in dance.
Choreographic content varies from semester to semester. Permission
only; acceptance by formal audition.
Typically offered in Fall and Spring

DAN 260  Hip-hop Dance  (1 credit hours)
This course introduces students to the physical, social, communal,
historical, and cultural aspects of Hip-hop dance. Students might have to
provide transportation and/or pay a minimal cost for a performance not to
exceed $15.
GEP Health and Exercise Studies, GEP U.S. Diversity, GEP Visual and
Performing Arts
Typically offered in Fall and Spring

DAN 272  Dance Composition - Solo Forms  (1 credit hours)
This course introduces principles of dance composition through creative
problem solving. Course content includes: movement invention; creation
of a thematic phrase; manipulation and development of theme through
application of choreographic devices; str
Prerequisite: HESM 320 or instructor permission
GEP Visual and Performing Arts
Typically offered in Fall only

DAN 290  Special Topics in Dance  (1-4 credit hours)
Examination of selected topics in dance. May be repeated for credit
provided course content is different each time.

DAN 295  Problems of Dance Performance  (2 credit hours)
Practical performing experience in a company setting. Rehearsal,
performance and production of concert dance.
Prerequisite: Audition
Typically offered in Fall and Spring

DAN 490  Adv Spec Top Dance  (1-4 credit hours)
DAN 498  Independent Study in Dance  (1-3 credit hours)
Independent study in special choreographic or performance projects
approved by and done under the direction of the Dance Program.
Individualized/Independent Study and Research courses require a
“Course Agreement for Students Enrolled in Non-Standard C
Prerequisite: DAN 272, Dan 295, Dance Program approval required.
Typically offered in Fall only

Design (D)

D 100  Design Inquiry I: Methods and Processes  (3 credit hours)
Design Inquiry I asks students to think critically about and experiment
with expanding their toolkit of process and methods in solving large
scale problems with innovative solutions. Through discussion sections,
students will also be introduced to methods of critical reading and writing
as a reflective practice. Topics students will consider and implement
include lateral thinking, metaphorical thinking, abductive reasoning,
networked thinking, discourse as thought, systems thinking and more.
Students in Design must receive a C- to pass the course.
GEP Interdisciplinary Perspectives
Typically offered in Fall only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 101</td>
<td>Design Inquiry II: Methods and Processes</td>
<td>3</td>
<td>As an important extension of the first semester, Design Inquiry II asks students to engage in the critical evaluation of the making process and how design and the artifacts that we create contribute to material culture. Lecture topics are both historical and contemporary and include: design in the age of reason, the age of composition, and the age of experience; consumption and material culture; designing the obsolete; humanity-centered design, and universal design. Student in Design must receive a C- to pass the course.</td>
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<tr>
<td>D 104</td>
<td>First Year Studio I</td>
<td>6</td>
<td>First Year Studio I provides College of Design freshman with an introduction to foundational design concepts and methods representative of creative activity across design and artistic disciplines. This 6-credit fall semester course encourages entering freshman to think critically and act creatively about and upon design, art and the world around them as they secure a skillful level of craftsmanship in the conception, development, and making of all studio-based work. Semester work focuses on key design issues such as process, method, technique, technology and the production of visual and physical items necessary for the envisioning and development of design. College of Design Studio Majors Only; Students must receive a C- to pass the course.</td>
</tr>
<tr>
<td>D 105</td>
<td>First Year Studio II</td>
<td>6</td>
<td>First Year Studio II is the continuation of a comprehensive introduction to foundational design concepts and methods begun in First Year Studio I. This 6-credit fall semester course asks freshman to think critically and act creatively about and upon design, art, and the world around them as they apply a skillful level of craftsmanship in the conception, development, and making of all studio-based work. In this discipline specific second semester studio, students acquire further knowledge of design and art through assignments and projects that explore their design major. College of Design Studio Majors Only; Students must receive a C- to pass the course.</td>
</tr>
<tr>
<td>D 231</td>
<td>Design History for Engineers and Scientists</td>
<td>3</td>
<td>Study of historical connections among various disciplines and across cultures from prehistory to the present, with an emphasis on design. Students develop visual timelines of events to better understand how seemingly disparate disciplines affect one another. Special attention paid to scientific, artistic, and philosophical &quot;revolutions&quot; and their impact upon each other and upon other intellectual and practical endeavors. There are no prerequisites or corequisites for this course. Design Studies students should consult with the Instructor prior to enrollment for their own benefit.</td>
</tr>
<tr>
<td>D 292</td>
<td>Special Topics in Design</td>
<td>1-3</td>
<td>Topics of current interest in the college of Design. Used to develop new courses.</td>
</tr>
<tr>
<td>D 492</td>
<td>Special Topics in Design</td>
<td>1-6</td>
<td>Topics of current interest in the College of Design. Used to develop new courses.</td>
</tr>
<tr>
<td>D 492</td>
<td>Special Topics in Design</td>
<td>1-6</td>
<td>Topics of current interest in the College of Design. Used to develop new courses.</td>
</tr>
<tr>
<td>D 684</td>
<td>Teaching Design at the College Level</td>
<td>3</td>
<td>Preparation for college level teaching in the design disciplines. Discussion of the history of design education, curriculum development, pedagogical strategies, assessment, and teaching and research demands on college design faculty. Meets partial requirements for the university Certificate of Accomplishment in Teaching. Restricted to students enrolled in College of Design masters and doctoral programs.</td>
</tr>
<tr>
<td>D 685</td>
<td>Master's Supervised Teaching</td>
<td>1-3</td>
<td>Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.</td>
</tr>
<tr>
<td>D 696</td>
<td>Summer Thesis Res</td>
<td>1</td>
<td>Students enrolled in College of Design masters and doctoral programs.</td>
</tr>
<tr>
<td>D 701</td>
<td>Research Methods in Design</td>
<td>3</td>
<td>Survey of research methods in the field of design including overall systems of inquiry, criteria for assessing quality, strategies and tactics. Strengths and weaknesses of various research designs. Experimental and quasi-experimental research, correlational research, qualitative research strategies, simulation and modeling research, action research and design intervention, case study, and combined strategies.</td>
</tr>
<tr>
<td>D 702</td>
<td>Research Paradigms in Design</td>
<td>3</td>
<td>Overview of contributions and limitations of various theoretical perspectives that inform the field of design inquiry. Knowledge and theory construction. Nature, scope, and merits of scientific approach. Criticism of the scientific approach and examination of alternative approaches utilized in design research and practice. Linking philosophy, research, and action/practice/application.</td>
</tr>
</tbody>
</table>

Typically offered in Fall, Spring, and Summer
DDN 740 Introduction to Practice-Based Design Research (3 credit hours)
This course presents an introduction and overview of interdisciplinary research theories, strategies, and methods as applied to issues in professional practice of design. Special emphasis is placed on the roles, values, and specific methods related to design practice, including (not limited to) case study analysis and evaluation; design typology; engaged research; research and development (e.g. prototyping); and design process. Course content is adaptable to student needs and interests. Restricted to Doctor of Design (D.Des) students; other advanced post-professional design students may enroll with permission of instructor. Although course content and instruction is predominantly online, the course requires one week of face-to-face intensive on-campus instruction and other activities before Fall term begins (TBA).
Restriction: Doctor of Design Students or other advanced students (PhD or other DDes programs off campus) may be enrolled by permission of instructor only.
*Typically offered in Fall only*

DDN 741 Case Study Analysis in Design (3 credit hours)
The case study method addresses the importance of learning how to learn as an essential element of professional growth as well as a means toward building a culture of reflective design practice. Case studies provide orientation and perspective on the complexity of design practice, both for novices and seasoned professionals. When closely examined, lessons learned from design processes and decision-making provide opportunities to build a body of professional knowledge. Course content is adaptable to student needs and interests. Restricted to Doctor of Design (D.Des) students; other advanced post-professional design students may enroll with permission of instructor. Although course content and instruction is predominantly online, the Fall course requires one week of face-to-face intensive on-campus instruction and other activities prior to the start of Fall term. The Spring course requires one week of face-to-face intensive on-campus instruction and other activities during Spring term (TBA).
Corequisite: DDN 740
*Typically offered in Fall and Spring*

DDN 771 Design as Cognitive Artifact (3 credit hours)
Relationship between theories of human cognition and design. Analysis and critique of design objects as cognitive artifacts and extension, transformation, or diminishing of human thought by their form and content. A critical examination of cognitive, linguistic and social science theories shaping design.
Prerequisite: Doctoral student, Design Majors, Corequisite: DDN 830 or 831
*Typically offered in Fall and Spring*

DDN 772 Design as Cultural Artifact (3 credit hours)
Recent theories in various disciplines concerning a cultural understanding of graphic design. Theories of mass and popular culture, critiques of creativity and authorial intentionality, influences of interpretive criticism, theories of consumption and issues of cultural representation. Emphasis on adaptation of these theories to an understanding of the cultural significance of graphic design. Non-majors by permission only.
Prerequisite: Doctoral student, Design Majors, Corequisite: DDN 830 or 831
*Typically offered in Fall only*

DDN 773 New Information Environments (3 credit hours)
Changing role of design in new information environments. Implications of new technology on social construction of meaning, impact of electronic media on culture and cognition, and differences in designing artifacts and designing interactions.
Prerequisite: Doctoral student, Design Majors, Corequisite: DDN 830 or 831
*Typically offered in Spring only*

DDN 777 Human Use of the Urban Landscape (3 credit hours)
*Typically offered in Spring only*

DDN 795 Special Topics (3-6 credit hours)
*Typically offered in Fall and Spring*

DDN 809 Dissertation Colloquium (1 credit hours)
Prerequisite: Doctoral student in Design
*Typically offered in Spring only*

DDN 810 Special Topics (1-6 credit hours)

DDN 830 Independent Study (1-3 credit hours)
*Typically offered in Fall and Spring*

DDN 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student in Design
*Typically offered in Fall, Spring, and Summer*

DDN 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student in Design
*Typically offered in Fall, Spring, and Summer*

DDN 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student in Design
*Typically offered in Fall, Spring, and Summer*

DDN 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student in Design
*Typically offered in Summer only*

DDN 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student in Design
*Typically offered in Fall, Spring, and Summer*
Design Studies (DS)

DS 100 Design in Culture and Context (3 credit hours)
Design in Culture and Context is a first year seminar for Design Studies majors. The course examines design action and the relationships between design and other systems, chiefly the natural and built environment, society and culture, and technology and economics. Recent independent studies, field projects, and special initiatives by artists, designers, and principal investigators will introduce students to the negotiations that take place among the decision-makers, manufacturers, and civic and community patrons in understanding the nature and limits of a variety media, processes of design, and the cultural implications of researching meaningful solutions to current challenges and public needs.

Prerequisite: D 100; Design Studies Majors only

Typically offered in Spring only

DS 200/ADN 200 A Survey of Design Studies (3 credit hours)
This course will introduce students to a variety of perspectives and lenses through which to examine and evaluate design in the world. Students will consider design studies through theory and criticism of design, as well as applied to business administration, museum studies, and environmental studies. In addition, students will be encouraged to find evidence of and define design studies in areas that are uniquely suited to their individual areas of interest. As an advised elective, this course is required for Design Studies majors who are sophomores in their major.

Typically offered in Fall only

DS 481 Design Studies Senior Research Seminar (3 credit hours)
Each student in Design Studies will develop a topic for his or her Senior Capstone Research Paper to be done during the Spring term. During the Research semester, each student will develop a comprehensive bibliography for the topic and an outline of the paper. One paper will be written before the end of the term that addresses issues directly related to the Capstone Research paper. Throughout the term, students will share their research with others in the seminar.

Prerequisite: Completion of all course work in DS through junior year; Design Studies Majors

Typically offered in Fall only

DS 482 Design Studies Capstone Seminar (1 credit hours)
Students will meet on a weekly basis to discuss their individual research papers. Drafts of papers will be due at the end of the eighth week of class. Drafts will be read by the instructor, other instructors of the student’s choosing, and by two other members of the class for critical analysis.

Prerequisite: DS 481; Design Studies Majors

Typically offered in Spring only

DS 483 Design Studies Capstone Research Paper (3 credit hours)
Course consists of guided independent study resulting in a serious research paper. Students will work on their own, with meetings with faculty advisor(s) at weekly intervals.

Prerequisite: DS 481; Design Studies Majors

Typically offered in Spring only

DS 494 Design Studies Internship (1-6 credit hours)
Supervised internships in museums, galleries, schools, or other approved venues, in which students are engaged in activities related to Design Studies. Students are responsible for transportation to and from internship. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: Junior or Senior Standing in Design Studies Program; Design Studies Majors

Typically offered in Fall and Spring

Ecology (ECO)

ECO 601 Ecology Seminar (1 credit hours)
Scientific articles, progress reports and special problems of interest to ecologists are reviewed and discussed. Minimum of one seminar presentation required for credit.

Prerequisite: Graduate standing

Typically offered in Spring only

Economics (EC)

EC 201 Principles of Microeconomics (3 credit hours)
Scarcity, production possibilities, and opportunity cost. Supply and demand analysis, free markets, the price system, and government policy. Microeconomic analysis of business decisions in competitive and noncompetitive markets. Labor markets, capital, and natural resource markets, and externalities. Market breakdown, income redistribution, and role of government. Free trade, tariffs, and gains from international trade. Credit will not be given for both EC 201 and either ARE 201 or EC 205.

Credit is not allowed for both EC 201 and EC 205 or ARE 201.

GEP Social Sciences

Typically offered in Fall, Spring, and Summer

EC 202 Principles of Macroeconomics (3 credit hours)
Aggregate economic analysis emphasizing current public policy issues. Determinants of level and rate of growth of total output. Causes of unemployment and business cycles, inflation, and exchange rate fluctuations. Effects of monetary policy (money supply) and fiscal policy (government spending, taxes, deficits) on these problems. Trade surpluses/deficits and impact of international events and policies on national economies. Credit will not be given for both EC 202 and EC 205.

Prerequisite: EC 201 or ARE 201 or EC 205

GEP Social Sciences

Typically offered in Fall, Spring, and Summer

EC 205 Fundamentals of Economics (3 credit hours)
Fundamental ideas in economics: scarcity, substitution, opportunity cost, marginal analysis, gross domestic product, real and nominal magnitudes. Supply and demand analysis. Microeconomic analysis of pricing in competitive and noncompetitive markets. Macroeconomic analysis of production, employment, the price level, and inflation. Monetary and fiscal policy and the stabilization of the economy. Comparative advantage and international trade. Credit will not be given for both EC 205 and either EC 201 or ARE 201. Credit will not be given for both EC 205 and EC 202.

Credit is not allowed for both EC 205 and EC 201 or ARE 201 or EC 202.

GEP Social Sciences

Typically offered in Fall, Spring, and Summer
EC 301/ARE 301 Intermediate Microeconomics (3 credit hours)
Functioning of the market economy, role of prices in determining the allocation of resources, the functioning of the firm in the economy, forces governing the production and consumption of economic goods.
Prerequisite: MA 121 or MA 131 or MA 141 and EC 201 or EC 205 or ARE 201
Typically offered in Fall, Spring, and Summer

EC 302 Intermediate Macroeconomics (3 credit hours)
Applied, analytical course in aggregate economics: business cycles, stabilization policy, inflation, costs of disinflation, international trade, and economic growth. Interaction of consumers and businesses with government economic policies; unemployment, interest rates, and output growth. Impacts of government deficits, trade deficits, and monetary policies.
Prerequisite: (EC 201 or EC 205 or ARE 201) and (MA 121 or MA 131 or MA 141)
Typically offered in Fall, Spring, and Summer

EC 305 A Closer Look at Capitalism (3 credit hours)
Comparison of market allocation to government allocation. Criteria for evaluating economic systems. How markets create value. Relationship of economic freedom to political freedom and economic growth. Applications to policies such as antitrust policy, education policy, and environmental policy.
Prerequisite: EC 201 or EC 205 or ARE 201.
Typically offered in Fall only

EC 336/ARE 336 Introduction to Resource and Environmental Economics (3 credit hours)
Application of basic economic tools to understand and evaluate environmental/resource policies. Concepts such as property rights, non-market goods, allocation over time, externalities, and public goods. Current policy issues such as global climate change, evaluating natural resource damages from oil spills, reducing the costs of regulations, protecting estuaries, and dealing with non-point source pollution.
Prerequisite: ARE 201 or EC 201 or EC 205
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

EC 348 Introduction to International Economics (3 credit hours)
Application of basic economic analysis to international economic events and policies. Gains from trade, impacts of trade restrictions, international systems of payments, global capital markets, and balancing international with domestic macroeconomic policies. Current policy issues such as economic integration (customs unions and free trade areas), a common European currency, and the role of international trade in economic growth and development.
Prerequisite: EC 201 or EC 205 or ARE 201.
Typically offered in Fall and Spring

EC 351 Econometrics I (3 credit hours)
Tools for describing and analyzing data as used in economics. Probability, random variables, sampling, point and interval estimation. Hypothesis testing and regression analysis with emphasis on economic applications. Statistics majors may not enroll in EC 351. Statistics majors interested in enrolling in EC 451 will satisfy the prerequisite of EC 351 with ST 430.
Prerequisite: BUS/ST 350 or ST 312 or ST 370 or ST 372
Typically offered in Fall and Spring

EC 404 Money, Financial Markets, and the Economy (3 credit hours)
Prerequisite: EC 302 and (BUS/ST 350, or ST 372, or ST 370, or ST 372)
Typically offered in Spring only

EC 410 Public Finance (3 credit hours)
A micro-economic analysis of the rationale for public expenditure and taxation. Externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism.
Prerequisite: EC/ARE 301
Typically offered in Spring only

EC 413 Industrial Organization (3 credit hours)
An overview of industrial organization, including the study of monopoly, oligopolistic behavior, monopolistic competition, product differentiation and the dynamic behavior of competitive industries under uncertainty.
Prerequisite: EC/ARE 301
Typically offered in Spring only

EC 431 Labor Economics (3 credit hours)
An economic approach to the labor market and its problems including unemployment and the determination of wages, hours and working conditions under various labor market structures. The economic effects of trade unions. Introduction to human capital theory.
Prerequisite: EC/ARE 301
Typically offered in Fall and Spring

EC 437 Health Economics (3 credit hours)
Application of micro-economic tools to the analysis of public and private policy issues concerning health care financing and delivery in the United States.
Prerequisite: EC/ARE 301
Typically offered in Fall only

EC 449 International Finance (3 credit hours)
Study of international markets and their effects on firms, investors and national economics. Topics include: futures and options in foreign exchange, management of foreign exchange risk; exchange rate determination, and macroeconomic policy in an open economy.
Prerequisite: EC/ARE 301
GEP Global Knowledge
Typically offered in Fall only

EC 451 Econometrics II (3 credit hours)
The measurement, specification, estimation and interpretation of functional relationships through single equation least-square techniques. Applications of simple and multiple regression, curvilinear regression and various transformations to demand, cost, production, consumption and investment relationships.
Prerequisites: EC/ARE 301, EC 302, and EC 351 (or ST 430 for Statistics majors)
Typically offered in Fall and Spring
EC 468 Game Theory (3 credit hours)
Studies the competitive and cooperative behavior that results when several parties with conflicting interests must work together. Learn how to use game theory to analyze situations of potential conflict. Applications are drawn from economics, business, and political science.
Prerequisite: EC 301
Typically offered in Fall and Spring

EC 474 Economics of Financial Institutions and Markets (3 credit hours)
Prerequisite: (MA 121 or MA 131 or MA 141) and EC 302
Typically offered in Spring only

EC 480 Introduction to Economic Research (3 credit hours)
Finding economic data. Critically analyzing newspaper and journal articles using economic reasoning. Developing, writing, and presenting economic analysis.
Prerequisite: EC/ARE 301 and (BUS/ST 350 or ST 312 or ST 370 or ST 372)
Typically offered in Fall only

EC 490 Research Seminar in Economics (3 credit hours)
The final course for students completing the undergraduate programs in economics. Students study a selected economic issue, make classroom presentations related to the seminar topic, and write research papers.
Prerequisite: EC/ARE 301 and EC 302 and (BUS/ST 350 or ST 312 or ST 370 or ST 372)
Typically offered in Fall and Spring

EC 495 Special Topics in Economics (1-6 credit hours)
Examination of special topics in economics not normally treated in other courses, or offering of new courses on a trial basis.

EC 498 Independent Study in Economics (1-6 credit hours)
Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Director of Undergraduate Programs. Individualized/In
Typically offered in Fall, Spring, and Summer

ELP 296 Special Topics in Education: General Studies (1-3 credit hours)
Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.
Typically offered in Fall, Spring, and Summer

ELP 344 School and Society (3 credit hours)
The interrelationship between the school and other institutions, values, and patterns of thought in American society.
Prerequisite: Junior standing.
Typically offered in Fall and Spring

ELP 496 Special Topics in Education: General Studies (1-3 credit hours)
Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.
Prerequisite: Junior standing or Senior standing
Typically offered in Fall, Spring, and Summer

ELP 515 Education and Social Diversity (3 credit hours)
Overview of role of education within a culturally diverse society. Major attention to racial, socioeconomic and regional subpopulations. Issues discussed include subcultural influences on public school performances, equality of educational opportunity, social stratification and mobility, and the impact of schooling on intergroup relations.
Typically offered in Fall and Spring

ELP 518 Introduction To Education Law (3 credit hours)
Relationship of constitutional, statutory and case law to elementary and secondary public school settings, particularly in areas of students, teachers and liability. Particular emphasis on N.C. and federal law.
Typically offered in Spring only

ELP 532 Introduction To Educational Inquiry (3 credit hours)
Basic concepts and methods of educational inquiry. Emphasis on logic underlying various approaches to problem definition and solution and on tools of investigator, as well as on sources and interpretation of research information related to student's particular area of study.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

ELP 534 Ethics and Educational Decision Making (3 credit hours)
Application of moral theories and methods of moral reasoning to problems and issues involving educational policy and decision making. Character of morality; moral autonomy and leadership; intellectual freedom and public interest; authority and education
Typically offered in Spring only

ELP 550 Principles of Educational Leadership and Empowerment (3 credit hours)
Examines school organization theories and critical domains of leadership (e.g., school vision, culture, management, collaboration, ethics, and environments). Develops conceptual, managerial and interpersonal leadership skills through analysis of school goals and purpose; organizational design, development and improvement; curricular and instructional leadership; and school-community relationships. Instructional activities will include lecture, seminar discussion, case and problem-based analysis. Graduate standing required.
Typically offered in Fall only
ELP 551  Context and Challenges of School Improvement (3 credit hours)
Examination of social, cultural, political and policy environment of schooling with emphasis on NC. Analysis of major theories of school change and development. Critical examination of opportunities and barriers to strategic change efforts. Instructional activities will include lecture, seminar discussion, case and problem-based analysis.

Typically offered in Spring only

ELP 552  School-Based Planning, Management, and Evaluation in Professional Learning Communities (3 credit hours)
Prepares administrators to strategically plan, manage and evaluate core programs and systems for the safe and efficient operation of schools. Operational domains examined will include information systems, management systems, curriculum, instruction, student behavior and school security systems. Instructional activities include lecture, seminar discussions, case, situation and problem-based analysis.

Typically offered in Fall only

ELP 553  Organizational Management I: Human Resource Management in K-12 Education (3 credit hours)
Examination and application of models, theories, and research pertaining to personnel appraisal in education, including recruitment, hiring, retention, and dismissal; evaluation models for professional and classified staff; use of effective professional development models to support professional growth and development.

Typically offered in Fall and Spring

ELP 554  Organizational Management II: Resource Support and Sustainability in K-12 Education (3 credit hours)
Theories and practices of funding K-12 education including examination of: political frameworks and policy issues; concepts central to education finance and budgeting; purposes, designs, and uses of school budgets; procedures for generating, analyzing and interpreting issues related to education finance and school budgeting. Construct, manage and analyze school and district-level budgets; address issues of economic efficiency, equity and fiscal adequacy and their fiscal impact on the school community. Understand North Carolina’s Uniform Chart of Accounts accounting structure for school budgeting.

Corequisite: ELP 553
Typically offered in Fall and Spring

ELP 595  Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

ELP 620  Special Problems in Education (1-6 credit hours)
Opportunity for graduate students in education to study problem areas in professional education under direction of member of graduate faculty.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

ELP 641  Practicum in Education Administration (1-6 credit hours)
Supervised experience in appropriate educational setting to enable student to gain practice in applying concepts, principles and theories of education administration.

Typically offered in Fall and Spring

ELP 651  Internship in Educational Leadership and Program Evaluation (1-9 credit hours)
Utilization of participant-observer role and required participation in selected educational situations with emphasis upon development of observational skills, ability to record relevant observations by means of written journals, skills in analyzing experiences identifying critical incidents and projection of events and consequences. Required development of possible alternative courses of action in various situations, selection of one of alternatives and evaluation of consequences of selected course of action.

Prerequisite: Nine hrs. in grad.-level courses
Typically offered in Fall and Spring

ELP 685  Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall and Spring

ELP 692  Master's Research Projects in Educational Leadership and Program Evaluation (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of graduate faculty. Research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.

Prerequisite: ELP 532
Typically offered in Fall, Spring, and Summer

ELP 693  Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

ELP 695  Master's Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall and Spring

ELP 696  Summer Thesis Research (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

ELP 699/EMS 699/EOE 699/EAC 699/ECD 699/ECI 699  Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall and Spring
ELP 720 Cases In Educational Administration (3 credit hours)
Utilization of case study and case simulation approach to study of school administration. Development and application of administrative concepts to simulated situations and to actual case histories. View of administrative process as a decision-making pr
Prerequisite: Graduate standing
Typically offered in Fall only

ELP 724 Contemporary Educational Thought (3 credit hours)
Reading and discussion of 20th-century works in educational philosophy. Consideration of such movements as pragmatism, reconstruction, perennialism and existentialism.
Typically offered in Fall, Spring, and Summer

ELP 728 School Law For the Administrator (3 credit hours)
Comprehensive study of constitutional, statutory and case law as related to elementary and secondary school administration. Emphasis on legal issues associated with governance, finance, property, personnel and curriculum.
Typically offered in Spring only

ELP 729 Educational Finance (3 credit hours)
Historical and sociopolitical contextual analysis of underlying values, methodologies and policies associated with economic and financial planning of K-12 education (e.g., efficiency, equity, and liberty) and the economic and financial mechanisms used to generate, distribute, and expend revenues for educational purposes.
Typically offered in Fall only

ELP 735 Policy Research in Education (3 credit hours)
This course will draw on both classic and contemporary materials in educational policy research and will primarily focus on the substance of policy research rather than methodology. It addresses research pertaining to the foundations, implementation and evaluation of policy in all levels and sectors of the educational system. Major attention will be given to education in the United States, with comparative perspectives included.
Typically offered in Fall, Spring, and Summer

ELP 736 Qualitative Research In Education and Policy Analysis (3 credit hours)
Provision of public school personnel and educational policy analysts with research training and experience to address educational research and policy problems using qualitative methods. Qualitative research design and strategies; data collection, management and analysis; interpretation and writing; qualitative evaluation and formation as applied particularly to educational research and policy analysis.
Typically offered in Fall only

ELP 737 Advanced Qualitative Applications in School Administration and Policy (3 credit hours)
Application of advanced qualitative methods and action research in school administration and policy analysis. Research proposal development, article preparation, evaluation of qualitative and action research, discussion of theoretical and methodological issues, computer analysis of qualitative data.
Prerequisite: ELP 736
Typically offered in Spring only

ELP 742 Applied Research Methods In Education (3 credit hours)
Through use of simulated educational settings, consideration given to development of research proposals or plans, selection and/or development of appropriate measurement instruments and purposes and functions of various statistical designs and procedures. Preparation and analysis of simulated data using computer-based statistical packages, interpretation of results and production of a research report.
Typically offered in Spring only

ELP 751 Politics of P-12 Education (3 credit hours)
Analysis of political interactions of individuals and groups in P-12 education, specifically, how politics shapes educational decisions within a federal system of governance. Topics covered include micropolitics and macropolitical systems at the school, district, municipal, state, and federal levels, as well as political culture, interest groups, advocacy coalitions, and institutions. Doctoral standing required.
Typically offered in Fall only

ELP 752 Theories Framing curriculum Inquiry (3 credit hours)
Introduction to different curricula research paradigms and/or epistemologies and the philosophies upon which they are founded within the context of education. Develop an understanding of the philosophies upon which different research paradigms or epistemologies are found, particularly positivism, realism, neo-realism, interpretivism, phenomenology, hermeneutics, narrative orientations, critical theory, feminism, race-based approaches, lesbian/gay orientations, and postmodernism.
Prerequisite: Graduate standing
Typically offered in Spring only

ELP 753 Data Decision Making for School Administrators (3 credit hours)
Understand the purposed and uses of school data for research-based school improvement. Understand different types of assessment needed for school and district-wide improvement. Develop models of administrative decision making incorporating key goals, resources, curriculum alignment, data, assessment, and evaluation. Doctoral student status required.
Typically offered in Spring only

ELP 756 Organizational Leadership & Mangement for School Leaders (3 credit hours)
Prepares district-level administrators to analyze the changing nature of the superintendency, including major management and leadership responsibilities and leadership approaches. Operational domains examined include school governance and organizational theory, school boards, school district policy, collaborative leadership, material and human resource management, systemic and sustainable reform, contemporary challenges, and personal practices management. Doctoral standing required.

ELP 757 Research in P-12 Administrative Leadership (3 credit hours)
Apply theories of administrative leadership to daily practice. Understand, develop, and utilize theory and research in leadership to inform and improve practice. Analysis of macro and micro level forces impacting administrative leadership at the building and district level. Doctoral student status required.
Typically offered in Spring only
ELP 780 Evaluation Theory and Practice in Education (3 credit hours)
Review of educational program evaluation with emphasis on (1) theory and conceptual models of evaluation, (2) evaluation design, and (3) environmental practical factors influencing design and implementation of evaluation studies.

Typically offered in Fall only

ELP 789 Personnel Recruitment, Selection, Development and Appraisal in Education (3 credit hours)
Issues, models, theories, research and applications in the evolving field of educational personnel and human resources administration with emphasis on recruitment, selection, and development.

Typically offered in Summer only

ELP 795 Special Topics (1-6 credit hours)
Special Topics in Educational Research and Leadership

ELP 820 Special Problems in Education (1-6 credit hours)
Opportunity for graduate students in education to study problem areas in professional education under direction of member of graduate faculty.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

ELP 851 Internship in Educational Leadership and Program Evaluation (1-9 credit hours)
Utilization of participant-observer role and required participation in selected educational situations with emphasis upon development of observational skills, ability to record relevant observations by means of written journals, skills in analyzing experiences identifying critical incidents and projection of events and consequences. Required development of possible alternative courses of action in various situations, selection of one of alternatives and evaluation of consequences of selected course of action.

Prerequisite: Nine hrs. in grad.-level courses
Typically offered in Fall, Spring, and Summer

ELP 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall only

ELP 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

ELP 891 Problems of Research Design in Education (1-3 credit hours)
Provision of individualized but structured investigation of alternative problem definitions, research methodologies and statistical analyses for a problem of student's choosing, usually associated with thesis or dissertation. In small groups or individually with instructor, student consideration of research design, measurements and statistical analysis necessary to conduct research.

Prerequisite: ELP 742
Typically offered in Fall, Spring, and Summer

ELP 892 Research Projects in Educational Leadership and Program Evaluation (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of graduate faculty. Research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.

Typically offered in Fall, Spring, and Summer

ELP 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

ELP 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ELP 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

ELP 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

Education (ED)

ED 100 Intro to Education (2 credit hours)
This course serves as an introduction to the field of education and as an orientation to the College and University experience. Students will examine the knowledge, skills, and dispositions necessary to become effective educators of diverse populations. Topics include student success strategies, professional standards for teachers, and resources in the College of Education. This course is restricted to College of Education students only.

Restriction: College of Education Students only, others by permission of the College of Education
GEP U.S. Diversity
Typically offered in Fall only
ED 101 Freshman Teaching Fellows Forum I (1 credit hours)
Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education. Restricted to Students Admitted to the Teaching Fellows Program

Typically offered in Fall only

ED 103 Intro to University Education (1 credit hours)
Developmental and academic topics to assist students as they make well-informed decisions about majors and careers. Through technology-assisted plenary and small group seminars, students will examine the knowledge, skills and dispositions necessary to become globally aware, ethical, reflective students of diverse populations in the 21st century. Topics include academic skills, student success strategies, community and diversity; major and career decision making; assessment of interests, skills, and values; available university resources; overview of university majors and minors as well as policies and procedures. This course is restricted to Wake STEM Early College students only.

Typically offered in Fall only

ED 104 Intro to University Education II (1 credit hours)
Developmental and academic topics to assist students as they make well-informed decisions about majors and careers. Through technology-assisted plenary and small group seminars, students will examine the knowledge, skills, and dispositions necessary to become globally aware, ethical, reflective students of diverse populations in the 21st century. Topics include academic skills, student success strategies, community, and diversity; major and career decision making; assessment of interests, skills, and values; available university resources; overview of university majors and minors as well as policies and procedures. This course is restricted to Wake STEM Early College students only. Students will be required to provide their own transportation if they choose a co-curricular activity that is off campus.

Restriction: This course is restricted to NC State Wake STEM Early College students.

Typically offered in Spring only

ED 150 Students Advocating for Youth I (1 credit hours)

Typically offered in Fall only

ED 151 Students Advocating for Youth II (1 credit hours)
Continuing to build upon a passion for advocacy. Understanding how legislation and policy affects youth advocacy and youth organizations. Exploring changes within the career field. Exploring peer influence processes among youth. Practical youth advocacy

Prerequisite: ED 150

Typically offered in Spring only

ED 201 Sophomore Teaching Fellows Forum I (1 credit hours)
Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.

Prerequisite: Students in Teaching Fellows Program

Typically offered in Fall only

ED 204 Introduction to Teaching in Today's Schools (2 credit hours)
Overview of teaching as work and as a profession in today's schools. Course focuses on establishing a respectful environment for a diverse student population, dispositions and practices required for effective teaching, integration of digital technology into K-12 settings, and taking informed action through service learning. The course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools. Students are required to purchase intern liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge, which typically ranges between $12-50 depending on the year and organization used.

Prerequisite: Sophomore standing; Corequisite: ECI 204, or EMS 204, or EMS 205, or TDE 202

Typically offered in Fall and Spring

ED 296/ECI 296 Special Topics in Education (1-3 credit hours)
Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

Typically offered in Fall and Spring

ED 299/FL 299 Field Experience for 21st Century Teaching (1 credit hours)
This course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. This course is restricted to Foreign Language Education majors.

Prerequisite: ECI 204 and ED 204

Typically offered in Spring only

ED 301 Junior Teaching Fellows Forum I (1 credit hours)
Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education. Restricted to Students Admitted to the Teaching Fellows Program

Typically offered in Fall only

ED 302 Junior Teaching Fellows Forum II (1 credit hours)
Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education. Restricted to Students Admitted to the Teaching Fellows Program

Typically offered in Spring only
ED 311 Classroom Assessment Principles and Practices (2 credit hours)
This course will enable candidates to understand and use appropriate classroom assessment practices to promote positive student achievement. Candidates will learn to use knowledge of standards, student needs, and data-driven instruction to design and implement formative and summative assessments. ED 311 also examines the rationale for assessment, implications of assessment, and the varied ways assessment data is used by stakeholders both within and outside of the K-12 classroom.

Prerequisite: Admission to Teacher Education Candidacy (gpa 2.75) AND course prerequisite of ED 204, or ELM 250, or AEE 206; Co-requisite: ED 312
Typically offered in Fall and Spring

ED 312 Classroom Assessment Principles and Practices
Professional Learning Lab (1 credit hours)
This class is a co-requisite professional learning lab to ED 311. Classroom Assessment Principles and Practices, wherein teacher candidates are exposed to practical applications of the ED 311 course topics. The course has a required fieldwork component in local K-12 schools, and candidates are responsible for their own transportation to and from the schools. Candidates are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. This course is restricted to Teacher Education majors.
Course Prerequisite / Co-requisite: P-R: Admission to Candidacy; Co-R: ED 311
Prerequisite: Admission to Teacher Education Candidacy (gpa 2.75) and ED 204, ELM 250, or AEE 206; Co-requisite: ED 311
Typically offered in Fall and Spring

ED 403 Teaching Fellows Senior Seminar (1 credit hours)
A casebook study of first-year teacher experiences and an examination of professional, ethical, and legal issues in education as found in cases dealing with new teachers.
Prerequisite: Senior standing
Typically offered in Fall and Spring

ED 496/ECI 496 Special Topics in Education (1-3 credit hours)
Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.
Prerequisite: Junior standing or Senior standing
Typically offered in Fall and Spring

ED 508 Exploring Diversity in Classroom and Community (3 credit hours)
Students will explore and apply the major philosophical and historical influences to current educational context as they relate to issues of diversity. Focus will be placed on theoretical and practical issues of diversity in classroom settings, especially related to culture, race, gender, ethnicity, language, and socio-economic levels. (Field-based experiences will be required).
Typically offered in Fall, Spring, and Summer

ED 569 Teaching Internship: MAT (4 credit hours)
A supervised teaching experience requiring a minimum of 10 consecutive full-time weeks in an appropriate school classroom. Designed to develop the knowledge, skills, and dispositions necessary for teaching at the elementary, middle and/or secondary level. Includes regularly scheduled clinical observations and conferences. Requires successful completion of at least 21 hrs. in the MAT program and approval by specialty area faculty. Student responsible for transportation to placement site.
Typically offered in Fall and Spring

ED 570 Classroom Action Research (1 credit hours)
Provides a brief introduction to educational research focusing specifically on classroom action research. Requires admission to MAT; completion of 6 hours in the program.
Typically offered in Fall, Spring, and Summer

ED 571 Inquiry and Professional Development (1 credit hours)
Builds on earlier course work (ED 570) preparing students to refine an action research proposal, collect data in a school setting, write a report, and to identify resources and activities that will support their ongoing professional development; requires 9 hours of graduate credit in the MAT curriculum.
Typically offered in Fall, Spring, and Summer

ED 572 Teacher Leadership (1 credit hours)
This course explores the multiple contexts, roles, and approaches to teacher leadership in classrooms, schools, communities, and professional organizations. Requires at least 30 credit hours in the MAT program.
Typically offered in Fall and Spring

ED 579 Special Problems in Teaching and Learning (1-6 credit hours)
In-depth study of topical problems in teaching and learning of current and special interest to K-12 Classroom teachers.
Typically offered in Fall, Spring, and Summer

ED 605 Special Problems in Teaching (1-3 credit hours)
In-depth study of topical problems in teaching selected from areas of current concern to K-12 teachers.
Prerequisite: Graduate standing

ED 700 Introduction to Research Design in Education (3 credit hours)
Survey of the field of educational research specifically with regard to the modes of inquiry, variety of methodologies, and ethical standards for conducting research with human participants. Limited to doctoral students in Education or by permission of instructor.
Typically offered in Fall only
ED 710  Applied Quantitative Methods in Education I (3 credit hours)
This course is designed for educational researchers and leaders to gain experience with designing and evaluating research using a quantitative approach to answer research questions in educational research and policy analysis. Students will examine design issues in research, create data sets, develop research questions from data provided, use a variety of descriptive and inferential procedures to answer formulated research questions, interpret the results and write the results in the language of educational research. Restricted to doctoral students in Education or by permission of instructor.
Prerequisite: ED 700, or ECI 510, or ELP 532, or ST 507
Typically offered in Fall, Spring, and Summer

ED 711  Applied Quantitative Methods in Education II (3 credit hours)
Students will apply and enhance their quantitative skills through analysis of existing datasets. Course goals include practicing and extending Multiple Regression knowledge and skills, generating and testing hypotheses in a multiple regression framework, and appropriately disseminating results. Restricted to doctoral students in Education Research only.
Prerequisite: ED 710
Typically offered in Fall and Spring

ED 712  Survey Methods in Educational Research (3 credit hours)
Introduces students to the skills and resources needed to design and conduct a survey in educational settings. Students who take this course will be able to identify and develop specific survey objectives, design survey studies, sample respondents, develop reliable and valid self-administered questionnaires, administer surveys, and process data.
Prerequisite: ED 710
Typically offered in Fall only

ED 730  Introduction to Qualitative Research in Education (3 credit hours)
Design of qualitative studies, conduct of field work including open-ended interviews and participant observation, analysis of data and understanding of theoretical and philosophical background of this research approach.
Typically offered in Fall, Spring, and Summer

ED 731  Advanced Qualitative Research and Data Analysis in Education (3 credit hours)
Intensive course in the use of field-based and general qualitative research data analysis methods in the social study of education. The course is to help participants acquire skills and gain experience in using various methodological and analytical research techniques. The course emphasis is on the collection, management, analysis, and interpretation of qualitative data.
Prerequisite: ELP 736, EAC 785 or ED 730
Typically offered in Fall and Spring

ED 750/EDP 750  Mixed Methods Research in Education (3 credit hours)
Explores the theoretical and practical issues surrounding the combining of quantitative and qualitative methods in educational research studies. It addresses how to design, implement and write-up mixed methods research as well as how to critically review and interpret mixed methods research studies.
Prerequisite: ED 711, ED 730, ST 507, ELP 736 or equivalent and/or permission of the instructor
Typically offered in Fall and Spring

ED 755  Scholar Leader: Diversity and Equity in Schools and Communities (3 credit hours)
The objective of this course is to inform you about the research and theories related to diversity (race/ethnicity, gender, social class, sexuality, ability, intersectionality and more) and equity in schools and communities for application to your own personal and professional experiences. This process will provide you with a foundation from which you may base your own decisions in your profession. As the course proceeds, your role will be to try to understand what you hear and read and to ask questions, to formulate an opinion about the theories/concepts that are presented, and to connect what you read to your own experiences as a human being, graduate student, and professional.
Restriction: Doctoral standing and (13ELPPHD, 13LTSPHD, 13TELSPHD)
Typically offered in Fall, Spring, and Summer

ED 756  Scholar Leader: Systemic Change in Education (3 credit hours)
This is a required course for students in College of Education PhD programs. It is designed to help prepare students to engage in informed analysis, critique and planning of education policies and programs designed to foster systemic changes in K-16 education. A central focus will be the intersection of research, policy, and practice in efforts to update and improve education systems, and the social and political complexities of educational reform.
Restriction: Doctoral standing and (13ELPPHD, 13LTSPHD, 13TELSPHD)
Typically offered in Fall and Spring

ED 795  Special Topics in Education Research (3-6 credit hours)
This course provides in-depth instruction and applications in new or emerging areas of educational research, studies or venues. May be repeated for credit if topic changes. Doctoral students in education only.
Typically offered in Fall, Spring, and Summer
Educational Psychology (EDP)

EDP 304  Educational Psychology  (3 credit hours)
Psychological principles applied to education, including cognitive and personality development, individual differences, learning and behavior theory, cognitive strategies for learning and remembering, critical thinking and problem-solving strategies, student motivation, classroom management techniques, components of teacher effectiveness, measurement and student evaluation procedures, characteristics of exceptional children, mainstreaming in the classroom, and multicultural education.

Prerequisite: Sophomore standing
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

EDP 370  Applied Child Development  (3 credit hours)
Students will explore how biological, cognitive, and social/emotional development affects children’s learning and behavior. The course will focus on applying important theories and current findings in development to issues in education such as lesson planning, curriculum design, behavior management, motivation, an appropriate assessment. Students will also apply knowledge of development to issues such as creating actively engaging individuated experiences to deal with gifted students, students with diverse ethnic or cultural backgrounds, and students with exceptionalities or disabilities.

Prerequisite: Sophomore standing
GEP Social Sciences
Typically offered in Fall only

EDP 476/PSY 476  Psychology of Adolescent Development  (3 credit hours)
Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.

Prerequisite: PSY 200 or EDP 304
Typically offered in Summer only

EDP 504  Advanced Educational Psychology  (3 credit hours)
A critical appraisal of current psychological findings relevant to educational practice and theory.

Prerequisite: Graduate standing
Typically offered in Spring only

EDP 560  Educational Testing and Measurement  (3 credit hours)
The study of principles of educational testing and measurement, particularly classroom assessment, including norm and criterion referenced assessment, classroom testing methods and principles, standardized testing and measurement, item analysis, and an introduction to basic descriptive statistics. A brief introduction to innovative assessment is also included.

Prerequisite: Graduate standing
Typically offered in Spring only

EDP 575/ECD 575  Multicultural Lifespan Development  (3 credit hours)
This course surveys theories, principles, and issues of psychological development throughout the lifespan. Emphasis will be placed on understanding current developmental research and its application to the enhancement of development from birth to late adulthood. Implications for helping professionals working in multicultural contexts will be provided.

Prerequisite: Six Hours of Graduate Study
Typically offered in Spring and Summer

EDP 582/PSY 582  Adolescent Development  (3 credit hours)
Current theories and research on development during adolescence. Topics include: physical growth, cognitive changes, relationships with peers, parents and teachers, quest for identity and independence, morality and sexuality.

Prerequisite: 6 hours in PSY
Typically offered in Fall only

EDP 590  Special Problems in Educational Psychology  (1-6 credit hours)
In-depth study of topical problems in cognition, motivation, assessment, or other educational psychology area of current and special interest to educators.

Typically offered in Fall, Spring, and Summer

EDP 605  Special Problems in Educational Psychology  (1-6 credit hours)
In-depth study of topical problems in educational psychology selected from areas of current concern to educators.

Typically offered in Fall, Spring, and Summer

EDP 696  Summer Thesis Res  (1 credit hours)

EDP 704  Theories and Research in Educational Psychology  (3 credit hours)
Review and synthesis of pertinent literature in specialized topics and areas of research in educational psychology. Topic selection will vary by semester and instructor. Graduate standing or permission of instructor.

Doctoral students only (DR)
Typically offered in Fall only

EDP 723  Motivation in Education  (3 credit hours)
The purpose of this course is to inform students about motivation theories and how various concepts from these theories are related to education practice. The course components are designed to provide students with an understanding of research in motivation, as well as the relationships between theoretical perspectives of human motivation and the teaching practice.

P: ED 700 or equivalent
Typically offered in Spring only
EDP 750/ED 750  Mixed Methods Research in Education (3 credit hours)
Explores the theoretical and practical issues surrounding the combining of quantitative and qualitative methods in educational research studies. It addresses how to design, implement and write-up mixed methods research as well as how to critically review and interpret mixed methods research studies.
Prerequisite: ED 711, ED 730, ST 507, ELP736 or equivalent and/or permission of the instructor
Typically offered in Fall and Spring

EDP 896  Summer Dissert Res (1 credit hours)

EGR-Engineering Master's (EGR)

EGR 501  Engineering Leadership and Strategic Change (3 credit hours)
In the current business environment, an understanding of leadership and change management is essential to career success. The objective of this course is to provide practitioners in technical fields the knowledge to lead, align and transform the human element, individuals and teams, to achieve organizational performance excellence. The class includes both individual and collaborative (team) learning. An engineering, technical, or scientific undergraduate degree is required.
Typically offered in Fall and Spring

EGR 503  Statistical Engineering using Six Sigma DMAIC Process (3 credit hours)
Statistical Engineering: systematic approach (Six Sigma DMAIC methodology) for improving manufacturing and business processes and products using advanced graphical and statistical methods. Defining the improvement opportunity, measurement system analysis (MSA), Failure Mode and Effects Analysis (FMEA), data collection, graphical and statistical analysis, design of experiment (DOE) methods, and statistical process control (SPC) methods. Application of statistical engineering to business and manufacturing case studies.

ST 361 or ST 370 or Entry Level Statistics
Typically offered in Fall and Spring

EGR 505  Managerial Finance for Engineers (3 credit hours)
In the current business environment, familiarity with and appreciation of finance is essential to career success. Technically competent managers must be able to speak the common language of business and to understand how their work affects the performance of their organization. The objective of this course is to provide practitioners in technical fields the financial know-how to plan, control and make decisions that achieve organizational performance excellence. The class includes both individual and collaborative (team) learning. An engineering, technical or scientific undergraduate degree is required.
Typically offered in Fall and Spring

EGR 506  Managing New Hi Tech Product Launches (3 credit hours)
This course covers new high-tech product development and launch from the perspective of the technical manager responsible for developing and launching new products and new lines of business within the high tech firm. Topics cover the entire spectrum of

Requirement: Graduate standing in Engineering
Typically offered in Spring and Summer

EGR 507  Product Life Cycle Management (3 credit hours)
This course covers the management of complex technical products during all phases of the product life cycle. It is a broad survey of all the tools needed by the technical product manager throughout the life cycle of a complex product. The course is taught

Requirement: Graduate standing in Engineering
Typically offered in Fall, Spring, and Summer

EGR 590  Special Topics in Engineering (1-6 credit hours)
Discussion of special topics in engineering. Identification of various specific topics and prerequisites for each section from term to term.

Typically offered in Fall, Spring, and Summer

EGR 688  Non-Thesis Masters Continuous Registration-Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

Electrical and Computer Engineering (ECE)

ECE 109  Introduction to Computer Systems (3 credit hours)
Introduction to key concepts in computer systems. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps.
Typically offered in Fall, Spring, and Summer

ECE 200  Introduction to Signals, Circuits and Systems (4 credit hours)
Ohm's law and Kirchoff's laws; circuits with resistors, phototransistors, diodes and LEDs; rectifier circuits; first order RC circuits; periodic signals in time and frequency domains, instantaneous, real and apparent power; DC and RMS value; magnitude and power spectra, dB, dBW, operational amplifier circuits, analog signal processing systems including amplification, clipping, filtering, addition, multiplication, AM modulation sampling and reconstruction. Weekly hardware laboratory utilizing multimeter, function generator, oscilloscope and spectrum analyzer and custom hardware for experiments on various circuits and systems.
Prerequisite: Cum GPA 2.5 or above (or NTR), C or better in MA 241 and PY 205
Typically offered in Fall, Spring, and Summer

ECE 209  Computer Systems Programming (3 credit hours)
Computer systems programming using the C language. Translation of C into assembly language. Introduction to fundamental data structures: array, list, tree, hash table.
Prerequisite: Grade of C- or better in ECE 109
Typically offered in Fall, Spring, and Summer
ECE 211 Electric Circuits (4 credit hours)
Introduction to theory, analysis and design of electric circuits. Voltage, current, power, energy, resistance, capacitance, inductance. Kirchhoff's laws node analysis, mesh analysis, Thévenin's theorem, Norton's theorem, steady state and transient analysis, AC, DC, phasors, operational amplifiers, transfer functions.
Prerequisite: C- or better in ECE 200 and Corequisite: ECE 220
Typically offered in Fall, Spring, and Summer

ECE 212 Fundamentals of Logic Design (3 credit hours)
Introduction to digital logic design. Boolean algebra, switching functions, Karnaugh maps, modular combinational circuit design, latches, flip-flops, finite state machines, synchronous sequential circuit design, datapaths, memory technologies, caches, and memory hierarchies. Use of several CAD tools for simulation, logic minimization, synthesis, state assignment, and technology mapping.
Prerequisite: C- or better in ECE 109
Typically offered in Fall, Spring, and Summer

ECE 220 Analytical Foundations of Electrical and Computer Engineering (3 credit hours)
This course is designed to acquaint you with the basic mathematical tools used in electrical and computer engineering. The concepts covered in this course will be used in higher level courses and, more importantly, throughout your career as an engineer. Major topics of the course include complex numbers, real and complex functions, signal representation, elementary matrix algebra, solutions to linear systems of equations, linear differential equations, Laplace transforms used for solving linear differential equations, Fourier series and transforms and their uses in solving ECE problems. EE and CPE Majors Only.
Prerequisite: C- or better in ECE 200
Typically offered in Fall, Spring, and Summer

ECE 231 Microelectronics (4 credit hours)
Introduction to the physics of semiconductors, PN Junctions, BJTs and MOS field effect transistors; physics of operation, IV characteristics, load line, quiescent point of operation, PSPICE analysis; diode circuit analysis; voltage regulation; Single Stage Transistor Amplifiers: Common Emitter and Common Source configurations, biasing, inverting and non-inverting amplifiers; follower circuits; calculation of small signal voltage gain, current gain, coupling and bypass capacitors; Multistage ac-coupled amplifiers; small signal modeling; input resistance and output resistance; logic inverters.
Prerequisite: A grade of C- or better in ECE 211
Typically offered in Fall, Spring, and Summer

ECE 303 Electromagnetic Fields (3 credit hours)
This course prepared the students to formulate and solve electromagnetic problems relevant to all fields of electrical and computer engineering and that will find application in subsequent courses in RF circuits, photonics, microwaves, wireless networks, computers, bioengineering, and nanoelectronics. Primary topics include static electric and magnetic fields, Maxwell's equations and force laws, wave propagation, reflection and refraction of plane waves, transient and steady-state behavior of waves on transmission lines. Restriction: EE and CPE Majors Only.
Prerequisite: A grade of C- or better in ECE 211 and ECE 220
Typically offered in Fall, Spring, and Summer

ECE 305 Principles of Electromechanical Energy Conversion (3 credit hours)
Three-phase circuits and power flow, analysis of magnetic circuits, performance of single-phase and three-phase transformers, principles of electromechanical energy conversion, steady-state characteristics and performance of alternating current and direct current machinery.
Prerequisite: C- or better in ECE 211 or ECE 331
Typically offered in Fall and Spring

ECE 306 Introduction to Embedded Systems (3 credit hours)
Introduction to designing microcontroller-based embedded computer systems using assembly and C programs to control input/output peripherals. Use of embedded operating system.
Prerequisite: C- or better in ECE 209 and ECE 212
Typically offered in Fall and Spring

ECE 307 Elements of Control Systems (3 credit hours)
Analog system dynamics, open and closed loop control, block diagrams and signal flow graphs, input-output relationships, stability analyses using Routh-Hurwitz, root-locus and Nyquist time and frequency domain analysis and design of analog control systems. Use of computer-aided analysis and design tools. Class project. EE, CPE, BME majors only.
Prerequisite: (ECE 220 and ECE 211) or BME 311; Co-requisite: ECE 301
Typically offered in Fall and Spring

ECE 308 Data Structures and Object-Oriented Programming for Electrical and Computer Engineers (3 credit hours)
Advanced programming topics focusing on data structures and object-oriented programming. Common data structures, including linked lists, hash tables, trees, balanced trees, heaps, graphs, and B-trees, are described, analyzed, and implemented. Object-oriented programming topics, classes, inheritance, polymorphism, abstract types, and generic types are described and applied to program design.
Prerequisite: C- or better in ECE 209
Typically offered in Fall and Spring

ECE 309 Design of Complex Digital Systems (3 credit hours)
Design principles for complex digital systems. Decomposition of functional and interface specifications into block diagrams and simulation with hardware description languages. Synthesis of gate-level descriptions from register-transfer level descriptions.
Prerequisite: A grade of C- or better in ECE 212
Typically offered in Fall and Spring
ECE 331 Principles of Electrical Engineering (3 credit hours)
Concepts, units and methods of analysis in electrical engineering. Analysis of d-c and a-c circuits, characteristics of linear and non-linear electrical devices; principles of operational amplifiers; transformers; motors; and filters.
Prerequisite: PY 208 and a C or better in MA 241
Typically offered in Fall, Spring, and Summer

ECE 380 Engineering Profession for Electrical Engineers (1 credit hours)
Introduction to engineering as a profession including issues surrounding electrical engineering. Topics include professional and ethical responsibilities, risks and liabilities, intellectual property, and privacy. Economic issues including entrepreneurship and globalization.
Pre-requisites: C- or better in ECE 211 and ECE 212 and ECE 220
Typically offered in Fall and Spring

ECE 381 Engineering Profession for Computer Engineers (1 credit hours)
Introduction to engineering as a profession including issues surrounding computer engineering. Topics include professional and ethical responsibilities, risks and liabilities, intellectual property, and privacy. Economic issues including entrepreneurship and globalization.
Pre-requisites: C- or better in ECE 211 and ECE 212 and ECE 220
Typically offered in Fall and Spring

ECE 383 Introduction to Entrepreneurship and New Product Development (1 credit hours)
This course is part of the Engineering Entrepreneurs Program. Students work as team members on projects being led by seniors completing their senior capstone design. Students will be exposed to many areas of product development and will assist in the
Typically offered in Fall and Spring

ECE 384 Practical Engineering Prototyping (3 credit hours)
This course will teach prototyping skills, standard tools, and best practices to convert a project concept into a functioning, verifiable prototype. Course topics include understanding component specifications, system schematics, system functionality verification, power calculations and measurements, driver circuit designs, soldering and wiring procedures, basic MCU programming, Printed Circuit Board design and test, and debugging/test/verification tools/methods and procedures. Quick workshops on sensor interfacing, standard circuits and off-the-shelf systems, mobile app design, prototype packaging, and patent search resources will also be included in this course. Students will be required to complete several prototyping activities outside of class. This course is an open elective recommended to be taken before or at the same time as the capstone classes for Electrical and Computer (ECE) Engineering. Students are expected to have some basic knowledge about what is ac-dc, dc-dc voltage converters, motors, transistors, op-amps, and MOSFETS.
Prerequisites: (ECE 200 and ECE 209 and ECE 211) or their equivalent
Typically offered in Summer only

ECE 382 Communications Engineering (3 credit hours)
An overview of digital communications for wireline and wireless channels which focuses on reliable data transmission in the presence of bandwidth constraints and noise. The emphasis is on the unifying principles common to all communications systems, examples include digital telephony, compact discs, high-speed modems and satellite communications.
P: ECE 301 and ST 371; R: EE and CPE Majors Only
Typically offered in Fall, Spring, and Summer

ECE 380 Engineering Profession for Electrical Engineers (1 credit hours)
Introduction to engineering as a profession including issues surrounding electrical engineering. Topics include professional and ethical responsibilities, risks and liabilities, intellectual property, and privacy. Economic issues including entrepreneurship and globalization.
Pre-requisites: C- or better in ECE 211 and ECE 212 and ECE 220
Typically offered in Fall and Spring

ECE 383 Introduction to Entrepreneurship and New Product Development (1 credit hours)
This course is part of the Engineering Entrepreneurs Program. Students work as team members on projects being led by seniors completing their senior capstone design. Students will be exposed to many areas of product development and will assist in the
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This course will teach prototyping skills, standard tools, and best practices to convert a project concept into a functioning, verifiable prototype. Course topics include understanding component specifications, system schematics, system functionality verification, power calculations and measurements, driver circuit designs, soldering and wiring procedures, basic MCU programming, Printed Circuit Board design and test, and debugging/test/verification tools/methods and procedures. Quick workshops on sensor interfacing, standard circuits and off-the-shelf systems, mobile app design, prototype packaging, and patent search resources will also be included in this course. Students will be required to complete several prototyping activities outside of class. This course is an open elective recommended to be taken before or at the same time as the capstone classes for Electrical and Computer (ECE) Engineering. Students are expected to have some basic knowledge about what is ac-dc, dc-dc voltage converters, motors, transistors, op-amps, and MOSFETS.
Prerequisites: (ECE 200 and ECE 209 and ECE 211) or their equivalent
Typically offered in Summer only

ECE 402 Communications Engineering (3 credit hours)
An overview of digital communications for wireline and wireless channels which focuses on reliable data transmission in the presence of bandwidth constraints and noise. The emphasis is on the unifying principles common to all communications systems, examples include digital telephony, compact discs, high-speed modems and satellite communications.
P: ECE 301 and ST 371; R: EE and CPE Majors Only
Typically offered in Fall, Spring, and Summer

ECE 403 Electronics Engineering (3 credit hours)
Design and analysis of CMOS integrated circuits, from single transistor stages to operational amplifiers. Feedback in operational amplifier circuits, compensation and stability. ECE majors only.
Prerequisite: ECE 301, ECE 302
Typically offered in Spring only

ECE 404 Introduction to Solid-State Devices (3 credit hours)
Basic principles required to understand the operation of solid-state devices. Semiconductor device equations developed from fundamental concepts. P-N junction theory developed and applied to the analysis of devices such as varactors, detectors, solar cells, bipolar transistors, field-effect transistors. Emphasis on device physics rather than circuit applications.
P: ECE 302 or E 304; C: EE, CPE, NanoScience and Technology Majors Only
Typically offered in Fall and Spring

ECE 406/CSC 406/CSC 506/ECE 506 Architecture Of Parallel Computers (3 credit hours)
The need for parallel and massively parallel computers. Taxonomy of parallel computer architecture, and programming models for parallel architectures. Example parallel algorithms. Shared-memory vs. distributed-memory architectures. Correctness and performance issues. Cache coherence and memory consistency. Bus-based and scalable directory-based multiprocessors. Interconnection-network topologies and switch design. Brief overview of advanced topics such as multiprocessor prefetching and speculative parallel execution. Credit is not allowed for more than one course in this set: ECE 406, ECE 506, CSC 406.
Typically offered in Fall and Spring

ECE 407 Introduction to Computer Networking (3 credit hours)
This course focuses on engineering principles of computer communications and networking, including layering concepts, overview of protocols, architectures for local, metropolitan, and wide-area networks, routing protocols, internet operations, transport control and applications, emerging issues in computer networks. EE and CPE majors only.
Prerequisite: ECE 301
Typically offered in Fall and Spring
ECE 418/BME 418/BME 518/ECE 518 Wearable Biosensors and Microsystems (3 credit hours)
This course surveys the methods and application of wearable electronics and microsystems to monitor human biometrics, physiology, and environmental conditions. Topics covered include wearable electrocardiograms, blood-glucose monitors, electronic tattoos, wearable energy harvesting, “smart” clothing, body area networks, and distributed population networks. Critical comparison of different sensor modalities, quantitative metrics, and how their limitations in realistic applications define the selection, design, and operation criteria of one type of sensor over another will be considered.

Prerequisite: ECE 303 or Permission of the Instructor
Typically offered in Fall only

ECE 420 Wireless Communication Systems (3 credit hours)
A study of applications of communication theory and signal processing to wireless systems. Topics include an introduction to information theory and coding, basics and channel models for wireless communications, and some important wireless communication techniques including spread-spectrum and OFDM. MATLAB exercises expose students to engineering considerations.

Prerequisite: ECE 402
Typically offered in Fall and Spring

ECE 421 Introduction to Signal Processing (3 credit hours)

Prerequisite: ECE 301
Typically offered in Fall, Spring, and Summer

ECE 422 Transmission Lines and Antennas for Wireless (3 credit hours)
Review of time-varying electromagnetic theory. A study of the analytical techniques and the characteristics of several useful transmission lines and antennas. Examples are coaxial lines, waveguides, microstrip, optical fibers and dipole, monopole and array antennas.

Prerequisite: ECE 303
Typically offered in Fall only

ECE 423 Introduction to Photonics and Optical Communications (3 credit hours)
This course investigates photonic devices at the component level and examines the generation, propagation, and detection of light in the context of optical communication systems. Topics include the design of simple optical systems and focuses on the use of lasers, fiber optics, and photodetectors. The labs include building a Michelson interferometer, preparing and coupling light to an optical fiber, characterizing LEDs and laser diodes and making a fiber optical link.

Prerequisite: ECE 303 or Permission of the Instructor
Typically offered in Fall only

ECE 424/ECE 524 Radio System Design (3 credit hours)
Introduction to communication theory and radio system design. Design and analysis of radio systems, such as heterodyne transceivers, and effects of noise and nonlinearity. Design and analysis of radio circuits: amplifiers, filters, mixers, baluns and other transmission line and discrete circuits.

Prerequisite: ECE 302
Typically offered in Spring only

ECE 426 Analog Electronics Laboratory (3 credit hours)
A hands on laboratory based course with two construction projects (dual power supply, high frequency buffer amplifier) and six breadboard based activities with a focus on operational amplifiers and their applications. Student must have a portable computer and ‘Digilent Analog Discovery’. Topics include: amplifier performance, integrator/differentiator, filters, converters (I to V, V to I) and audio circuits.

Prerequisite: ECE 302
Typically offered in Fall and Spring

ECE 434 Fundamentals of Power Electronics (3 credit hours)
Design, analysis, modeling and control of DC-DC converters, DC-AC inverters, AC-DC rectifiers/converters, and AC-to-AC converters. power conversion using switched high-voltage high-current semiconductors in combination with inductors and capacitors. Design of DC-DC, DC-AC, AC-DC, and AC-AC power converters as well as an introductions to design of magnetic components for use in power converters, applications to fuel cells, photovoltaics, motor drives, and uninterruptable power supplies

Prerequisite:ECE 302 or equivalent
Typically offered in Fall only

ECE 436 Digital Control Systems (3 credit hours)
Discrete system dynamics, sampled-data systems, mathematical representations of analog/digital and digital/analog conversions, open- and -closed-loop systems, input-output relationships, state-space and stability analyses, time and frequency domain analysis with emphasis on time domain. Design and implementation of digital controllers. Design project including hardware implementation.

Prerequisite: ECE 308
Typically offered in Spring only

ECE 442 Integrated Circuit Technology and Fabrication (3 credit hours)
Semiconductor device and integrated-circuit processing and technology. Wafer specification and preparation, oxidation, diffusion, ion implantation, photolithography, design rules and measurement techniques.

Prerequisite: ECE 404
Typically offered in Fall only

ECE 451 Power System Analysis (3 credit hours)
Long-distance transmission of electric power with emphasis on load flow, economic dispatch, fault calculations and system stability. Applications of digital computers to power-system problems. Major design project.

Prerequisite: ECE 305
Typically offered in Fall only
ECE 452/ECE 552 Renewable Electric Energy Systems (3 credit hours)
Principles and characteristics of renewable energy based electric power generation technologies such as photovoltaic systems, wind turbines, and fuel cells. Main system design issues. Integration of these energy sources into the power grid. Economics of distributed generation. Credit is not allowed for both ECE 452 and ECE 552.
Prerequisite: ECE 305 or ECE 331
Typically offered in Spring only

ECE 453 Electric Motor Drives (3 credit hours)
Principles of electromechanical energy conversion; analysis, modeling, and control of electric machinery; steady state performance characteristics of direct-current, induction, synchronous and reluctance machines; scalar control of induction machines; introduction to direct- and quadrature-axis theory; dynamic models of induction and synchronous motors; vector control of induction and synchronous motors.
Prerequisite: A grade of C or better in ECE 305.
Typically offered in Spring only

ECE 455 Industrial Robotic Systems (3 credit hours)
Techniques of computer control of industrial robots; interfacing with synchronous hardware including analog/digital and digital/analog converters, interfacing noise problems, control of electric and hydraulic actuators, kinematics and kinetics of robots, path control, force control, sensing including vision. Major design project. EE, CPE, BME, JEM majors only.
Prerequisite: ECE 308
Typically offered in Spring only

ECE 456/ECE 556 Mechatronics (3 credit hours)
The study of electro-mechanical systems controlled by microcomputer technology. The theory, design and construction of smart systems; closely coupled and fully integrated products and systems. The synergistic integration of mechanisms, materials, sensors, interfaces, actuators, microcomputers, controllers, and information technology.
Prerequisite: ECE 308
Typically offered in Spring only

ECE 460/ECE 560 Embedded System Architectures (3 credit hours)
Concepts of architectures for embedded computing systems. Emphasis on hands-on implementation. CPU scheduling approaches to support multithreaded programs, including interrupts, cooperative schedulers, state machines, and preemptive scheduler (real-time kernel). Communication and synchronization between threads. Basic real-time analysis. Using hardware peripherals to replace software. Architectures and design patterns for digital control, streaming data, message parsing, user interfaces, low power, low energy, and dependability. Software engineering concepts for embedded systems. Students may not receive credit for both ECE 460 and ECE 560.
Prerequisite: C- or better in ECE 306
Typically offered in Fall only

ECE 461/ECE 561 Embedded System Design (3 credit hours)
Design and implementation of software for embedded computer systems. The students will learn to design systems using microcontrollers, C and assembly programming, real-time methods, computer architecture, interfacing system development and communication networks. System performance is measured in terms of power consumption, speed and reliability. Efficient methods for project development and testing are emphasized. Credit will not be awarded for both ECE 461 and ECE 561. Restricted to CPE and EE Majors.
Prerequisite: Grade of C- or better in ECE 460
Typically offered in Spring only

ECE 463/ECE 563 Microprocessor Architecture (3 credit hours)
Architecture of microprocessors. Measuring performance. Instruction-set architectures. Memory hierarchies, including caches, prefetching, program transformations for optimizing caches, and virtual memory. Processor architecture, including pipelining, hazards, branch prediction, static and dynamic scheduling, instruction-level parallelism, superscalar, and VLIW. Major projects.
Prerequisite: ECE 209 and ECE 212
Typically offered in Fall and Spring

ECE 464/ECE 564 ASIC and FPGA Design with Verilog (3 credit hours)
Design of digital application specific integrated circuits (ASICs) and Field Programmable Gate Arrays (FPGAs) based on hardware description languages (Verilog) and CAD tools. Emphasis on design practices and underlying methods. Introduction to ASIC specific design issues including verification, design for test, low power design and interfacing with memories. Required design project. Expected Prior Experience or Background: ECE 310 is useful but not assumed. Functionally, I assume that students are familiar with logic design, including combinational logic gates, sequential logic gates, timing design, Finite State Machines, etc.
P: Grade of C or better in ECE 212 or equivalent.
Typically offered in Fall only

ECE 466/ECE 566 Compiler Optimization and Scheduling (3 credit hours)
Provide insight into current compiler designs dealing with present and future generations of high performance processors and embedded systems. Introduce basic concepts in scanning and parsing. Investigate in depth program representation, dataflow analysis, scalar optimization, memory disambiguation, and interprocedural optimizations. Examine hardware/software trade-offs in the design of high performance processors, in particular VLIW versus dynamically scheduled architectures. Investigate back-end code generation techniques related to instruction selection, instruction scheduling for local, cyclic and global acyclic code, and register allocation and its interactions with scheduling and optimization.
Prerequisites: ECE 209 or competency in any machine language programming and ECE 309 or CSC 316 or proficiency in either C or C++ programming using advanced data structures, like hash tables and linked lists.P: ECE 209 or competency in an
Typically offered in Spring only
ECE 468/CHE 468/CHE 568/ECE 568 Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems (3 credit hours)
Conventional and emerging nano-manufacturing techniques and their applications in the fabrication of various structures and devices. Review of techniques for patterning, deposition, and etching of thin films including emerging techniques such as an imprint and soft lithography and other unconventional techniques. Electronic and mechanical properties of 0 to 3-D nanostructures and their applications in nano-electronics, MEMS/NEMS devices, sensing, energy harvesting, storage, flexible electronics and nano-medicine. Credit for both ECE/CHE 468 and ECE/CHE 568 is not allowed.

Prerequisite: E 304
Typically offered in Fall only

ECE 470 Internetworking (3 credit hours)
Introduction, Planning and Managing networking projects, networking elements-hardware, software, protocols, applications; TCP/IP, ATM, LAN emulation. Design and implementation of networks, measuring and assuring network and application performance;metrics, tools, quality of service. Network-based applications, Network management and security.

Prerequisite: ECE 407 or CSC 401
Typically offered in Spring only

ECE 482/MAE 482 Engineering Entrepreneurship and New Product Development I (3 credit hours)
Applications of engineering, mathematics, basic sciences, finance, and business to the design and development of prototype engineering products. This course requires a complete written report and an end-of-course presentation. This is the first course in a two semester sequence. Students taking this course will implement their designed prototype in ECE 483: Senior Design Project in Electrical Engineering and Computer Engineering II-Engineering Entrepreneurs. Departmental approval required.

Typically offered in Fall and Spring

ECE 483/MAE 483 Engineering Entrepreneurship and New Product Development II (3 credit hours)
Applications of engineering, science, management and entrepreneurship to the design, development and prototyping of new product ideas. Based on their own new product ideas, or those of others, students form and lead entrepreneurship teams (eTeams) to prototype these ideas. The students run their eTeams as 'virtual' startup companies where the seniors take on the executive roles. Joining them are students from other grade levels and disciplines throughout the university that agree to participate as eTeam members. Departmental approval required.

Prerequisite: ECE 482
Typically offered in Fall and Spring

ECE 484 Electrical and Computer Engineering Senior Design Project I (3 credit hours)
Applications of engineering and basic sciences to the total design of electrical and/or computer engineering circuits and systems. Consideration of the design process including concept and feasibility study, systems design, detailed design, project management, cost effectiveness, along with development and evaluation of a prototype accomplished through design-team project activity. Supported with introduction to a parallel functions impacting engineering design process to including: industrial design, finance, operations, etc. EE and CPE Majors only.

Prerequisite: ECE 380 and ECE 301 and ECE 302 and ENG 331; Coreq: One 400-level ECE Elective
Typically offered in Fall and Spring

ECE 485 Electrical and Computer Engineering Senior Design Project II (3 credit hours)
Applications of engineering and basic sciences to the total design of electrical engineering circuits and systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design-team project activity. Complete written and oral engineering report required. EE and CPE majors only.

Prerequisite: ECE 484
Typically offered in Fall and Spring

ECE 488/PB 588/ECE 588/PB 488 Systems Biology Modeling of Plant Regulation (3 credit hours)
This course provides an introduction to the field of systems biology with a focus on mathematical modeling, gene regulatory network and metabolic pathway reconstruction in plants. Students will learn how to integrate biological data with mathematical, statistical, and computational approaches to gain new insights into structure and behavior of complex cellular systems. Students are expected to have a minimal background in calculus and basic biology. The course will build on these basic concepts and provide all students, regardless of background or home department, with the fundamental biology, mathematics, and computing knowledge needed to address systems biology problems.

Prerequisite: MA 131 or MA 141
Typically offered in Fall only
ECE 489/ECE 589/MSE 489/MSE 589/ PY 489/ PY 589  Solid State Solar and Thermal Energy Harvesting  (3 credit hours)
This course studies the fundamental and recent advances of energy harvesting from two of the most abundant sources, namely solar and thermal energies. The first part of the course focuses on photovoltaic science and technology. The characteristics and design of common types of solar cells is discussed, and the known approaches to increasing solar cell efficiency will be introduced. After the review of the physics of solar cells, we will discuss advanced topics and recent progresses in solar cell technology. The second part of the course is focused on thermoelectric effect. The basic physical properties, Seebeck coefficient, electrical and thermal conductivities, are discussed and analyzed through the Boltzmann transport formalism. Advanced subject such as carrier scattering time approximations in relation to dimensionality and the density of states are studied. Different approaches for further increasing efficiencies are discussed including energy filtering, quantum confinement, size effects, band structure engineering, and phonon confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

ECE 492 Special Topics in Electrical and Computer Engineering  (1-4 credit hours)
Offered as needed for development of new courses in electrical and computer engineering.

Typically offered in Fall and Spring

ECE 495 Individual Study in ECE  (1-3 credit hours)
Independent investigation of a topic or research problem under faculty supervision. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty.

P: Appropriate 300-level Course; R: EE and CPE Majors Only.
Department Approval Required
Typically offered in Fall, Spring, and Summer

ECE 498 Special Projects in ECE  (1-3 credit hours)
Faculty-supervised special projects in electrical and/or computer engineering. Projects involve small groups of students, working collaboratively or independently, focused on a single theme, such as the design of a component or system. Requires a "Course Agreement for Students Enrolled in Non-Standard Courses," completed by the student and faculty member prior to registration by the department.

Prerequisite: At least one 300-level ECE course, 3.0 GPA; Restricted to: EE or CPE majors
Typically offered in Fall, Spring, and Summer

ECE 505 Neural Interface Engineering  (3 credit hours)
This course investigates the engineering techniques to understand, repair, replace, or enhance neural systems. The topics to be covered includes the following: the history of bioelectricity phenomena, the basics of modern neuroscience in electrical engineering terms and models, design of functional electrical interfaces with the nervous system for stimulating and recording purposes, basics of electrochemistry development of various systems for neuroprosthetics and neurorobotics applications such as pacemakers, cochlear implants and neuropsychiatric limbs.

Senior or graduate standing.
Typically offered in Fall only

ECE 506/ECE 406/CSC 406/CSC 506 Architecture Of Parallel Computers  (3 credit hours)
The need for parallel and massively parallel computers. Taxonomy of parallel computer architecture, and programming models for parallel architectures. Example parallel algorithms. Shared-memory vs. distributed-memory architectures. Correctness and performance issues. Cache coherence and memory consistency. Bus-based and scalable directory-based multiprocessors. Interconnection-network topologies and switch design. Brief overview of advanced topics such as multiprocessor prefetching and speculative parallel execution. Credit is not allowed for more than one course in this set: ECE 406, ECE 506, CSC 406.

Typically offered in Fall and Spring

ECE 511 Analog Electronics  (3 credit hours)
Analog integrated circuits and analog integrated circuit design techniques. Review of basic device and technology issues. Comprehensive coverage of analog-to-digital conversion techniques and switch design.

Prerequisite: ECE403
Typically offered in Fall only

ECE 513 Digital Signal Processing  (3 credit hours)
Digital processing of analog signals. Offline and real-time processing for parameter, waveform and spectrum estimation. Digital filtering and applications in speech, sonar, radar, data processing and two-dimensional filtering and image processing.

Prerequisite: ECE 421, B average in ECE and MA; Signals and Linear Systems
Typically offered in Fall only

ECE 514 Random Processes  (3 credit hours)
Probabilistic descriptions of signals and noise, including joint, marginal and conditional densities, autocorrelation, cross-correlation and power spectral density. Linear and nonlinear transformations. Linear least-squares estimation. Signal detection.

Prerequisite: Statistics 371; Signals and Linear Systems; Linear Algebra; Calculus
Typically offered in Fall only

ECE 515 Digital Communications  (3 credit hours)
This course is a first graduate-level course in digital communications. Functions and interdependence of various components of digital communication systems will be discussed. Statistical channel modeling, modulation and demodulation techniques, optimal receiver design, performance analysis methods, source coding, quantization, and fundamentals of information theory will be covered in this course.

Prerequisite: ECE 514, ST 371, Signals and Linear Systems; Linear Algebra
Typically offered in Spring and Summer
ECE 516 System Control Engineering  (3 credit hours)
Introduction to analysis and design of continuous and discrete-time dynamical control systems. Emphasis on linear, single-input, single-output systems using state variable and transfer function methods. Open and closed-loop representation; analog and digital simulation; time and frequency response; stability by Routh-Hurwitz, Nyquist and Liapunov methods; performance specifications; cascade and state variable compensation. Assignments utilize computer-aided analysis and design programs.
Prerequisite: ECE 435 or ECE 301
Typically offered in Spring only

ECE 517/CSC 517 Object-Oriented Design and Development  (3 credit hours)
The design of object-oriented systems, using principles such as the GRASP principles, and methodologies such as CRC cards and the Unified Modeling Language (ULM). Requirements analysis. Design patterns Agile Methods. Static vs. dynamic typing. Metaprogramming. Open-source development practices and tools. Test-first development. Project required, involving contributions to an open-source software project.
Prerequisite: CSC 326 or ECE 309
Typically offered in Fall and Spring

ECE 518/ECE 418/BME 518 Wearable Biosensors and Microsystems  (3 credit hours)
This course surveys the methods and application of wearable electronics and Microsystems to monitor human biometrics, physiology, and environmental conditions. Topics covered include wearable electrocardiograms, blood-glucose monitors, electronic tattoos, wearable energy harvesting, "smart" clothing, body area networks, and distributed population networks. Critical comparison of different sensor modalities, quantitative metrics, and how their limitations in realistic applications define the selection, design, and operation criteria of one type of sensor over another will be considered.
Prerequisite: Senior standing
Typically offered in Fall only

ECE 522/BME 522 Medical Instrumentation  (3 credit hours)
Fundamentals of medical instrumentation systems, sensors, and biomedical signal processing. Example instruments for cardiovascular and respiratory assessment. Clinical laboratory measurements, therapeutic and prosthetic devices, and electrical safety requirements. Students should have background in electronics design using operational amplifiers.
Typically offered in Spring only

ECE 523 Photonics and Optical Communications  (3 credit hours)
This course investigates photonic devices at the component level and examines the generation, propagation and detection of light in the context of optical communication systems. Topics include planar and cylindrical optical waveguides, LEDs, lasers, optical amplifiers, integrated optical and photodetectors, design tradeoffs for optical systems, passive optical networks, and wavelength division multiplexed systems.
Prerequisite: Graduate standing or Senior standing; Engineering Majors or Physics Majors
Typically offered in Spring only

ECE 524/ECE 424 Radio System Design  (3 credit hours)
Introduction to communication theory and radio system design. Design and analysis of radio systems, such as heterodyne transceivers, and effects of noise and nonlinearity. Design and analysis of radio circuits: amplifiers, filters, mixers, baluns and other transmission line and discrete circuits.
Prerequisite: ECE 302
Typically offered in Spring only

ECE 530 Physical Electronics  (3 credit hours)
Properties of charged particles under influence of fields and in solid materials. Quantum mechanics, particle statistics, semi-conductor properties, fundamental particle transport properties, p-n junctions.
Prerequisite: ECE 303, B average in ECE and MA
Typically offered in Fall only

ECE 531 Principles Of Transistor Devices  (3 credit hours)
Analysis of operating principles of transistor structures. Basic semi-conductor physics reviewed and used to provide explanation of transistor characteristics. Development and usage of device-equivalent circuits to interpret semi-conductor-imposed limitations on device performance. Devices analyzed include MISFIT’S, HEMT’S, Bipolar transistors, PBT’S, heterojunction BJT’S and SIT’S.
Prerequisite: ECE 404
Typically offered in Fall only

ECE 532 Principles Of Microwave Circuits  (3 credit hours)
Principles required to understand behavior of electronic circuits operating at microwave frequencies. Review of electromagnatic theory and establishing an understanding of techniques required for working with electronic circuits at microwave and millim
Prerequisite: ECE 422
Typically offered in Spring only

ECE 533 Power Electronics Design & Packaging  (3 credit hours)
This course introduces design of high-performance power electronic circuits where the integrated physical topology must be considered as part of the circuit, and provides an understanding of the multitude of parasitic elements created by circuit layout, materials and fabrication techniques. This prepares the student for high-density, high-frequency design of converters, gate drive circuits and resonant topologies. The student is also introduced to a power-electronics packaging lab and primary fabrication processes, such as Direct Bonded Copper (DBC) module construction with heavy-wire bonding, two-sided and 3D power modules in layered polymers, and high-voltage isolation of circuits with encapsulate in modules.
Prerequisite: ECE 434 or with permission of instructor
Typically offered in Spring only

ECE 534 Power Electronics  (3 credit hours)
DC and AC analysis of isolated and non-isolated switch mode power supply. Basic converter topologies covered include: buck, boost and buck-boost and their transformer-couples derivatives. Design of close loop of these DC/DC converters. Power devices and their applications in DC/DC converters. Inductor and transformer design.
Prerequisite: ECE 302
Typically offered in Fall and Spring
ECE 535/MAE 535 Design of Electromechanical Systems (3 credit hours)
A practical introduction to electromechanical systems with emphasis on modeling, analysis, design, and control techniques. Provides theory and practical tools for the design of electric machines (standard motors, linear actuators, magnetic bearings, etc). Involves some self-directed laboratory work and culminates in an industrial design project. Topics include Maxwell's equations, electromechanical energy conversion, finite element analysis, design and control techniques.
Prerequisite: MA 341
Typically offered in Spring and Summer

ECE 536 Digital Control System Projects (3 credit hours)
Discrete system dynamics, sampled-data systems, mathematical representations of analog/digital and digital/analog conversions, open- and closed-loop systems, input-output relationships, state-space and stability analyses, time and frequency domain analysis with emphasis on time domain. Design and implementation of digital controllers. Case studies. Design project including hardware implementation.
Prerequisite: Graduate standing & ECE 436 or similar or consent of instructor
Typically offered in Fall only

ECE 538 Integrated Circuits Technology and Fabrication (3 credit hours)
Prerequisite: ECE 404
Typically offered in Fall only

ECE 540 Electromagnetic Fields (3 credit hours)
Brief review of Maxwell's Equations, constitutive relations and boundary conditions. Reflection and refraction of plane waves; power and energy relations in isotropic media. Potential functions, Green's functions and their applications to radiation and scattering. Antenna fundamentals: linear antennas, uniform linear arrays and aperture antennas, microstrip antennas. Fundamentals of numerical methods for electromagnetic simulation and antenna design.
Prerequisite: ECE 422
Typically offered in Spring only

ECE 542 Neural Networks (3 credit hours)
Introduction to neural networks and other basic machine learning methods including radial basis functions, kernel methods, support vector machines. The course introduces regularization theory and principle component analysis. The relationships to filtering, pattern recognition and estimation theory are emphasized.
Typically offered in Spring only

ECE 544 Design Of Electronic Packaging and Interconnects (3 credit hours)
A study of the design of digital and mixed signal interconnect and packaging. Topics covered include: Single chip (surface mount and through-hole) and multi-chip module packaging technology; packaging technology selection; thermal design; electrical design of printed circuit board, backplane and multi-chip module interconnect; receiver and driver selection; EMI control; CAD tools; and measurement issues.
Prerequisite: ECE 302
Typically offered in Spring only

ECE 546 VLSI Systems Design (3 credit hours)
Digital systems design in CMOS VLSI technology: CMOS device physics, fabrication, primitive components, design and layout methodology, integrated system architectures, timing, testing future trends of VLSI technology.
Prerequisite: ECE 302
Typically offered in Spring only

ECE 547/CSC 547 Cloud Computing Technology (3 credit hours)
Study of cloud computing principles, architectures, and actual implementations. Students will learn how to critically evaluate cloud solutions, how to construct and secure a private cloud computing environment based on open source solutions, and how to federate it with external clouds. Performance, security, cost, usability, and utility of cloud computing solutions will be studied both theoretically and in hands-on exercises. Hardware-, infrastructure-, platform-, software-, security-, - "as-a-service".
Prerequisites: CSC 501 and either ECE/CSC 570 or ECE/CSC 573
Typically offered in Spring only

ECE 549 RF Design for Wireless (3 credit hours)
Design of the hardware aspects of wireless systems with principle emphasis on design of radio frequency (RF) and microwave circuitry. Introduction of system concepts then functional block design of a wireless system. RF and microwave transistors, noise, power amplifiers, CAE, linearization and antennas.
Prerequisite: ECE 303, ECE 302
Typically offered in Fall only

ECE 550 Power System Operation and Control (3 credit hours)
Fundamental concepts of economic operation and control of power systems. Real and reactive power balance. System components, characteristics and operation. Steady state and dynamic analysis of interconnected systems. Tieline power and load-frequency control with integrated economic dispatch.
Prerequisite: ECE 305, ECE 435
Typically offered in Fall only

ECE 551 Smart Electric Power Distribution Systems (3 credit hours)
Features and components of electric power distribution systems, power flow, short circuit and reliability analysis, basic control and protection, communications and SCADA, new "smart" functionality such as integrated volt/var control, automated fault location, isolation and restoration, demand response and advanced metering infrastructure, integration of distributed generation and energy storage.
Prerequisite: ECE 451
Typically offered in Spring only
ECE 552/ECE 452 Renewable Electric Energy Systems (3 credit hours)
Principles and characteristics of renewable energy based electric power generation technologies such as photovoltaic systems, wind turbines, and fuel cells. Main system design issues. Integration of these energy sources into the power grid. Economics of distributed generation. Credit is not allowed for both ECE 452 and ECE 552.
Prerequisite: ECE 305 or ECE 331
Typically offered in Spring only

ECE 553 Semiconductor Power Devices (3 credit hours)
The operational physics and design concepts for power semiconductor devices. Relevant transport properties of semiconductors. Design of breakdown voltage and edge terminations. Analysis of Schottky rectifiers, P-i-N rectifiers, Power MOSFETs, Bipolar Transistors, Thyristors and Insulated Gate Bipolar Transistors.
Prerequisite: ECE 404
Typically offered in Fall only

ECE 554 Electric Motor Drives (3 credit hours)
Topics covered in this course: Principles of Electromechanical energy conversion; analysis, modeling and control of electric machinery; steady state performance characteristics of direct current, induction, synchronous and reluctance machines; scalar control of induction machines; introduction to direct and quadrature axis theory; dynamic models of induction and synchronous machines; vector control of induction and synchronous machines.
Prerequisite: ECE 305 or equivalent
Typically offered in Spring only

ECE 555 Computer Control of Robots (3 credit hours)
An introduction to robotics: history and background, design, industrial applications and usage. Manipulator sensors, actuators and control, linear, non-linear, and force control. Manipulator kinematics: position and orientation, frame assignment, transformations, forward and inverse kinematics. Jacobian: velocities and static forces. Manipulator Kinetics: velocity, acceleration, force. Trajectory generation. Programming languages: manipulator level, task level, and object level. Introduction to advanced robotics. Credit not allowed for both ECE 455 and 555.
Prerequisite: ECE 435; ECE 436; ECE 456
Typically offered in Spring only

ECE 556/ECE 456 Mechatronics (3 credit hours)
The study of electro-mechanical systems controlled by microcomputer technology. The theory, design and construction of smart systems; closely coupled and fully integrated products and systems. The synergistic integration of mechanisms, materials, sensors, interfaces, actuators, microcomputers, controllers, and information technology.
Prerequisite: ECE 308
Typically offered in Fall only

ECE 557 Principles Of MOS Transistors (3 credit hours)
MOS capacitor and transistor regions of operation. Depletion and enhancement mode MOSFETs. MOSFET scaling, short and narrow channel effects. MOSFETs with ion-implanted channels. High field effects in MOSFETs with emphasis on recent advances in design of hit carrier suppressed structures. Small and large signal MOSFET models. State of the art in MOS process integration.
Prerequisite: ECE 404
Typically offered in Fall only

ECE 558 Digital Imaging Systems (3 credit hours)
Foundation for designing and using digital devices to accurately capture and display color images, spatial sampling, frequency analysis, quantization and noise characterization of images. Basics of color science are presented and applied to image capture and output devices.
Prerequisites: ECE 301 and ST 372
Typically offered in Fall only

ECE 560/ECE 460 Embedded System Architectures (3 credit hours)
Concepts of architectures for embedded computing systems. Emphasis on hands-on implementation. CPU scheduling approaches to support multithreaded programs, including interrupts, cooperative schedulers, state machines, and preemptive scheduler (real-time kernel). Communication and synchronization between threads. Basic real-time analysis. Using hardware peripherals to replace software. Architectures and design patterns for digital control, streaming data, message parsing, user interfaces, low power, low energy, and dependability. Software engineering concepts for embedded systems. Students may not receive credit for both ECE 460 and ECE 560.
Prerequisite: C- or better in ECE 306
Typically offered in Fall only

ECE 561/ECE 461 Embedded System Design (3 credit hours)
Design and implementation of software for embedded computer systems. The students will learn to design systems using microcontrollers, C and assembly programming, real-time methods, computer architecture, interfacing system development and communication networks, System performance is measured in terms of power consumption, speed and reliability. Efficient methods for project development and testing are emphasized. Credit will not be awarded for both ECE 461 and ECE 561. Restricted to CPE and EE Majors.
Prerequisite: Grade of C- or better in ECE 460
Typically offered in Spring only

ECE 563/ECE 463 Microprocessor Architecture (3 credit hours)
Architecture of microprocessors. Measuring performance. Instruction-set architectures. Memory hierarchies, including caches, prefetching, program transformations for optimizing caches, and virtual memory. Processor architecture, including pipelining, hazards, branch prediction, static and dynamic scheduling, instruction-level parallelism, superscalar, and VLIW. Major projects.
Prerequisite: ECE 209 and ECE 212
Typically offered in Fall and Spring

ECE 564/ECE 464 ASIC and FPGA Design with Verilog (3 credit hours)
Design of digital application specific integrated circuits (ASICs) and Field Programmable Gate Arrays (FPGAs) based on hardware description languages (Verilog) and CAD tools. Emphasis on design practices and underlying methods. Introduction to ASIC specific design issues including verification, design for test, low power design and interfacing with memories. Required design project. Expected Prior Experience or Background: ECE 310 is useful but not assumed. Functionally, I assume that students are familiar with logic design, including combinational logic gates, sequential logic gates, timing design, Finite State Machines, etc.
P: Grade of C or better in ECE 212 or equivalent.
Typically offered in Fall only
ECE 566/ECE 466 Compiler Optimization and Scheduling (3 credit hours)
Provide insight into current compiler designs dealing with present and future generations of high performance processors and embedded systems. Introduce basic concepts in scanning and parsing. Investigate in depth program representation, dataflow analysis, scalar optimization, memory disambiguation, and interprocedural optimizations. Examine hardware/software trade-offs in the design of high performance processors, in particular VLIW versus dynamically scheduled architectures. Investigate back-end code generation techniques related to instruction selection, instruction scheduling for local, cyclic and global acyclic code, and register allocation and its interactions with scheduling and optimization.

Prerequisites: ECE 209 or competency in any machine language programming and ECE 309 or CSC 316 or proficiency in either C or C++ programming using advanced data structures, like hash tables and linked lists. P: ECE 209 or competency in an
Typically offered in Spring only

ECE 568/ECE 468/CHE 468/CHE 568 Conventional and Emerging Nanomanufacturing Techniques and Their Applications in Nanosystems (3 credit hours)
Conventional and emerging nano-manufacturing techniques and their applications in the fabrication of various structures and devices. Review of techniques for patterning, deposition, and etching of thin films including emerging techniques such as an imprint and soft lithography and other unconventional techniques. Electronic and mechanical properties of 0 to 3-D nanostructures and their applications in nano-electronics, MEMS/NEMS devices, sensing, energy harvesting, storage, flexible electronics and nano-medicine. Credit for both ECE/CHE 468 and ECE/CHE 568 is not allowed.

Prerequisite: E 304
Typically offered in Fall only

ECE 570/CSC 570 Computer Networks (3 credit hours)
General introduction to computer networks. Discussion of protocol principles, local area and wide area networking, OSI stack, TCP/IP and quality of service principles. Detailed discussion of topics in medium access control, error control coding, and flow control mechanisms. Introduction to networking simulation, security, wireless and optical networking.

Prerequisite: ECE 206 or CSC 312, ST 371, CSC 258 and Senior standing or Graduate standing
Typically offered in Fall and Spring

ECE 573/CSC 573 Internet Protocols (3 credit hours)
Principles and issues underlying provision of wide area connectivity through interconnection of autonomous networks. Internet architecture and protocols today and likely evolution in future. Case studies of particular protocols to demonstrate how fund

Prerequisite: CSC/ECE 570
Typically offered in Fall, Spring, and Summer

ECE 574/CSC 574 Computer and Network Security (3 credit hours)
Security policies, models, and mechanisms for secrecy, integrity, and availability. Basic cryptography and its applications; operating system models and mechanisms for mandatory and discretionary controls; introduction to database security; security in distributed systems; network security (firewalls, IPsec, and SSL); and control and prevention of viruses and other rogue programs.

Prerequisite: (CSC 316) and (CSC 401 or CSC/ECE 570)
Typically offered in Fall and Spring

ECE 575/CSC 575 Introduction to Wireless Networking (3 credit hours)
Introduction to cellular communications, wireless local area networks, ad-hoc and IP infrastructures. Topics include: cellular networks, mobility management, connection admission control algorithms, mobility models, wireless IP networks, ad-hoc routing, sensor networks, quality of service, and wireless security.

Prerequisite: ECE/CSC 570
Typically offered in Spring and Summer

ECE 576/CSC 576 Networking Services: QoS, Signaling, Processes (3 credit hours)
Topics related to networking services, signaling for setting up networking services, such as SIP and IMS, networking architectures for providing QoS for networking services, such as MPLS, DiffServ and RAC, signaling protocols for setting up QoS connections in the transport stratum, such as LDP and RSVP-TE, video-based communications, and capacity planning models for dimensioning services.

Prerequisite: CSC/ECE 570
Typically offered in Fall and Spring

ECE 577/CSC 577 Switched Network Management (3 credit hours)
Topics related to design and management of campus enterprise networks, including VLAN design; virtualization and automation methodologies for management; laboratory use of open space source and commercial tools for managing such networks.

Typically offered in Fall only

ECE 578 LTE and 5G Communications (3 credit hours)
The course provides an introduction to the theoretical fundamentals and practical/experimental aspects of Long Term Evolution (LTE) and 5G systems. A basic understanding of digital communications and radio access networks is required. Following topics will be studied: 1) User and control plane protocols, 2) physical layer for downlink, 3) physical layer for uplink, 4) practical deployment aspects, 5) LTE-Advanced, 6) 5G communications. Fundamental concepts to be covered in the context of LTE/5G systems include OFDMA/SC-FDMA, synchronization, channel estimation, link adaptation, MIMO, scheduling, and millimeter wave systems. Students are recommended to have the prior knowledge gained from ECE 570 or ECE 582 before taking this course. The course will also require using Matlab software for homeworks, including its LTE and 5G toolboxes.

Typically offered in Fall only
ECE 579/OR 579/CSC 579  Introduction to Computer Performance Modeling  (3 credit hours)
Workload characterization, collection and analysis of performance data, instrumentation, tuning, analytic models including queueing network models and operational analysis, economic considerations.

Prerequisite: CSC 312 or ECE 206 and MA 421
Typically offered in Fall and Spring

ECE 581  Electric Power System Protection  (3 credit hours)
Protection systems used to protect the equipment in an electric power system against faults, fault analysis methods, basic switchgear used for protection, basic protection schemes, such as overcurrent, differential, and distance protection and their application.

Prerequisite: ECE 451
Typically offered in Spring only

ECE 582  Wireless Communication Systems  (3 credit hours)
Theory and analysis of wireless portable communication systems. Provides a fundamental understanding of the unique characteristics of these systems. Topics include: Code Division Multiple Access (CDMA), mobile radio propagation, characterization of a Rayleigh fading multipath channel, diversity techniques, adaptive equalization, channel coding, and modulation/demodulation techniques. Although contemporary cellular and personal communication services (PCS) standards are covered, the course stresses fundamental theoretical concepts that are not tied to a particular standard.

Prerequisite: Senior level digital communications course, e.g., ECE 402, Corequisite: ECE 714
Typically offered in Fall only

ECE 583  Electric Power Engineering Practicum I  (3 credit hours)
This course introduces fundamentals of project management and system engineering principles in a wide range of electric power applications from concept through termination. The course also provides opportunities for students to adapt technical content

Prerequisite: ECE 451
Typically offered in Spring only

ECE 584  Electric Power Engineering Practicum II  (3 credit hours)
In this capstone course students will apply electric engineering and science knowledge to an electrical power engineering project. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with development and evaluation of a prototype accomplished through design-team project activity. Complete written and oral engineering report required. Restricted to Master of Science in Electric Power Systems Engineering.

Prerequisite: ECE 583
Typically offered in Fall and Summer

ECE 585  The Business of the Electric Utility Industry  (3 credit hours)
Evolution of the electric utility industry, the structure and business models of the industry, the regulatory factors within which the utilities operate, the operations of the utility industry and the current policy and emerging technology issues facing the business. The course includes significant interaction with industry officials and utility business operations.

Prerequisite: ECE 451
Typically offered in Fall only

ECE 586  Communication and SCADA Systems for Smart Grid  (3 credit hours)
This is an introductory course on communication technologies and SCADA (supervisory control and data acquisition) systems for smart electric power applications. The fundamental concepts, principles, and practice of how communication systems operate are introduced and the function of main components reviewed. Application of communication systems for electric power, in particular SCADA architecture and protocols are also introduced. The course includes hands-on experience with typical intelligent electronic devices interconnected by a communication system.

R: Graduate Students Only
Typically offered in Fall only

ECE 587  Power System Transients Analysis  (3 credit hours)
Review of solutions to first and second order differential equations for electric power circuit transients. Applications to fault current instantaneous, shunt capacitor transients, circuit switching transients and overvoltages, current interruption and transformer transient behavior. Computer solution techniques for transient analysis using PSCAD and Matlab/Simulink. Modeling of utility power electronics circuits including single and three-phase rectifiers and inverters. Applications of power electronics for transmission system control and renewable generation. Distributed line modeling for traveling wave analysis of surge events. Introduction to voltage insulation, surge arrestor operation and lightning stroke analysis.

Typically offered in Fall only

ECE 588/PB 488/ECE 488/PB 588 Systems Biology Modeling of Plant Regulation  (3 credit hours)
This course provides an introduction to the field of systems biology with a focus on mathematical modeling, gene regulatory network and metabolic pathway reconstruction in plants. Students will learn how to integrate biological data with mathematical, statistical, and computational approaches to gain new insights into structure and behavior of complex cellular systems. Students are expected to have a minimal background in calculus and basic biology. The course will build on these basic concepts and provide all students, regardless of background or home department, with the fundamental biology, mathematics, and computing knowledge needed to address systems biology problems.

Prerequisite: MA 131 or MA 141
Typically offered in Fall only
ECE 589/MSE 489/MSE 589/ PY 489/ PY 589/ECE 489  Solid State Solar and Thermal Energy Harvesting  (3 credit hours)
This course studies the fundamental and recent advances of energy harvesting from two of the most abundant sources, namely solar and thermal energies. The first part of the course focuses on photovoltaic science and technology. The characteristics and design of common types of solar cells is discussed, and the known approaches to increasing solar cell efficiency will be introduced. After the review of the physics of solar cells, we will discuss advanced topics and recent progresses in solar cell technology. The second part of the course is focused on thermoelectric effect. The basic physical properties, Seebeck coefficient, electrical and thermal conductivities, are discussed and analyzed through the Boltzmann transport formalism. Advanced subject such as carrier scattering time approximations in relation to dimensionality and the density of states are studied. Different approaches for further increasing efficiencies are discussed including energy filtering, quantum confinement, size effects, band structure engineering, and phonon confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

ECE 591 Special Topics In Electrical Engineering  (1-6 credit hours)
Two-semester sequence to develop new courses and to allow qualified students to explore areas of special interest.

Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 592 Special Topics In Electrical Engineering  (1-6 credit hours)
Two-semester sequence to develop new courses and to allow qualified students to explore areas of special interest.

Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 600 ECE Graduate Orientation  (1 credit hours)
Introduction of the Electrical and Computer Engineering Department graduate program. Introduction to computing and library facilities; Review of NC State student code of conduct and ethics. Structure of the ECE department. General information for sta

Typically offered in Fall and Spring

ECE 633 Individual Topics In Electrical Engineering  (1-3 credit hours)
Provision of opportunity for individual students to explore topics of special interest under direction of a member of faculty.

Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 634 Individual Studies In Electrical Engineering  (1-3 credit hours)
The study of advanced topics of special interest to individual students under direction of faculty members.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ECE 650 Internship  (3 credit hours)
This course requires an internship with a company or organization outside the University. The student will secure an internship of a technical nature and complete and submit a Coop report for evaluation.

Restricted: 14EEMS, 14CPEMS, 14CNEMS, 14EPSEMS
Typically offered in Fall and Spring

ECE 685 Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Spring only

ECE 690 Master's Exam  (1-9 credit hours)
Typically offered in Fall and Spring

ECE 693 Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

ECE 695 Master's Thesis Research  (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ECE 696 Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

ECE 699 Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.

Prerequisite: Master's student
Typically offered in Fall and Spring

ECE 705 Memory Systems  (3 credit hours)
Covers recent research on overcoming the problem of memory access and memory speed, two major limitations on the speed of computers. Overview of the current state of memory technologies, novel cache structures and management techniques, prefetching, memory compression, and parallelism at the instruction and thread levels. Research papers required.

Prerequisite: ECE 521, Computer Design and Technology

ECE 706 Advanced Parallel Computer Architecture  (3 credit hours)
Advanced topics in parallel computer architecture. Hardware mechanisms for scalable cache coherence, synchronization, and speculation. Scalable systems and interconnection networks. Design or research project required.

Prerequisite: ECE/CSC 506, ECE 521
Typically offered in Spring only
ECE 712 Integrated Circuit Design for Wireless Communications (3 credit hours)
Analysis, simulation, and design of the key building blocks of an integrated radio: amplifiers, mixers, and oscillators. Topics include detailed noise optimization and linearity performance of high frequency integrated circuits for receivers and transmitters. Introduction to several important topics of radio design such as phase-locked loops, filters and large-signal amplifiers. Use of advanced RF integrated circuit simulation tools such as SpectreRF or ADS for class assignments.
Prerequisite: ECE 511
Typically offered in Fall only

ECE 714 Advanced Integrated Circuit Design: Data Converters (3 credit hours)
This course is a graduate level course in Analog-to-digital converters. Students will learn the fundamentals of sampling and the translation of signals in the digital to analog and analog to digital domains. Students will learn the basic circuits unique to data converters and how they impact design. Students will learn to design digital-to-analog converters as well as 3 ADCs: Pipeline, Sigma-Delta and Successive-approximation. After completion of this course you will have the background to successfully design an ADC and DAC.
Prerequisite: ECE 511
Typically offered in Fall only

ECE 718 Computer-Aided Circuit Analysis (3 credit hours)
Steady state and transient analysis of circuits with emphasis on circuit theory and computer methods. Consideration of many analysis techniques, including linear nodal, signal flow graph, state equation, time-domain and functional simulation and analysis of sampled data systems. Sensitivity and tolerance analysis, macromodeling of large circuits and nonlinear circuit theory.
Prerequisite: ECE 511

ECE 719 Advanced Microwave Design (3 credit hours)
Development and examination of techniques used in the design of microwave and millimeter wave components and systems. Specific topics include frequency planning, system design using modules, and design of microwave amplifiers and oscillators. Design for specified frequency, noise, power, mixer or oscillator performance will be covered. There are three design projects: system planning, amplifier design, and oscillator design all using commercial microwave computer aided design tools.
Prerequisite: ECE 549
Typically offered in Spring only

ECE 720 Electronic System Level and Physical Design (3 credit hours)
Study of transaction-level modeling of digital systems-on-chip using SystemC. Simulation and analysis of performance in systems with distributed control. Synthesis of digital hardware from high-level descriptions. Physical design methodologies, including placement, routing, clock-tree insertion, timing, and power analysis. Significant project to design a core at system and physical levels. Knowledge of object-oriented programming with C and register-transfer-level design with verilog or VHDL is required.
Prerequisite: ECE 520
Typically offered in Fall only

ECE 721 Advanced Microarchitecture (3 credit hours)
Survey of advanced computer microarchitecture concepts. Modern superscalar microarchitecture, complexity-effective processors, multithreading, advanced speculation techniques, fault-tolerant microarchitectures, power and energy management, impact of new technology on microarchitecture. Students build on a complex simulator which is the basis for independent research projects.
Prerequisite: ECE 521
Typically offered in Fall only

ECE 722 Electronic Properties of Solid-State Materials (3 credit hours)
Materials and device-related electronic properties of semiconductors. Included topics: energy band structure, electrical and thermal transport phenomena, scattering processes, localized energy states, equilibrium and non-equilibrium semiconductor statistics.
Prerequisite: ECE 530
Typically offered in Spring only

ECE 723 Optical Properties Of Semiconductors (3 credit hours)
Materials and device-related properties of compound optical semiconductors. Included topics: band structure, heterojunctions and quantum wells, optical constants, waveguides and optical cavities, absorption and emission processes in semiconductors, photodetectors, light emitting diodes, semiconductor lasers.
Prerequisite: ECE 530
Typically offered in Spring only

ECE 724 Electronic Properties Of Solid-State Devices (3 credit hours)
Basic physical phenomena responsible for operation of solids-state devices. Examination and utilization of semiconductor transport equations to explain principles of device operation. Various solid-state electronics devices studied in detail.
Prerequisite: ECE 530
Typically offered in Spring only

ECE 725 Quantum Engineering (3 credit hours)
Development of advanced engineering concepts at the quantum level relevant to nanoscience, nanoelectronics, and quantum photonics. Topics include tunneling phenomena, specifics of time dependent and time independent perturbation methodology for addressing applications under consideration, including the WKB approach, and an introduction to second quantization for engineers. Applications include, but are not limited to, tunneling in a two-level system, molecular rotation through excitation, field emission, van der Waal interactions, optical absorption in quantum wells, and electron transport through model molecules.
Prerequisite: ECE 530, and PY 401
Typically offered in Spring only

ECE 726 Advanced Feedback Control (3 credit hours)
Advanced topics in dynamical systems and multivariable control. Current research and recent developments in the field.
Prerequisite: ECE 516
Typically offered in Fall only
ECE 732 Dynamics and Control of Electric Machines (3 credit hours)
Dynamic behavior of AC electric machines and drive systems; theory of field orientation and vector control for high performance induction and synchronous machines; permanent magnet and reluctance machines and their control; principles of voltage source and current source inverters, and voltage and current regulation methods.
Prerequisite: ECE 453 or ECE 592
Typically offered in Fall only

ECE 733 Digital Electronics (3 credit hours)
In-depth study of digital circuits at the transistor level. Topics include fundamentals; high speed circuit design; low-power design; RAM; digital transceivers; clock distribution; clock and data recovery; circuits based on emerging devices. Project.
Prerequisite: ECE 546
Typically offered in Fall only

ECE 734 Power Management Integrated Circuits (3 credit hours)
Review of modern power management converters and circuits; Review modeling and control of converters; Detailed discussion of voltage and current mode controllers; Understanding of power converter losses and optimization method, as well as management of power; Integrated circuit design of various power management chips.
Prerequisite: ECE 511 and ECE 534
Typically offered in Spring only

ECE 735 Wide Band Gap Semiconductor Power Devices (3 credit hours)
This course provides students with an in-depth knowledge of power devices built from wide bandgap semiconductors: the design of high breakdown voltages, the physics of unique power rectifier structures suitable for SiC material, the operating principles for unique SiC power MOSFETs, and GaN HEMT devices, the development of bipolar power devices from SiC to achieve ultra-high voltage performance and the performance of wide bandgap semiconductor power devices as compared to advanced silicon devices.
Prerequisite: ECE 553 or equivalent
Typically offered in Spring only

ECE 736 Power System Stability and Control (3 credit hours)
Prerequisite: ECE 451 and ECE 750
Typically offered in Spring only

ECE 739 Integrated Circuits Technology and Fabrication Laboratory (3 credit hours)
An integrated circuit laboratory to serve as a companion to ECE 538. Hands-on experience in semiconductor fabrication laboratory. Topics include: techniques used to fabricate and electrically test discrete semiconductor devices, the effects of process variations on measurable parameters.
Prerequisite: ECE 538
Typically offered in Spring only

ECE 745 ASIC Verification (3 credit hours)
This course covers the verification process used in validating the functional correctness in today's complex ASICs (application specific integrated circuits). Topics include the fundamentals of simulation based functional verification, stimulus generation, results checking, coverage, debug, and formal verification. Provides the students with real world verification problems to allow them to apply what they learn.
Prerequisite: ECE 564
Typically offered in Spring only

ECE 748 Advanced Functional Verification with Universal Verification Methodology (3 credit hours)
The Universal Verification Methodology is the industry standard for functional verification of today's complex ASICs and FPGAs. Students will learn the content and use of UVM to architect and implement complex test benches. The characteristics and architecture of reusable verification components is a major focus of the course. Students will learn and implement verification components which are reusable across projects, from block level simulation to chip level simulation, and from simulation to emulation. The course projects teach and demonstrate advanced verification methodologies that prepare students for careers in functional verification of digital semiconductors.
Prerequisite: ECE 745 or equivalent
Typically offered in Fall only

ECE 751 Detection and Estimation Theory (3 credit hours)
Methods of detection and estimation theory as applied to communications, speech and image processing. Statistical description of signals and representation in time, spatial and frequency domains; Bayesian methods, including Wiener, Kalman and MAP filters; performance measures; applications to both continuous and discrete systems.
Prerequisite: ECE 514, ECE 421
Typically offered in Spring only

ECE 752 Information Theory (3 credit hours)
An overview of Shannon's theory of information, which establishes fundamental limits on the performance of data compression and quantization algorithms, communication systems, and detection and estimation algorithms. Topics include information measures and their properties, information source models, lossless data compression, channel coding and capacity, information theory and statistics, and rate-distortion theory. Applications of information theory will also be discussed, including Lempel-Ziv data compression, vector quantization, error-correcting codes, satellite communications and high-speed modems.
Prerequisite: ECE 514: Random Processes
ECE 753 Computational Methods for Power Systems (3 credit hours)
This course is designed to introduce computational methods used for power grid operation and planning. The course will help students understand the various computational methods that form the basis of major commercial software packages used by grid analysts and operators. Students are expected to have some basic understanding of principles of power system analysis including power system models, power flow calculation, economic dispatch, reliable and stability analysis. The course covers the following computational methods commonly used in power grid operation and planning: Locational Marginal Pricing Schemes, Game Theory, Unconstrained Optimization, Linear Programming, Non-linear Constrained Optimization, and Forecasting Methods.
Prerequisite: ECE 451 or ECE 550
Typically offered in Spring only

ECE 755 Advanced Robotics (3 credit hours)
Advanced robotics at its highest level of abstraction; the level of synthesizing human reasoning and behavior. Advanced robotics deals with the intelligent connection of perception to action. At this level the subject requires knowledge of sensing (computer vision, tactile, sonar), and reasoning (artificial intelligence: machine learning, planning, world modeling). The advanced robotics course will be valuable for students who wish to work in the area.
Prerequisite: ECE 555; MAE 544
Typically offered in Fall only

ECE 756 Advanced Mechatronics (3 credit hours)
A project-oriented course focusing on the design, analysis, and implementation of advanced mechatronics technologies, including large-scale distributed sensors, distributed-actuators, and distributed-controllers connected via communication networks. Will use unmanned vehicles as the project platform, with applications from sensors, actuators, network-based controllers, cameras, and microcontrollers. ECE 516 is recommended.
Prerequisite: ECE 456 or ECE 556 with a Grade B+ and above
Typically offered in Spring only

ECE 759 Pattern Recognition (3 credit hours)
Image pattern recognition techniques and computer-based methods for scene analysis, including discriminate functions, fixture extraction, classification strategies, clustering and discriminant analysis. Coverage of applications and current research results.
Prerequisite: ECE(CSC) 514, ST 371, B average in ECE and MA
Typically offered in Spring only

ECE 762 Advanced Digital Communications Systems (3 credit hours)
An advanced graduate-level course in digital communications. Topics include signal design, equalization methods and synchronization techniques for realistic communication channels. Projects concentrate on literature review and computer simulations.
Prerequisite: ECE 515 or equivalent
Typically offered in Fall only

ECE 763 Computer Vision (3 credit hours)
Analysis of images by computers. Specific attention given to analysis of the geometric features of objects in images, such as region size, connectedness and topology. Topics include: segmentation, template matching, motion analysis, boundary detection, region growing, shape representation, 3-D object recognition including graph matching.
Prerequisite: ECE 558 and ECE 514
Typically offered in Spring only

ECE 765 Probabilistic Graphical Models for Signal Processing and Computer Vision (3 credit hours)
Techniques for machine learning using probabilistic graphical models. Emphasis on Bayesian and Markov networks with applications to signal processing and computer vision.
Prerequisites: Programming experience (MATLAB, C++ or other object oriented language such as Python), linear algebra (MA 405 or equivalent), and probability (ECE 514, equivalent or instructor permission)
Typically offered in Fall only

ECE 766 Signal Processing for Communications & Networking (3 credit hours)
This course deals with the signal processing principles underlying recent advances in communications and networking. Topics include: smart-antenna and multi-input multi-output (MIMO) techniques; multiuser communication techniques (multiple access, power control, multiuser detection, and interference management); signal processing in current and emerging network applications such as cognitive radio and social networks. Knowledge of linear algebra and stochastic analysis is required.
Prerequisite: Graduate standing
Typically offered in Fall only

ECE 767 Error-Control Coding (3 credit hours)
An introduction to the theory and practice of codes for detecting and correcting errors in digital data communication and storage systems. Topics include linear block codes, cyclic codes, cyclic redundancy checksums, BCH and Reed-Solomon codes, convolutional codes, trellis-coded modulation, LDPC and turbo codes, Viterbi and sequential decoding, and encoder and decoder architecture. Applications include the design of computer memories, local-area networks, compact disc digital audio, NASA's deepspace network, high-speed modems, communication satellites, and cellular telephony.
Prerequisite: ECE 514 Random Processes; linear algebra at the undergraduate level is strongly recommended

ECE 773/CSC 773 Advanced Topics in Internet Protocols (3 credit hours)
Cutting-edge concepts and technologies to support internetworking in general and to optimize the performance of the TCP/IP protocol suite in particular. Challenges facing and likely evolution for next generation internetworking technologies. This course investigates topics that include, but may be not limited to: Internet traffic measurement, characterization and modeling, traffic engineering, network-aware applications, quality of service, peer-to-peer systems, content-distribution networks, sensor networks, reliable multicast, and congestion control.
Prerequisite: CSC/ECE 573
Typically offered in Spring only
ECE 774/CSC 774  Advanced Network Security  (3 credit hours)
A study of network security policies, models, and mechanisms. Topics include: network security models; review of cryptographic techniques; internet key management protocols; electronic payments protocols and systems; intrusion detection and correlation; broadcast authentication; group key management; security in mobile ad-hoc networks; security in sensor networks.
Prerequisite: CSC/ECE 570, CSC/ECE 574
Typically offered in Spring only

ECE 775/CSC 775  Advanced Topics in Wireless Networking  (3 credit hours)
Reviews the current state of research in wireless networks, network architectures, and applications of wireless technologies; students will design, organize, and implement or simulate systems in a full-semester research project. For students with background in networking and communications who wish to explore research and development topics.
Prerequisite: ECE/CSC 575
Typically offered in Fall only

ECE 776/CSC 776  Design and Performance Evaluation of Network Systems and Services  (3 credit hours)
Introduction to the design and performance evaluation of network services. Topics include top-down network design based on requirements, end-to-end services and network system architecture, service level agreements, quantitative performance evaluation techniques. Provides quantitative skills on network service traffic and workload modeling, as well as, service applications such as triple play, internet (IPTV), Peer-to-peer (P2P), voice over IP (VoIP), storage, network management, and access services.
Prerequisite: CSC(ECE) 570 and CSC(ECE) 579
Typically offered in Fall only

ECE 777/CSC 777  Telecommunications Network Design  (3 credit hours)
Analytic modeling and topological design of telecommunications networks, including centralized polling networks, packet switched networks, T1 networks, concentrator location problems, routing strategies, teletraffic engineering and network reliability.
Prerequisite: CSC(ECE) 570
Typically offered in Spring only

ECE 785  Topics in Advanced Computer Design  (3 credit hours)
In depth study of topics in computer design; advantages and disadvantages of various designs and design methodologies; technology shifts, trends, and constraints; hardware/software tradeoffs and co-design methodologies.
Prerequisite: ECE 520, ECE 521
Typically offered in Spring only

ECE 786  Advanced Computer Architecture: Data Parallel Processors  (3 credit hours)
In-depth study of processor architectures to exploit data-level parallelism, including general computation on graphics processing units (GPGPU, aka GPU computing architecture) and vector processors; memory subsystems; advantages and disadvantages of various architectures; technology shifts, trends, and constraints.
P: ECE 463/563 and CSC/ECE 506
Typically offered in Spring only

ECE 791  Special Topics In Electrical Engineering  (3-6 credit hours)
Two-semester sequence to develop new courses and to allow qualified students to explore areas of special interest.
Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 792  Special Topics In Electrical Engineering  (1-6 credit hours)
Two-semester sequence to develop new courses and to allow qualified students to explore areas of special interest.
Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 801  Seminar in Electrical and Computer Engineering  (1-3 credit hours)
Typically offered in Fall and Spring

ECE 804  Seminar in Comm/Sig PR  (1-3 credit hours)
Typically offered in Fall and Spring

ECE 833  Individual Topics In Electrical Engineering  (1-3 credit hours)
Provision of opportunity for individual students to explore topics of special interest under direction of a member of faculty.
Prerequisite: B average in technical subjects
Typically offered in Fall and Spring

ECE 834  Individual Studies In Electrical Engineering  (1-3 credit hours)
The study of advanced topics of special interest to individual students under direction of faculty members.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ECE 885  Individual Topics In Electrical Engineering  (1-3 credit hours)
Provision of opportunity for individual students to explore areas of special interest.
Prerequisite: B average in technical subjects
Typically offered in Fall only

ECE 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall only

ECE 891  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall only

ECE 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
**Typically offered in Fall only**

**Prerequisite:** ELM 250, Junior standing, Elementary Education Majors from their school based experiences.

**Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experience.**

**Typically offered in Summer only**

**Prerequisite:** Doctoral student

**Typically offered in Fall and Spring**

**Elementary Education (ELM)**

1. **ELM 250  Introduction to Elementary Education in a Global Society (3 credit hours)**
   - Introduction to the major conceptual and intellectual foundations of the teaching profession, the sociology and culture of elementary schools and classrooms, and the world of work of elementary teachers. Fieldwork in schools and related settings maybe required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences. Students interested in Elementary Education.
   - **Prerequisite:** Sophomore standing
   - **Typically offered in Spring and Summer**

2. **ELM 310  Children’s Thinking and Additive Reasoning (3 credit hours)**
   - Examination of mathematical reasoning processes in primary grade children and the theory and practice of active teaching strategies designed to motivate and engage children in mathematics learning in grades K-3. Fieldwork in schools and related settings
   - **Prerequisite:** ELM 250, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**

3. **ELM 320  Teaching Science in the Primary Grades (3 credit hours)**
   - Examination of science knowledge and thinking in primary-age children. Development and application of methods for teaching science in the primary grades that leads to active learning of science as a process of inquiry. Fieldwork in schools and related settings
   - **Prerequisite:** ELM 250, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**

4. **ELM 330  Teaching Reading in Elementary School: K-2 (3 credit hours)**
   - ELM 330 is designed to prepare preservice teachers to teach reading and to lead to licensure in the elementary grades. Specific topics that relate to the theory and practice of teaching reading for early and emergent readers, including literature and struggling readers, will be examined. Fieldwork in schools and related settings may be required in lieu of lecture in occasion. Students are responsible for transportation to and from their school based experiences.
   - **Prerequisite:** ELM 250, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**

5. **ELM 335  Teaching Reading in the Elementary School: 3-5 (3 credit hours)**
   - ELM 335 is designed to prepare preservice teachers to teach reading and to lead to licensure in the elementary grades. Specific topics that relate to the theory and practice of teaching reading for upper elementary grade readers, including information and media literacy and literature, will be examined. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experience.
   - **Prerequisite:** ELM 330, Junior standing, Elementary Education Majors
   - **Typically offered in Spring only**

6. **ELM 340  Children Design, Create and Invent (3 credit hours)**
   - An active hands-on class where prospective elementary school teachers develop learning activities that children can use to stimulate their imaginations and learn fundamental concepts in science, technology, engineering, and mathematics. Part of a program leading to licensure in Elementary Education.
   - **Prerequisite:** ELM 370, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**

7. **ELM 350  Assessment of Learning and Behavior (3 credit hours)**
   - Application of knowledge of pedagogy and development to develop high-quality strategies for formative and summative assessment. Best practices using developmentally-appropriate assessment strategies including authentic assessment, portfolios and electronic portfolios, real-time feedback, open- and closed-ended formal assessments, and standardized testing. Particular attention to examining the rationale for assessment and the implications of assessment.
   - **Prerequisite:** ELM 250, Junior standing, Elementary Education Majors
   - **Typically offered in Spring only**

8. **ELM 370  Connections Seminar I The Elementary Classroom and School Community (3 credit hours)**
   - The purpose of this course is to introduce preservice teachers to the world of public school classrooms and school communities and to the tasks of teaching. Particular emphasis is placed on building a positive classroom climate and implementing effective practices using developmentally-appropriate assessment strategies.
   - **Prerequisite:** ELM 250, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**

9. **ELM 375  Connections Seminar II Cultural Identity, Social Justice and Diverse Learners (3 credit hours)**
   - The purpose of the course is to help prospective elementary grades teachers develop the competencies to provide equitable opportunities to all of their future students. To do this, students will investigate issues of systemic injustice and the role of the school in interrupting cycles of inequality, and develop the capacity to engage in culturally relevant pedagogy. Weekly fieldwork in schools and related settings is required 3 hours a week. Students are responsible for transportation to and from their school based experiences.
   - **Prerequisite:** ELM 370, Junior standing, Elementary Education Majors
   - **Typically offered in Fall only**
ELM 400 Connections Seminar III Instructional Design and Assessment (3 credit hours)

In this course preservice elementary educators will examine research-verified practices in instructional design and assessment that are designed to meet the needs of diverse K-6 learners. This course will prepare candidates to plan appropriate units of study, learning experiences and assessment methods for use in the elementary classroom. Weekly fieldwork in schools and related settings is required. Students are responsible for transportation to and from their school based experiences.

Prerequisite: ELM 375, Senior standing, Elementary Education Majors
Typically offered in Fall only

ELM 410 Children’s Thinking and Multiplicative Reasoning (3 credit hours)

This course is designed to prepare preservice teachers to teach math in the intermediate grades and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching of math will be examined. Fieldwork

Prerequisite: ELM 310, Junior standing, Elementary Education Majors
Typically offered in Spring only

ELM 420 Teaching Science in the Intermediate Grades (3 credit hours)

This course is designed to prepare preservice teachers to teach science in intermediate grades and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching science will be examined. Fieldwork

Prerequisite: ELM 320, Senior standing, Elementary Education Majors
Typically offered in Spring only

ELM 430 Teaching Language Arts in the Elementary School (3 credit hours)

This course is designed to prepare preservice teachers to teach language arts and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching language arts will be examined. Fieldwork in school

Prerequisite: ELM 335, Senior standing, Elementary Education Majors
Typically offered in Fall only

ELM 440 Teaching Children with Special Needs in the Elementary Classroom (3 credit hours)

This course is designed to prepare preservice teachers to teach students with special needs and to lead to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching students with special needs will be examined.

Prerequisite: ELM 350, ELM 375, Senior standing, Elementary Education Majors, Corequisite: ELM 420
Typically offered in Fall only

ELM 450 The Arts for Elementary Education (3 credit hours)

This course is designed to prepare preservice teachers to integrate the arts; visual music, dance and drama, into the content areas. Successful completion of this course leads to licensure in the elementary grades. Specific methodologies that relate to the theory and practice of teaching the arts will be examined.

Prerequisite: ELM 375, Senior standing, Elementary Education Majors
Typically offered in Fall only

ELM 460 Social Studies for the Young Learner (3 credit hours)

This course is designed to prepare preservice teachers to teach social studies and to lead to licensure in the elementary grades. The course is an examination of curriculum, instruction, and learning in K-6 social studies education. Emphases include development of the social studies; curricular principles and components; teaching strategies; and learner outcomes. Fieldwork in schools and related settings may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

Prerequisite: ELM 370, Junior standing, Elementary Education Majors
Typically offered in Fall only

ELM 480 Connections Seminar IV Linking Theory and Practice (3 credit hours)

ELM 480 Linking Theory and Practice is designed as the capstone course in the Elementary Education Program. Teacher candidates will meet regularly to analyze and discuss their student teaching experiences and connect new learning to previous university coursework. In addition, teacher candidates will complete their edTPA Tasks and other culminating activities required by the program.

Prerequisite: ELM 400, Elementary Education Majors, Admission to the Professional Semester, Corequisite: ELM 484
Typically offered in Spring only

ELM 484 Student Teaching in Elementary Education (9 credit hours)

Culminating experience for Elementary Education majors. A minimum of 10 weeks of supervised teaching in an elementary school classroom, demonstrating competent applications of standards-based practices and other required knowledge, skill, and dispositional outcomes. Taken concurrently with ELM 480. Students responsible for transportation to placement site.

Prerequisite: ELM 480, ELM 400, Elementary Education Majors, Admission to the Professional Semester
Typically offered in Spring only

ELM 515 Instructional Practice in Schools I (1 credit hour)

Prepares pre-service teachers to develop competencies in assessment, instructional design, and tutoring and leads to initial licensure in the elementary grades. Includes 15-20 hours of fieldwork; transportation to schools is the responsibility of the students.

Typically offered in Fall and Spring

ELM 516 Instructional Practice in Schools II (2 credit hours)

Prepares pre-service teachers to develop competencies in assessment, instructional design, and teaching in whole class settings and leads to initial licensure in the elementary grades. Includes 30 hours of fieldwork; transportation to the schools is the responsibility of the students.

Corequisite: ELM 572, ELM 573, ELM 575
Typically offered in Fall and Spring
ELM 520 Methods of Teaching Elementary School Science (3 credit hours)
This course is intended for teachers seeking to expand their knowledge and skills in teaching elementary school science. The course examines the purposes, scope, sequences, materials, and methodologies for teaching science in elementary schools to a diverse student body. It develops skill in planning, instructing, and assessing understanding of science content and processes. It links instruction and assessment and addresses relevant content topics in chemistry, biology, physics, and earth and space science.

Typically offered in Spring only

ELM 524 Issues in Elementary School Science Education (3 credit hours)
Analysis of contemporary elementary school environments specific to elementary science content areas: life, Earth/space, and physical science in elementary school as well as science practices of argumentation, discourse, learning progressions, and science for all.

Typically offered in Spring only

ELM 530 Social Studies In the Elementary School (3 credit hours)
Advanced professional training in teaching of social studies for middle grades and elementary teachers, including in-depth introduction to research-based teaching strategies, instructional resources and literature of the field.

ELM 533 Targeted Literacy Assessment and Instruction for Elementary School (3 credit hours)
Intended for teachers seeking to expand their knowledge and skills in assessing and teaching elementary reading, particularly to students with reading difficulties. Exploring the purposes, sequences, and materials for identifying students’ instructional strengths and learn methods for providing appropriate evidence-based reading instruction. Closely links reading assessment and reading instruction and addresses relevant content topics in elementary reading development, assessment, and instruction.

Typically offered in Spring only

ELM 537/ECI 537 Teaching Children's Literature (3 credit hours)
Instructions for educators in quality children's literature, specific needs of young reader, genres of children's literature, strategies for instructing children's literature, ways to target reader's interests, and design of literature units.

Typically offered in Summer only

ELM 539 Special Problems in Elementary School Science (3 credit hours)
In this course teachers build their science content knowledge in life, physical, and Earth/space science, examine strategies for effective science instruction to provide students with 21st Century skills with applications to young children's cognitive and affective learning.

Typically offered in Spring only

ELM 540 Reading In the Elementary School (3 credit hours)
Theoretical foundations of reading instruction and current methods and materials for teaching reading, with emphasis on planning and implementing reading programs for children in kindergarten through grade six.

Typically offered in Fall and Spring

ELM 555 Number Systems and Operations: K-5 Mathematical Tasks (3 credit hours)
Analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level; attention is also given to the expansion of content knowledge.

Typically offered in Fall only

ELM 556 Rational Numbers and Operations: K-5 Learning Trajectories (3 credit hours)
Focus on rational number concepts through learning trajectories at the K-5 level; attention also given to problem solving and content knowledge.

Typically offered in Spring only

ELM 557 Data Analysis and Measurement: K-5 Classroom Interactions (3 credit hours)
Focus on statistical literacy of elementary teachers and the teaching of data analysis and measurement to K-5 students; attention is also given to learning methods which facilitate appropriate classroom interactions.

Typically offered in Summer only

ELM 558 Algebraic Reasoning: K-5 Discourse and Questioning (3 credit hours)
Focus on the early algebra concepts of functional thinking and generalized arithmetic in relationship to pedagogical practices centered on questioning in the mathematics classroom.

Typically offered in Summer only

ELM 559 Geometry and Spatial Visualization: K-5 Assessment (3 credit hours)
Formative and summative assessment strategies of students' geometric thinking in elementary grades; Concept development of 2- and 3-dimensional Geometry. Attention also given to diagnosis of student errors.

Typically offered in Summer only

ELM 560 Mathematical Modeling: K-5 Leadership (3 credit hours)
Generating mathematical representations and making explicit connections between concepts; Pedagogy designed to equip elementary teachers to become mathematics teacher-leaders in school settings; Focus given to topics integrated within mathematical strands

Typically offered in Summer only

ELM 571 Language Arts, New Literacies and Media for Initial License (3 credit hours)
Examine research-based processes for writing instruction, effects of and approaches for use of technology on literacy development, and effects of media and new literacies (non-print literacies, e.g. digital, visual, film) on literacy learning and development in elementary schools. Restricted to ELM MAT students.

Typically offered in Fall and Spring

ELM 572 Methods for Teaching Reading in the Elementary Classroom for Initial License (3 credit hours)
ELM 572 prepares pre-service teachers to teach reading and leads to licensure in the elementary grades. The course examines specific research-based methodology that relates to the theory and practice of teaching reading for elementary readers. Restricted to ELM, MAT students.

Typically offered in Fall and Spring
ELM 573 Methods for Teaching Elementary School Science for Initial License (3 credit hours)
ELM 573 prepares preservice teachers to teach science and leads to licensure in the elementary grades. The course examines specific research verified methodologies that relate to the theory and practice of teaching science to elementary students. Restricted to students.

Typically offered in Fall and Spring

ELM 574 Methods for Teaching Mathematics in the Elementary Classroom for Initial License (3 credit hours)
Prepares preservice teachers to teach mathematics and leads to licensure in the elementary grades. Examines specific research-based methodologies that relate to the theory and practice of teaching mathematics to elementary students. Limited to students.

Typically offered in Fall and Spring

ELM 575 Social Studies in the Elementary School for Initial License (3 credit hours)
Designed to prepare pre-service teachers to teach social studies and to lead to licensure in the elementary grades. The course is an examination of curriculum, instruction, and learning in K-6 social studies education. Emphasis include development of the social studies, curricular principles and components, research verified teaching strategies, and learner outcomes. Restricted to ELM MAT students.

Typically offered in Fall and Spring

ELM 590 Special Problems in Elementary Education (1-6 credit hours)
In-depth study of topical problems in teaching and learning of current and special interest to elementary education practitioners.

Typically offered in Fall, Spring, and Summer

ELM 630 Independent Study in Elementary Education (1-3 credit hours)
Detailed investigation of topics of particular interest to graduate students under faculty direction on a tutorial basis. Determination of credits and content by faculty member in consultation with department head.

Typically offered in Fall and Spring

ELM 644 Practicum in Elementary Education (1-6 credit hours)
Supervised practical experiences in schools and area agencies concerned with education of elementary-age students.

Typically offered in Fall and Spring

ELM 654 Internship In Elementary Education (1-6 credit hours)
Supervised opportunities for advanced professional development in contexts concerned with elementary grades education.

Typically offered in Fall and Spring

Engineering (E)

E 101 Introduction to Engineering & Problem Solving (1 credit hours)
An introduction to the College of Engineering as a discipline and profession. Emphasis on engineering design, interdisciplinary teamwork, and problem solving from a general engineering perspective. Overview of academic policies affecting undergraduate engineering students. Exposure to College of Engineering and university-wide programs and services.

Prerequisite: Engineering Majors, Freshman standing
Typically offered in Fall only

E 102 Engineering in the 21st Century (2 credit hours)
This interdisciplinary course will provide an overview of the fourteen engineering grand challenges of the 21st century and their relationships to all of the separate engineering disciplines in the College of Engineering. The lectures will incorporate examples, guests, and specific readings on the challenges in sustainability, health, vulnerability, and the joy of living to advance civilization into the next century. Students will gain an appreciation for the methods in which engineers, in each discipline, acquire knowledge and design tools or interdisciplinary solutions essential to meet society's future needs. Course is available to 25% non-engineering students.

Restriction: Freshmen only with completion of a college introductory course, i.e. E101
GEP Interdisciplinary Perspectives
Typically offered in Spring and Summer

E 115 Introduction to Computing Environments (1 credit hours)
Introduction to the NC State computing system, and to student-owned computing resources. Includes topics such as maintaining your own computer, learning about campus-based computing resources and applications (how to access and use them), ethics and professionalism in the use of computing resources, introduction to web development and other campus resources.

Typically offered in Fall, Spring, and Summer

E 122 Engineering Academic Success (1 credit hours)
This 8-week course is designed to teach students a variety of proven strategies for creating greater academic, professional, and personal success. Enrollment is required of students in the College of Engineering who were unsuccessful in completing E101 and/or have an earned GPA less than 2.0 after the first semester of the freshman year. Topics include: time management, goal setting, stress management, study skills, learning styles, and campus resources using a platform of lectures and guest speakers.

Typically offered in Spring only

E 144 Academic and Professional Preparation for Engineering I (1 credit hours)
Assist new freshmen engineering students in the transition from high school to the collegiate environment. Cover critical-thinking; problem solving techniques; academic skills and time management.

Typically offered in Fall only

E 145 Academic and Professional Preparation for Engineering II (1 credit hours)
Engineering as a field of study and profession. Career and professional development, goal setting, decision making and effective communication strategies.

Typically offered in Spring only
E 201 Engineering Transfer to Success (1 credit hours)
This 8-week course will provide an overview of the NC State University policies and procedures, organizations, and resources available for enhancing the academic success of new transfer students in the College of Engineering. Lectures and discussion from departmental representatives will focus on requirements and availability for financial aid, cooperative education, career services, and campus student organizations. Emphasis will be placed on acclimating student through teamwork and academic achievement within the first year of transfer.
Prerequisite: E101 or Introduction to College Course
Typically offered in Fall only

E 298 Special Topics Engineering (1-3 credit hours)
Typically offered in Spring only

E 304 Introduction to Nano Science and Technology (3 credit hours)
Fundamental concepts of Nano-Science and Technology including scaling, nano-scale physics, materials, mechanics, electronics, heat transfer, photonics, fluids and biology. Applications of nano-technology.
Prerequisite: MA 242 and PY 208 with grade of C- or higher
Typically offered in Fall and Spring

E 480 Namibia Wildlife Aerial Observatory (6 credit hours)
Namibia Wildlife Aerial Observatory (WAO) is restricted to junior-level and above students who participate in Namibia WAO study-abroad. The course is a purpose-driven educational experience of field work and research. The first 10 weeks take place in Namibia; of which during the first two weeks, the students receive lectures on such topics as African landscapes and wildlife, African culture, cross-cultural knowledge and skills, wildlife trade and poaching, data analysis for research, and are trained in the operation and maintenance of unmanned aerial vehicle systems (e.g. vehicles, cameras, communications) and in the following eight weeks are divided into field units that conduct aerial data collection for the purposes of meeting given wildlife missions. Upon returning to NC State, each field unit spends two-weeks (10 days) turning their findings into a research journal article for dissemination.
Junior standing or above
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall only

E 490 Fundamentals of Engineering(FE) Exam Preparation (1 credit hours)
Preparation for graduating seniors in engineering to take the Fundamentals of Engineering (FE) Examination. Information on how to register for the FE exam, exam strategy, and a review of selected science and engineering topics through active learning exercises directed at working sample examination problems. Credit may not be counted toward graduation
Prerequisite: Engineering Majors, Senior standing, Graduate students, or PBS status
Typically offered in Fall and Spring

E 497 Engineering Research Projects (1-3 credit hours)
Projects in research, design or development in engineering or computer science. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: Junior standing in College of Engineering, Engineering Scholars Program or Engineering Research Center Scholars
Typically offered in Fall, Spring, and Summer

E 531/OR 531/MA 531 Dynamic Systems and Multivariable Control I (3 credit hours)
Introduction to modeling, analysis and control of linear discrete-time and continuous-time dynamical systems. State space representations and transfer methods. Controllability and observability. Realization. Applications to biological, chemical, economic, electrical, mechanical and sociological systems.
Prerequisite: MA 341, MA 405
Typically offered in Fall only

E 731/MA 731/OR 731 Dynamic Systems and Multivariable Control II (3 credit hours)
Prerequisite: OR(E,MA) 531
Typically offered in Spring only

English (ENG)

ENG 1GEP 100 Level English Composition (3 credit hours)
100 Level English Composition. Transfer students with 3 hours of ENG 1GEP credit may receive ENG 101 equivalency by completing ENG 105 with a C- or better.

ENG 100 Reading and Writing Rhetorically (4 credit hours)
Intensive practice in reading and writing critically and rhetorically, with attention to how those change according to purpose and situation. Introduction to rhetorical concepts and elements with application to a variety of academic, professional, or civic texts. Exploration of principles of argument and organization. Guidance in developing flexible, self-aware reading and composing processes. Practice in seeking, providing, and responding to constructive feedback. Practice with making choices about grammar, mechanics, and style appropriate to specific rhetorical situations. Extensive writing practice and individualized coaching to support ongoing development as a writer. Intended as preparation for ENG 101. Departmental consent required.
Typically offered in Fall, Spring, and Summer
ENG 101  Academic Writing and Research  (4 credit hours)
Intensive instruction in academic writing and research. Basic principles of rhetoric and strategies for academic inquiry and argument. Instruction and practice in critical reading, including the generative and responsible use of print and electronic sources for academic research. Exploration of literate practices across a range of academic domains, laying the foundation for further writing development in college. Continued attention to grammar and conventions of standard written English. Successful completion of ENG 101 requires a C- or better. Credit for ENG 101 is not allowed if the student has already fulfilled the first-year writing requirement.
Prerequisite: Placement via English Department guidelines
Typically offered in Fall, Spring, and Summer

ENG 202  Disciplinary Perspectives in Writing  (3 credit hours)
Examination of the uses of writing and research within academic disciplines; analysis, synthesis, and reflection on what makes effective academic arguments; development of an understanding of the rhetorical demands of disciplinary writing, including attention to audience, purpose, and context; instruction in critical research practices; engagement in reflective activities on writing and research processes to help students gain facility in academic writing across disciplines and within their own discipline. Restricted to transfer students with 3 hours of ENG1** or ENG1GEP transfer credit. Together with approved transfer credit hours, this course satisfies the Introduction to Writing component of the General Education Program. Course Pre-requisite: 3 credits of ENG1** or ENG1GEP transfer credit.
P: 3 hours transferring ENG1** or ENG1GEP transfer credit
Typically offered in Fall, Spring, and Summer

ENG 206  Studies In Drama  (3 credit hours)
Selected drama from the classical period to the present. Emphasis on reading for enjoyment as well as understanding theory and development of tragedy, comedy, and other modes of dramatic expression. Writers such as Sophocles, Euripides, Shakespeare, Ibsen, and Shaw, and contemporary playwrights.
GEP Humanities
Typically offered in Fall and Spring

ENG 207  Studies In Poetry  (3 credit hours)
Main features of poetry such as tone, voice, form, diction, figurative language, and sound patterns. Reading of poetry from different periods with the goal of learning how to understand, appreciate, and analyze different kinds of poems.
GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 208  Studies In Fiction  (3 credit hours)
Representative examples of novels and short stories from different periods, emphasizing understanding and appreciation of fiction as a genre, a knowledge of the features and techniques of fiction, and a sense of the development of the genre.
GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 209  Introduction to Shakespeare  (3 credit hours)
Shakespeare for non-English majors. Seven to ten major plays, including representative comedies, such as The Taming of the Shrew; histories, such as Richard III; tragedies, such as Hamlet; and romances, such as The Tempest. Does not satisfy requirements for English major.
GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 210  Introduction to Language and Linguistics  (3 credit hours)
Linguistics theory and method. Topics include the English sound system, morphology, syntactic structure, semantics, and historical and contemporary dialect variation. Language acquisition, language and the brain, and computer processing and human language.
Prerequisite: ENG 101
GEP Social Sciences
Typically offered in Fall and Spring

ENG 214  Introduction to Editing  (3 credit hours)
Basic editorial skills with a wide range of publications. Stylistic editing (conventions of written English, consistency, effectiveness of syntax, appropriateness of diction), substantive editing (accuracy, legal issues, ethics), and production editing (layout, typography, electronic publication processing). Introduction to resources such as standard reference works and professional organizations.
Prerequisite: ENG 101
Typically offered in Fall, Spring, and Summer

ENG 216  Technologies for Texts  (3 credit hours)
Uses of computers for creating, designing, analyzing, and disseminating texts, both on desktops and on the Internet. Overview of technologies that facilitate reading, writing, and communication; development of skill with various applications and understanding of their capabilities, limitations, and historical analogues. Recommended for students in journalism and technical writing.
Prerequisite: ENG 101
Typically offered in Spring only

ENG 219/FL 219  Studies in Great Works of Non-Western Literature  (3 credit hours)
Readings, in English translation, or non-Western literary masterpieces from the beginnings of literacy in the Middle East, Asia, and Africa to the modern period, including excerpts from texts such as the Upanishads, the Ramayana, the Sundiata, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring
**ENG 220/FL 220  Studies in Great Works of Western Literature**  (3 credit hours)
Readings, in English translation, of Western literary masterpieces, from the beginnings of literacy in the Middle East and Europe towards the present, including such authors as Homer, Sophocles, Virgil, Ovid, Augustine, Dante, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf. Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222.
Restriction: Credit is not allowed for both ENG 220 and ENG 221 or ENG 222.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

**ENG 221/FL 221  Literature of the Western World I**  (3 credit hours)
Readings from English translations of Biblical, Classical, Medieval, and Early Renaissance literature, including works by such authors as Homer, Plato, Virgil, Ovid, St. Paul, St. Augustine, Marie de France, and Dante. Credit is not allowed for both ENG 221 and ENG 220.
Restriction: Credit is not allowed for both ENG 221 and ENG 220.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

**ENG 222/FL 222  Literature of the Western World II**  (3 credit hours)
Readings from English translations of Renaissance, Neo-Classical, Romantic, and Early Modern literature, emphasizing the cultures of continental Europe from the Renaissance to 1900, and including such authors as Petrarch, Erasmus, Rabelais, Machiavelli, Shakespeare, Moliere, Voltaire, Rousseau, Goethe, Flaubert, and Tolstoy. Credit is not allowed for both ENG 220 and ENG 222.
Restriction: Credit is not allowed for both ENG 222 and ENG 220.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

**ENG 223/FL 223  Contemporary World Literature I**  (3 credit hours)
Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

**ENG 224/FL 224  Contemporary World Literature II**  (3 credit hours)
Twentieth-century literature of some of the following cultures: Asian, Middle Eastern, African, Caribbean, Native-American.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

**ENG 226  Reading Literature and Exploring Textuality**  (3 credit hours)
Introduces fundamental questions in literary history and critical theory. Emphasizes critical reading skills and prepares students for the kinds of courses--surveys, genre courses, author courses, problem-based courses--that are part of the English major. Papers prepared using standard word processing programs.
Prerequisite: ENG 101
Typically offered in Fall and Spring

**ENG 232  Literature and Medicine**  (3 credit hours)
Literary, cultural, and philosophical perspectives on medical science and practice, illness, epidemics, and related topics. Readings will include fiction, poetry, personal essays, film, and other media.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

**ENG 246/FL 246  Literature of the Holocaust**  (3 credit hours)
Fictional and nonfictional versions of the Holocaust, focusing on themes of survival, justice, theology, and the limits of human endurance.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

**ENG 248/AFS 248  Survey of African-American Literature**  (3 credit hours)
African-American writing and its relationships to American culture and history. Covers such writers as Wheatley, Douglass, Chesnutt, Dunbar, DuBois, Hughes, Hurston, Wright, and Morrison.
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

**ENG 249  Native American Literature**  (3 credit hours)
A survey of Native American literatures from before contact with Europeans to contemporary culture. Writers may include: Apess (Pequot), Ridge (Cherokee), Silko (Laguna Pueblo), Momaday (Kiowa), Power (Sioux) Gunn Allen (Laguna-Sioux), Harjo (Creek), and Erdrich (Anishinaabe).
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

**ENG 251  Major British Writers**  (3 credit hours)
Significant British authors chosen from among such figures as Chaucer, Shakespeare, Milton, Swift, Pope, Austen, Wordsworth, Coleridge, Tennyson, Browning, Bronte, Dickens, Joyce, Eliot, Woolf, and Yeats. Credit will not be given for both ENG 251 and either ENG 261 or 262.
Credit is not allowed for both ENG 251 and ENG 261 or ENG 262.
GEP Humanities
Typically offered in Fall, Spring, and Summer

**ENG 255  Beyond Britain: Literature from Colonies of the British Empire**  (3 credit hours)
This course challenges students to understand the historical, political, and cultural circumstances that gave rise to literary production in 18th- and 19th-century colonial societies. The course will enable students to understand the value of reading 18th- and 19th-century literature from a global perspective, a critical component of literary studies in today's twenty-first-century world.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

**ENG 260  Reading Literature and Exploring Textuality**  (3 credit hours)
Introduces fundamental questions in literary history and critical theory. Emphasizes critical reading skills and prepares students for the kinds of courses--surveys, genre courses, author courses, problem-based courses--that are part of the English major. Papers prepared using standard word processing programs.
Prerequisite: ENG 101
Typically offered in Fall and Spring
ENG 261 English Literature I (3 credit hours)
A survey of English literature to 1660, including Old English, Middle English, and Renaissance writing, focusing on such central authors as Chaucer, Spenser, Marlowe, Shakespeare, Jonson, Donne, and Milton. Credit will not be given for both ENG 261 and ENG 251.

Restriction: Credit is not allowed for both ENG 261 and ENG 251.
GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 262 English Literature II (3 credit hours)
A survey of English literature from 1660 to the present. Poetry, fiction, drama and intellectual prose by such central writers as Dryden, Pope, Swift, Johnson, Wollstonecraft, Wordsworth, Keats, Shelley, Bronte, Carlyle, Tennyson, Browning, Yeats, Woolf, Joyce and Eliot. Credit will not be given for both ENG 262 and ENG 251.

Credit is not allowed for both ENG 262 and ENG 251.
GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 265 American Literature I (3 credit hours)
A survey of American literature from the beginnings to the Civil War, including such central authors as Edwards, Franklin, Irving, Emerson, Hawthorne, Melville, Poe, Stowe, Douglass, Thoreau, and Whitman. Credit will not be given for both ENG 265 and ENG 252.

Credit is not allowed for ENG 265 and ENG 252.
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

ENG 266 American Literature II (3 credit hours)
A survey of American literature from the Civil War to the present, including such central authors as Whitman, Dickinson, Twain, James, Crane, Wharton, Frost, Eliot, Hemingway, Hurston, Faulkner, Wright, O'Connor, and Morrison. Credit will not be given for both ENG 266 and ENG 252.

Credit is not allowed for both ENG 266 and ENG 252.
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

ENG 267 LGBTQI Literature in the U.S. (3 credit hours)
Chronological survey of works of literature by and about gay, lesbian, bisexual, transgender, questioning, and intersex communities in the U.S. Primary texts will be considered in historical, political, and literary contexts. Brief consideration of early works from colonial period and 19th century with primary focus on 20th and 21st century texts.

GEP Humanities
Typically offered in Fall, Spring, and Summer

ENG 275/FL 275 Literature and War (3 credit hours)
A geographical and thematic examination of war and questions it raises, as reflected in selected writings from, Homer, Sophocles, Japan’s Tale of the Heike, Shakespeare, The Bhagavad-Gita, Keegan, Kipling, Graham Green, Mulden, Michael Herr, Dexter Filkins, Lucius Shepherd as well as writers on Just War and Deterrence Theory, and military science.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

ENG 281 Introduction to Creative Nonfiction (3 credit hours)
This is an introductory course that will instruct students in writing, editing and appreciating the professional nonfiction one finds in magazines, on issue-oriented websites, and in general interest publications, from the New Yorker-style long article to the personal columns one finds on online media outlets: writing about an issue or event in a personal, stylish way while obtaining the rigor of journalism in scrupulous research and clarity. In an ever-enlarging media universe, this is the most visible and commercial of all the creative writing genres.

Prerequisite: ENG 101
Typically offered in Fall, Spring, and Summer

ENG 282 Introduction to Film (3 credit hours)
Examination of basic film techniques and methods of film analysis. Emphasis on understanding and appreciating film as a major US and international art form and industry operating in various national, cultural, and historical contexts.

GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

ENG 287 Explorations in Creative Writing (3 credit hours)
Introduction to the basic elements and principles of three genres of creative writing: poetry, fiction and drama. Reading and class discussion of student work. Recommended for students with no prior experience in creative writing.

Prerequisite: ENG 101
Typically offered in Fall, Spring, and Summer

ENG 288 Fiction Writing (3 credit hours)
Experience in writing short prose fiction. Class critiquing of student work and instruction in techniques of fiction.

Prerequisite: ENG 101
Typically offered in Fall and Spring

ENG 289 Poetry Writing (3 credit hours)
Experience in writing poetry. Class critiquing of student work and instruction in techniques of poetry.

Prerequisite: ENG 101
Typically offered in Fall and Spring

ENG 292 Writing About Film (3 credit hours)
Comprehensive study of various approaches to writing about film. Primary focus is on the critical and evaluative practice involved in writing film criticism for non-academic audiences. Film screenings, discussion of assigned readings, and in-class writing workshops aid students in preparing a portfolio of film writing that includes film reviews of various lengths.

Prerequisite: ENG 101
GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

ENG 298 Special Projects in English (1-3 credit hours)
Faculty-guided independent study, or courses on special topics determined by departmental interest or need.

Typically offered in Fall, Spring, and Summer
ENG 305/WGS 305 Women and Literature (3 credit hours)
Nineteenth through twenty-first century women's literature, as shaped by the intersecting and competing claims of gender, race, sexuality, and culture. Focus on fiction, accompanied by critical readings from American studies, feminist literary criticism, and postmodern theory.
Prerequisite: Sophomore standing and above
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

ENG 308/WGS 308 Contemporary Issues in Ecofeminism (3 credit hours)
Contemporary issues in ecofeminism provides a historical introduction to and global perspectives on women's sociopolitical, ethical, and economic contributions to the 20th and 21st century environmental movement. Theory and political action as they interweave issues of gender, race, and class in western and non-Western contexts will be emphasized. Students will read works by and about female scientists/activists/writers and examine their own communities, analyzing the ways that individuals, community values, and dominant institutions impact women's relationships with the environment. Students will formulate questions, responses, and interpretations through critical reading practices, class discussion groups, self-reflective writing, and comparative analyses. Special attention will be paid to the role of literature--memoir, novel, short story, essay--in the dissemination of ecofeminist ideas.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

ENG 314 Technical Document Design and Editing (3 credit hours)
Layout and design principles for written documents; desktop building; legibility, readability testing; conventions of proposals, instructions, and reports; basics of technical editing: usage, vocabulary, style manuals, editing mathematical equations, graphs, tables.
Prerequisite: ENG 214
Typically offered in Fall only

ENG 315 Phonetics (3 credit hours)
This course is an introduction to phonetics: how spoken language is produced and perceived, and the physical properties of speech. An understanding of phonetics is fundamental to scientific and clinical approaches to speech and language. This course is meant to build both skills and knowledge.
Typically offered in Fall only

ENG 316 Introduction to News and Article Writing (3 credit hours)
Prerequisite: ENG 101
Typically offered in Fall and Spring

ENG 317 Designing Networked Communications (3 credit hours)
A course in the layout, design, and composition of digitally-networked communication. Students will learn to analyze audiences and themselves for their uses of information in order to plan, compose, and critically evaluate digitally networked ecologies including web pages, mobile applications, and social media platforms. Students will acquire theories and skills with HTML/CSS coding, rhetorically-centered design, accessibility, and user experience and will apply those skills to the composition of a variety of digital texts. Course work will require students to become proficient with commercially-available and open source content platforms.
Prerequisite: ENG 101
Typically offered in Spring only

ENG 320 Anatomy and Physiology of Speech (3 credit hours)
Students will learn about the anatomy and physiology of the speech mechanism including the muscular, skeletal, and nervous system structures involved in respiration, phonation, and articulation. This knowledge may be applied in clinical fields such as speech-language pathology or serve as the basis for the study of linguistic phonetics.
Typically offered in Fall only

ENG 321/COM 321 Survey of Rhetorical Theory (3 credit hours)
Principles of rhetorical theory from its classical origins through the modern period to the present time. Key concepts and theories that provide a critical understanding of the processes of persuasive symbol use.
Prerequisite: Sophomore standing and above

ENG 323 Writing in the Rhetorical Tradition (3 credit hours)
A writing course based on the study of rhetoric. Readings on the principles of invention, arrangement, and style; analysis of written texts; writing of persuasive texts for a variety of audiences and purposes.
Prerequisite: ENG 101
Typically offered in Fall, Spring, and Summer

ENG 324 Modern English Syntax (3 credit hours)
Study of Modern English at the sentence level. Analysis of grammatical structure. Consideration of language variation in English.
Prerequisite: ENG 101
Typically offered in Fall only

ENG 325 Spoken and Written Traditions of American English Dialects (3 credit hours)
Basic issues in the study of language: linguistic terminology and categories; grammatical traditions and topics such as prescriptivism and descriptivism, standard and non-standard, orality and literacy; language acquisition and awareness; language aesthetics and ethics.
Prerequisite: ENG 101
Typically offered in Fall only

ENG 326 History of the English Language (3 credit hours)
Development of the English language from its Indo-European origins to the present. Emphasis on historical and comparative linguistic methodology and on changes in sound, syntax, and meaning.
P: ENG 101
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only
ENG 327/WGS 327 Language and Gender (3 credit hours)
Introduction to the use of language by men and women. Research in Linguistics and Women's Studies addressing issues such as the acquisition of gender-differentiated language, gender and conversational interaction, sexism in language, gender issues in society, and the relationship between language, gender, and other social constructs (e.g., class, culture, and ethnicity).

Prerequisite: ENG 101
Typically offered in Fall only

ENG 328 Language and Writing (3 credit hours)
Study of language structure; specific attention to differences between spoken and written language; print conventions; error analysis; and the application of linguistics to rhetoric and composition. Analysis of a variety of grammatical approaches; how

Prerequisite: ENG 101
Typically offered in Fall only

ENG 329 Language and Globalization (3 credit hours)
Introduction to the sociolinguistics of globalization. Through linguistic-semiotic practices, examine how mobility, migration, and the global circulation of information and ideologies impact people, places, and practices. Study of the interplay between global flows, (trans)local contexts, and the consequences of intense contact with linguistic and cultural otherness. Topics include: English as a global language; mobility, migration, multilingualism; youth language in mobility; multilingual hip-hop; globalization and social media; multilingual signs and linguistic landscapes in urban settings.

GEP Global Knowledge, GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

ENG 330 Screenwriting (3 credit hours)
Writing for films, story planning, character development, communicating information, building scenes, relationships between script and cinematic dimensions, working with studios and editors.

Prerequisite: 6 credit hours from courses in writing for media, creative writing, or Film Studies
Typically offered in Fall and Spring

ENG 331 Communication for Engineering and Technology (3 credit hours)
Written communication in industrial and technical organizations, emphasizing internal communication with managers and technical personnel and including external communication with regulators, vendors, and clients. Intensive practice in writing; relationship of writing to oral and visual communication. For students in engineering and other primarily technological curricula. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.

Prerequisite: Junior standing. Credit is not allowed for both ENG 331 and ENG 332 or ENG 333.
Typically offered in Fall, Spring, and Summer

ENG 332 Communication for Business and Management (3 credit hours)
Written communication in business and public organizations, including both internal communication (such as instructions, policies, management reports) and external communication with clients, vendors, and publics. Intensive practice in writing; relationship of writing to oral and visual communication. For students in business and management-related programs. Credit is not allowed for more than one of ENG 331, ENG 332, and ENG 333.

Prerequisite: Junior standing. Credit is not allowed for both ENG 332 and ENG 331 or ENG 333.
Typically offered in Fall, Spring, and Summer

ENG 333 Communication for Science and Research (3 credit hours)
Written communication in scientific and research contexts, emphasizing relationship between research and writing in problem formulation, interpretation of results, and support and acceptance of research. Intensive practice in writing; relationship of writing to oral and visual communication. For students who plan careers in scientific research. Credit is not allowed for more than one of ENG 331, 332, and 333.

Prerequisite: Junior standing. Credit is not allowed for both ENG 333 and ENG 331 or ENG 332.
Typically offered in Fall, Spring, and Summer

ENG 335 Language Development (3 credit hours)
This course addresses syntactic, semantic, morphologic, and pragmatic development from birth through adolescence, explores the influence of cognitive and social development on language development, and contrasts first language acquisition with second language learning.

Typically offered in Spring only

ENG 338 Speech Science (3 credit hours)
Learn about the acoustic properties of speech sounds and the dynamics of speech sound production. Become familiar with and practice the use of basic clinical instrumentation used to measure respiratory, phonatory, and articulatory movements and the acoustic events that result from these movements. Complete assignments requiring the use of basic instrumentation and computer software.

Prerequisite: ENG 320
Typically offered in Spring only

ENG 339 Literature and Technology (3 credit hours)
Introduction to how the interactions among technologies, media, and literature shape the cultural past. The course pursues studies of fictional and non-fictional texts through several disciplinary perspectives including literary criticism, communications, media theory, and history. Technologies and literary and historical eras considered will vary.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring
ENG 340 Literature, Art, and Society (3 credit hours)
This course explores the intersection of literature and the arts, including the visual and/or performing arts, and their role as social commentary. It will consider the expressive power of the medium in the arts, whether that of an individual artist working across mediums or a collaboration between artists, and will examine the rich relations that have existed between literature, the arts, and important social movements of the day. Disciplinary perspectives include literary criticism, history, art history, performance studies, and museum studies.

Requisite: Sophomore Standing or Above
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

ENG 341 Literature and Science (3 credit hours)
This course tracks the imaginative potentials, social repercussions, and interdisciplinary mixing of literature and science since the emergence of empiricism in the sixteenth century. Well before literature and science divided into "two cultures," they supplied a fruitful crossover for ideas about how and why the world works and how we gain new knowledge. Even with the development of modern disciplines, literature plays an important role in cultural assessments of scientific discovery and education. Students will read a selection of works from literary as well as scientific writers, analyzing texts and historical contexts and producing written arguments within an interdisciplinary framework.

Requisite: Sophomore Standing or Above
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

ENG 342 Literature of Space and Place (3 credit hours)
This course investigates how various spatial categories (for example, the city, the pastoral, wilderness, region, nation, or the globe) work in and are constructed by literary texts. Humanities fields have increasingly noted the importance of space and place in shaping our lives and as key mechanisms through which ideas of gender, sexuality, race, class, national identity, or nature are shaped. Our spatial analysis of literature will borrow from an interdisciplinary range of methods: cultural and historical geography, cartography, urban studies, and/or environmental studies. The course also addresses the historical and cultural contexts that have shaped ideas of space.

Requisite: Sophomore Standing or Above
GEP Humanities, GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall and Spring

ENG 349/LFS 349 African Literature in English (3 credit hours)
Anglophone literature in Africa. Emphasis on the relationship between the African world-view and literary production and the persistent trend by African writers to connect literature with politics. Writers such as Achebe, Ngugi, Soyinka, and Serote.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 350 Professional Internships (3 credit hours)
Directed work for CHASS majors including work-site mentoring and evaluation. Department supervision includes a course work directed toward designing employment application materials, developing a portfolio of professional work or relevant research paper, considering a variety of career options, and reading literature on workplace socialization. Students must provide their own transportation to the internship site. Modest liability insurance fee required. Students must have at least a 2.5 overall GPA and at least a 3.0 GPA in the major, be a junior or senior CHASS major or minor, and must complete the application process outlined on the Internship Program Website or provide the internship coordinator with contact information for your supervisor at an internship you obtained independently.

Typically offered in Fall and Spring

ENG 359 Topics in Film Studies (3 credit hours)
Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester.

Typically offered in Spring only

ENG 361 Studies in British Poetry (3 credit hours)
An examination of selected British poetry within its historical and cultural contexts. The course will focus on poetry of the Victorian period. Poets studied include Matthew Arnold, Robert and Elizabeth Barrett Browning, Rudyard Kipling, Christina and Dante Gabriel Rossetti, Alfred, Lord Tennyson, and Oscar Wilde. Class discussion will focus on analysis of literary texts within the larger cultural contexts of debates over art and aesthetics, science and industrialization, gender roles, religion, and imperial expansion.

Requisite: Sophomore Standing or Above
GEP Humanities
Typically offered in Fall and Spring

ENG 362 Studies in the British Novel (3 credit hours)
Emphasizes major novelists such as Behn, Fielding, Defoe, Richardson, Swift, Austen, Dickens, the Brontës, Eliot, Carroll, Hardy, Stevenson, Wilde, Stoker, James, Woolf, Forster, Joyce, Orwell, Lawrence, Lessing, Murdoch, Burgess, McEwan, Ishiguro, Byatt, Mantel, Zadie Smith.

Requisite: Sophomore Standing or Above
GEP Humanities
Typically offered in Fall and Spring

ENG 364/COM 364 History of Film to 1940 (3 credit hours)
Technological developments and aesthetic movements that shaped international cinema production from the beginning of the industry to 1940. Formal evolution in camera movement, editing, sound, narrative form, and the documentary. The rise to prominence of Hollywood and international cinemas in historical, economic, and cultural contexts.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall only

ENG 369 The American Novel of the 19th Century (3 credit hours)
Major novels illustrating the development of American fiction from Romanticism to Realism and Naturalism. Works by such writers as Brown, Cooper, Hawthorne, Stowe, Melville, Twain, Howells, James, Norris, Crane, Chopin, and Dreiser.

Prerequisite: Sophomore standing and above
Typically offered in Fall only
ENG 370 American Fiction, Twentieth Century and Beyond (3 credit hours)
Study of narrative fiction written in the twentieth-century and after by American writers. This course will examine major developments in narrative form and technique, based on developments in important literary traditions such as realism, modernism or postmodernism. The course will situate the fiction in key contexts, whether literary or cultural. Representative writers: Ernest Hemingway, Gertrude Stein, William Faulkner, Toni Morrison and Cormac McCarthy.
Prerequisite: Sophomore standing and above
GEP Humanities
Typically offered in Fall and Spring

ENG 372 American Poetry, Twentieth Century and Beyond (3 credit hours)
Study of poetry written in the twentieth-century and after by American poets. This course will examine major developments in form and technique by poets influenced by transformative movements such as Imagism, Modernism, the Objectivists, Black Mountain poets, New York School and subsequent developments. The course will situate poetry in key contexts, whether literary or cultural. Representative poets: T.S. Eliot, H.D., Langston Hughes, Frank O'Hara, C.D. Wright and Yusef Komunyakaa.
Prerequisite: Sophomore standing and above
GEP Humanities
Typically offered in Fall and Spring

ENG 374/COM 374 History of Film From 1940 (3 credit hours)
Technological developments and aesthetic movements that have shaped international cinema production from 1940 to the present. Evolution in camera movement, editing, sound, narrative form, and the documentary. Post-war Hollywood cinema and international film industries (both established and emerging) in historical, economic and cultural context.
Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Spring only

ENG 375/AFS 375 African American Cinema (3 credit hours)
Survey and analysis of African American film culture from 1900-present. Examination of pre-Hollywood, classical Hollywood, and Independent filmmaking. Particular focus on independent filmmakers’ response to dominant industry representations and the work of filmmakers who seek to create a specifically African American cinematic style.
GEP U.S. Diversity
Typically offered in Spring only

ENG 376 Science Fiction (3 credit hours)
Representative works of science fiction. Emphasis on works written in the twentieth century, with some attention to the history and development of the genre.
Prerequisite: Sophomore standing and above
GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

ENG 377 Fantasy (3 credit hours)
Representative works in the genre of fantasy. Emphasis on works of 19th and 20th centuries. Authors such as Carroll, Lewis, Tolkien, Borges, LeGuin, and Gardner.
Prerequisite: Sophomore standing and above
GEP Humanities
Typically offered in Spring only

ENG 378 Women & Film (3 credit hours)
This course will introduce students to women’s participation, as well as their representation, in the history of film and other audiovisual media, including television, music videos, and performance art. The course includes screenings and addresses issues such as: the gendered nature of the gaze; film form and genre; nation and postcoloniality; spectatorship; race, class, and sexuality.
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall only

ENG 380 Modern Drama (3 credit hours)
Major plays and playwrights from Ibsen to Churchill, including at least some of the following: Ibsen, Shaw, Chekhov, Glaspell, O'Neill, Brecht, Hughes, Hellman, Beckett, Williams, Miller, Albee, Hansberry, Walcott, Soyinka, Churchill, Kushner, and Parks.
Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

ENG 381 Creative Nonfiction Writing Workshop (3 credit hours)
A workshop in creative nonfiction (literary or magazine journalism) for the student with demonstrated understanding of the basic techniques of creative writing and journalism.
Prerequisite: ENG 215, 287, 288, or 289
Typically offered in Fall and Spring

ENG 382 Film and Literature (3 credit hours)
Ways of adapting literary works to film form. Similarities and differences between these two media. Emphasis on the practical art of transforming literature into film. Attention to the impact of film upon literature.
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

ENG 384 Introduction to Film Theory (3 credit hours)
Survey of critical approaches to film art. Application of theoretical paradigms--formalist, realist, psychoanalytic, feminist, poststructuralist--to individual films, genres, national cinemas and directors.
Prerequisite: ENG 282
Typically offered in Spring only

ENG 385 Biblical Backgrounds of English Literature (3 credit hours)
Influences of the Bible--principal forms, genres, and texts--on major English and American writers such as Milton, Spenser, Melville, Eliot, and Faulkner.
Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only
ENG 388  Intermediate Fiction Writing Workshop  (3 credit hours)
An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing prose fiction.

P: ENG 288; R: Students must have earned a B or better in ENG 288.
Typically offered in Fall and Spring

ENG 389  Intermediate Poetry Writing Workshop  (3 credit hours)
An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing poetry.

Prerequisite: ENG 289; Students must have earned a B or better in ENG 289.
Typically offered in Fall and Spring

ENG 390  Classical Backgrounds of English Literature  (3 credit hours)
Literature of the ancient Western world and its influence on English and American writing. Emphasis on the connections between the two bodies of literature. Covers such writers as Plato, Horace, Virgil, and St. Augustine.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 391  Special Topics in Modern Drama  (3 credit hours)
Various topics in modern drama covering different cultures, issues, and theatrical practices within the last 100 years. Modern American drama, modern British drama, modern World Drama, and European theatre from World War II to the present.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 392/FL 392  Major World Author  (3 credit hours)
Intensive study in English, of the writings of one (or two) author(s) from outside the English and American traditions. Sample subjects: Homer, Virgil and Ovid, Lady Murasaki, Marie de France and Christine de Pizan, Dante, Cervantes, Goethe, Balzac, Flaubert, Kafka, Proust, Lessing and Gurdimer, Borges and Marquez, Neruda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

ENG 393/FL 393  Studies in Literary Genre  (3 credit hours)
Concentrated treatment of one literary genre, such as the epic, the lyric, the drama, satire, romance, autobiography, the essay, the novel, or the short story. Treatment of materials from several national or ethnic cultures and several periods. All readings in English. Course may be taken three times for credit. Course may be taken 3 times in different genres.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

ENG 394/FL 394  Studies in World Literature  (3 credit hours)
Study of a subject in world literature: for example, African literature, Asian literature, Hispanic literature, East European literature, Comedy, the Epic, the Lyric, Autobiography, the Faust legend, or Metamorphosis. Subjects vary according to availability of faculty. Readings in English translation.

Restriction: Sophomore Standing and Above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

ENG 395/COM 395  Studies in Rhetoric and Digital Media  (3 credit hours)
Study of the influence of emerging technologies on rhetorical theory and practice. Rhetorical analysis of texts, including visual and audio texts. Invention and construction of digital media texts as a means of engaging rhetorical theory and analysis. Topics vary to adapt to emerging technologies and changing vernacular practices.

Prerequisite: ENG 101
GEP Humanities
Typically offered in Fall and Spring

ENG 399  Contemporary Literature  (3 credit hours)
Literature from the twentieth-century and twenty-first century. Readings may be from various genres including fiction, non-fiction, drama, and poetry. Writers will be from the English-speaking world, but also reading may include writers outside it, that is, writers whose work has been translated into English. This course will track important developments, whether literary or cultural, in contemporary literature. Representative writers: Jean Rhys, James Baldwin, W.G. Sebald, Leslie Marmon Silko, August Wilson, Salman Rushdie and Wislawa Szymborska.

Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

ENG 400  Applied Criticism  (3 credit hours)
Types and methods of literary criticism designed specifically for students intending to teach English in high school.

Prerequisite: TED Majors, Senior standing.
Typically offered in Fall only

ENG 405/ECI 405  Literature for Adolescents  (3 credit hours)
The history, types, and characteristics of literature for adolescents. Emphasizes reading and analyzing the literature by exploring the themes, literary elements, and rationale for teaching literature for adolescents. Addresses ways in which this literature can be integrated and implemented in English/Language Arts curriculum.

Prerequisite: Junior standing.
Typically offered in Spring only

ENG 406/FL 406  Modernism  (3 credit hours)
Review and discuss the International Modernist movement in literature, from its nineteenth-century origins to its culmination in the early twentieth century. Identify and discuss definitions of modernity, as embodied in a variety of genres. Discuss Modernist texts within a variety of cultures that produced them.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only
ENG 407/FL 407  Postmodernism  (3 credit hours)
Study literary expressions of postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century and after. Examine post modernity, as embodied in a variety of genres. Situate postmodernist texts within a variety of cultures that have produced them.

*GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 410/WGS 410 Studies in Gender and Genre  (3 credit hours)
This course examines the ways in which women writers from diverse backgrounds have revisited the literary genres to include the varied experiences of women. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

Prerequisite: Sophomore Standing or Above

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

ENG 411/COM 411 Rhetorical Criticism  (3 credit hours)
Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramatistic analysis, content analysis, fantasy theme analysis.

Prerequisite: Junior standing

ENG 416 Advanced News and Article Writing  (3 credit hours)
Advanced work in writing news stories, profiles, features, and investigative stories. Includes analysis and critical reading of print media. Assumes thorough knowledge of AP style and rudiments of news and feature writing.

Prerequisite: ENG 316
Typically offered in Fall and Spring

ENG 417 Editorial and Opinion Writing  (3 credit hours)
Discussing and writing newspaper and magazine editorials, with added attention to other forms of opinion in print, such as columns and books and music reviews.

Prerequisite: ENG 214, ENG 316
Typically offered in Fall and Spring

ENG 420 Major American Author  (3 credit hours)
Intensive study of the writings of one (or two) American author(s). Developments across the career, relationships between the writing and the life, the writer's participation in a culture and an historical moment. Sample subjects: Emerson and Thoreau, Melville, Whitman, Stowe and Douglass, Dickinson, Twain, James and Wharton, Frost, O'Neill, Fitzgerald and Hemingway, Faulkner, Hurston and Wright, O'Connor, Morrison.

Prerequisite: Sophomore standing and above

GEP Humanities
Typically offered in Fall only

ENG 421 Computer Documentation Design  (3 credit hours)
Theory and design of documentation for computer hardware and software, including user guides, reference manuals, quick reference guides, tutorials, online documentation, and CD-based media delivery. Training in alternative documentation testing procedures, usability testing, and collaborative revision.

Prerequisite: ENG 214 or ENG 331 or ENG 332 or ENG 333
Typically offered in Spring only

ENG 422 Writing Theory and the Writing Process  (3 credit hours)
Theory and research on the processes and contexts of written discourse; cognitive, socio-cultural, educational perspectives; reflective and research-based accounts of the writing process; analysis of discourse contexts and communities.

Prerequisite: ENG 101
Typically offered in Spring only

ENG 425 Analysis of Scientific and Technical Writing  (3 credit hours)
The role of communication in the creation of scientific knowledge and technical designs and artifacts; methods of analyzing texts and of studying their creation and use; relationships between writing and other forms of communication. Field research in a

Prerequisite: Junior standing

GEP Interdisciplinary Perspectives
Typically offered in Spring only

ENG 426 Analyzing Style  (3 credit hours)
Development of a greater understanding of and facility with style in written discourse. Theories of style, stylistic features; methods of analysis, imitation.

Prerequisite: ENG 101
Typically offered in Fall and Spring

ENG 430 Advanced Screenwriting  (3 credit hours)
Advanced Screenwriting students will complete ready-to-sell screenplays over the course of the semester. Workload includes taking home two 100-page scripts each week and giving a thorough critique both in writing and in class discussion. Course included pitch sessions, opening scene workshops, intensive reading and writing.

Prerequisite: ENG 330
Typically offered in Spring only

ENG 439 Studies in English Renaissance Literature  (3 credit hours)
Works of non-dramatic literature written in English or circulated in England from the sixteenth and seventeenth centuries. The course puts the English Renaissance in both a European and colonial context. Genres include, but are not limited to: poetry, political and fictional prose, masques, travel writing, proto-ethnographies, and popular writing (conduct books, ballads, emblems, polemical texts). Authors may include Thomas Wyatt, Henry Howard, Isabella Whitney, Philip Sidney, Edmund Spenser, Louise Labe, Gaspara Stampa, Sor Juana Della Cruz, Castiglione, Mary Sidney, Ben Jonson, Mary Wroth, Aemilia Lanyer, John Donne, George Herbert, Margaret Cavendish, and Aphra Behn.

Prerequisite: Sophomore standing and above

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 448/AFS 448/ENG 548/AFS 548 African-American Literature  (3 credit hours)
Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Hurston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

Prerequisite: Junior standing.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring and Summer
### ENG 451/ENG 551 Chaucer (3 credit hours)
Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales.

R: Sophomore standing and above  
GEP Global Knowledge, GEP Humanities  
Typically offered in Spring only

### ENG 452 Medieval British Literature (3 credit hours)
Readings in the rich poetic, thematic, and generic diversity of Medieval British literature. Representative selections from romance, dream-vision, allegory, fabliau, lyric, chronicle, saint's life, satire, in historical and cultural contexts. Prior knowledge of Middle English unnecessary.

Prerequisite: Sophomore standing and above  
Typically offered in Spring only

### ENG 453 The Romantic Period (3 credit hours)
Emphasis on the major poetry of Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats, with selected readings from other poets, prose writers, and dramatists of the period.

Prerequisite: Sophomore standing and above  
Typically offered in Spring only

### ENG 454 British Literature and the Founding of Empire (3 credit hours)
This course uses literature to understand rapid shifts in making and breaking empire. Reading novels, newspapers, essays, and autobiographies, we will study liberty in colonial North America, the orientalism of British India, and adventure writing of nineteenth-century Africa. In 1773, George McCartney, a British imperial officer, looked out from India and saw a "vast empire on which the sun never sets." Ten years later the thirteen American colonies that had founded that empire were gone. We will use this sentiment to determine how empire shaped the world and to consider how it contributed to Britain's literary and cultural traditions.

Requisite: Sophomore Standing or Above  
GEP Global Knowledge, GEP Humanities  
Typically offered in Spring only

### ENG 455 Literacy in the U.S. (3 credit hours)
Academic study of the nature, functions, acquisition, institutionalization, and present state of literacy in the U.S., with special focus on issues of cultural diversity and social inequity. Three contexts for literacy - personal, academic, and home/community - provide a range of readings, investigations, and opportunities for reflection and further study.

Prerequisite: ENG 101; Junior or senior standing.  
Typically offered in Fall only

### ENG 456 Transatlantic Literatures (3 credit hours)
This course will investigate notable literary exchanges in the literatures of the Atlantic Rim, long linked by trade (including slavery) as well as by commerce of many other kinds. Examples of these exchanges include Great Britain and the U.S., the U.S. and the Caribbean, and very importantly, between African cultures on the Atlantic and Atlantic cultures in the U.S. The course will explore the literary and cultural hybridity brought about by these exchanges. Representative writers: William Shakespeare and Aimee Cesaire, Joseph Conrad and Chinua Achebe; Charlotte Bronte and Jean Rhys; William Faulkner and Edouard Glissant.

Requisite: Sophomore Standing or Above  
GEP Global Knowledge, GEP Humanities  
Typically offered in Fall and Spring

### ENG 457 American Colonial Literature (3 credit hours)
Survey of American literature and thought from its beginnings to the adoption of the Constitution. Representative works such as travel and exploration reports, Indian captivity narratives, diaries, journals, autobiographies, sermons, and poetry.

R: Sophomore standing and above  
GEP Humanities  
Typically offered in Spring only
ENG 468  Studies in Nineteenth-Century American Literature  (3 credit hours)
Topics in nineteenth-century American literature, such as Romanticism, the nineteenth-century novel, Realism & Naturalism, etc. Focus on special areas of interest, which will vary from year to year, with attention to cultural and historical contexts.
Restriction: Sophomore Standing and Above  
GEP Humanities  
Typically offered in Fall only

ENG 470  American Literature, Twentieth Century and Beyond  (3 credit hours)
American Literature from the twentieth century until the present day. Readings from various genres such as fiction, non-fiction, drama and poetry. Emphasis will be on key literary developments in relation to important critical/cultural contexts. Representative writers: F. Scott Fitzgerald, Gwendolyn Brooks, Zora Neale Hurston, James Baldwin, David Mamet, and Maxine Hong Kingston.
Requisite: Sophomore Standing or Above  
GEP Humanities, GEP U.S. Diversity  
Typically offered in Fall and Spring

ENG 476  Southern Literature  (3 credit hours)
Literary traditions of the Southeastern United States from colonization through the present, including study of such major writers as Byrd, Jefferson, Simms, Poe, Douglass, Twain, Chesnutt, Glasgow, Hurston, Tate, Wolfe, Faulkner, Warren, Wright, Welty, Williams, O'Connor, Percy, and Lee Smith.
Prerequisite: Sophomore standing and above  
GEP Humanities, GEP U.S. Diversity  
Typically offered in Fall only

ENG 480  Modern Drama  (3 credit hours)
ENG 481  History of the Book  (3 credit hours)
This course provides an overview of book history from the invention of the hand-written codex through the printing press and current digital manifestations, including electronic texts and Google Books. Students will examine rare materials in hands-on settings and during field trips to special collections libraries; try out historical techniques of writing, printing, and manufacture; and investigate the many social roles involved in creating and using books, including those of author, editor, printer, publisher, reader, and seller.
Restriction: Junior standing or above  
Typically offered in Fall and Spring

ENG 482  Reading in the Digital Age  (3 credit hours)
This capstone questions how textual, reading, and interpretive practices are changing in a digital age. Using a diverse sample of literature, the course explores the consequences of digital remediation for texts and literary studies. Students will learn concepts in mediation, analyze works of literature on different reading platforms, and experiment with computational methods for literary curation, quantitative analysis, and data visualization. Students of all technical levels are welcomed; no special skills are required beyond basic familiarity with a computer.
Junior standing or above  
Typically offered in Fall and Spring

ENG 483  Literature and Media  (3 credit hours)
This course will explore how shifts in media technologies have influenced the creation, transmission, and reception of literature. Topics might include: investigations of how the spread of printing presses led to the first newspapers in eighteenth-century London, with comparison to how newspapers look today; study of the importance of serial publication in magazines for nineteenth-century authors like Charles Dickens; and examinations of spy novels, detective fiction, and the rise of the paperback in the twentieth century before turning to the explosion of graphic novels in the twenty-first century.
Restriction: Junior standing or above  
Typically offered in Fall and Spring

ENG 485  Shakespeare: Revisions and Resources  (3 credit hours)
A study in the plays of Shakespeare and ways to teach them, using multi-media presentations and textual exegesis, concentrating on each performance as an unique interpretation. The play choices are chosen by examining the plays that students in the English Ed program will likely find themselves teaching in area high schools.
P: 6 credit hours of English above the 100-level  
GEP Humanities  
Typically offered in Fall only

ENG 486  Shakespeare, The Earlier Plays  (3 credit hours)
Study a selection of Shakespeare's major works before 1603 with an emphasis on his cultural context and development as a playwright.
Restriction: Sophomore Standing and Above  
GEP Humanities  
Typically offered in Fall only

ENG 487  Shakespeare, The Later Plays  (3 credit hours)
Study a selection of Shakespeare's major works after 1603 with an emphasis on his cultural context and development as a playwright.
R: Sophomore standing and above  
GEP Humanities  
Typically offered in Spring and Summer

ENG 488  Advanced Fiction Writing Workshop  (3 credit hours)
An advanced workshop in creative writing for students with demonstrated understanding and accomplishment in the techniques of writing prose fiction. This course is restricted to juniors and seniors. Departmental approval required.
Prerequisite: ENG 388  
Typically offered in Fall and Spring

ENG 489  Advanced Poetry Writing Workshop  (3 credit hours)
An advanced workshop in creative writing for the students with demonstrated understanding and accomplishment in the techniques of writing poetry. This course is restricted to juniors and seniors. Departmental approval required.
Prerequisite: ENG 389  
Typically offered in Fall and Spring
ENG 490  Studies in Medieval Literature  (3 credit hours)
Topics (in rotation) in medieval English and continental literature, such as
Arthurian legend and literature; women in medieval society and literature;
the self in the late Middle Ages. Focus on special areas of interest,
with attention to culturaland historical backgrounds and contemporary
scholarship. Some texts in Middle English, some in translation; no prior
knowledge of Middle English needed.
Prerequisite: Sophomore standing and above
Typically offered in Fall only

ENG 491  Honors in English  (3 credit hours)
Intensive course or independent study project designed as one portion of
the Honors Program in English. Subject varies.
Requisite: English Majors Only
Typically offered in Fall and Spring

ENG 492  Special Topics in Film Styles and Genres  (3 credit hours)
Critical approaches to focused film topics involving film genres, directorial
styles, or trends within a national cinema. Topics will vary from semester
to semester.
Typically offered in Fall and Spring

ENG 494  Special Topics in Linguistics  (3 credit hours)
(May be repeated for credit with new topic.) Methodology and
analysis within various branches of linguistics, e.g. syntax, semantics,
computational linguistics, phonology, dialectology, historical linguistics,
discourse analysis. Examination of topic's basic methods, controversial
issues, analysis of linguistic data. Projects may include novel analyses of
English constructions, parsing programs, field work reports.
Prerequisite: ENG 101
Typically offered in Spring only

ENG 495  Studies in Literature  (3 credit hours)
Intensive exploration of selected topics or issues in the area of literature/
English studies with a wide variation in content that sometimes includes
materials from several national or ethnic cultures and periods. Course
may be used to meet the capstone
Junior standing or above
Typically offered in Fall and Spring

ENG 496  Seminar in Literary Criticism  (3 credit hours)
Introduction to theoretical and applied criticism of literature, primarily for
English majors and minors. May include traditional theory from Plato and
Aristotle to New Criticism, as well as contemporary psychoanalytical,
social, historical, and linguistic approaches to literature.
Prerequisite: 9 hours of literature at the 300 level or above
Typically offered in Fall and Spring

ENG 498  Special Topics in English  (1-6 credit hours)
Directed individual study or experimental course offerings in language
or literature. Individual study arranged through consultation with faculty
member and Director of Undergraduate Studies.
Prerequisite: Six hours in ENG above the 100 level
Typically offered in Fall, Spring, and Summer

ENG 499  Special Topics in Creative Writing  (3 credit hours)
Techniques and practice in writing a particular form within the traditional
genres of poetry, prose, or drama, such as "Creative Non-Fiction,""Science Fiction," "The Novella," or "The Satirical Poem." Topics vary
from semester to semester.
Prerequisite: ENG 288 or ENG 289 ; Students must have earned a grade
of B or better in 288 or 289 or they must have demonstrated competence
in creative writing as determined by instructor.
Typically offered in Fall and Spring

ENG 505  Writing Program Administration: Theory, Practice, and
Research  (3 credit hours)
Seminar designed to focus on current theories, research, and practices
of writing program administration, including curricular design and
assessment, faculty development, assessment of student achievement,
budget oversight, the politics of administration in higher education, and
historical studies of writing program administration. Designed for all
interested MA, MFA and PhD students, but particularly valuable for
those considering administrative work in first-year writing programs,
writing centers, or WAC/WID/CAC programs at a range of institutions
(community colleges, small liberal arts colleges, and large research
universities). Course involves the study of an existing program through
contact with its director(s).
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENG 506/COM 506  Verbal Data Analysis  (3 credit hours)
Research strategies for understanding how spoken and written
language shapes activities (e.g., design, instruction, counseling, gaming
interactions, e-commerce, etc.). Tracking patterned uses of language
as verbal data (e.g., grammatically topically, thematically), formulating
research questions, and designing studies to answer those questions
through quantitative descriptive means. Sampling, collecting and
managing data, developing coding schemes, achieving reliability, using
descriptive statistical measures, and reporting the results.
Typically offered in Fall only

ENG 507  Writing for Health and Environmental Sciences  (3 credit hours)
Readings, on-site research, document gathering, and analysis of writing
in health and environmental science fields. Students study, practice,
and present major forms of writing in their profession. Professional
portfolio due at the end of the semester. Intended for students interested
in exploring or pursuing writing careers in medicine, pharmaceuticals,
nutrition, agriculture, ecology, or other health and environmental science-
related industries, or professionals who wish to improve knowledge and
skills.
Prerequisite: Graduate standing. Doctoral student, Master's student
Typically offered in Fall only
ENG 508 Usability Studies for Technical Communication (3 credit hours)
Advanced study of usability inspection, inquiry, and testing theories and practices related to instrumental and instructive texts (i.e., computer-related, legal, medical, pharmaceutical, financial, etc.). Practical experience testing a variety of texts using several testing methods, including completion of a substantial, lab-based usability test. For students planning careers in technical communication, human factors, software design, and multimedia design.
Prerequisite: ENG 517
Typically offered in Fall only

ENG 509 Old English Literature (3 credit hours)
Study of Old English language with selections from important poems including Beowulf. Examination of the poetry in the light of various modern critical approaches.
Typically offered in Spring only

ENG 510 Middle English Literature (3 credit hours)
Study of major works of medieval English literature (exclusive of Chaucer's Canterbury Tales) in historical context, as reflections of and influences on social and cultural change. Includes works such as Sir Gawain and the Green Knight, Pearl, Langland's Piers Plowman and Malory's Morte d'Arthur.
Typically offered in Spring only

ENG 511 Theory and Research In Composition (3 credit hours)
Research and scholarship in composition and the teaching of writing. Major theoretical perspectives (such as expressive, social, cognitive, feminist), current issues (such as audience, invention, revision, evaluation) and various research methods.
Typically offered in Fall and Spring

ENG 512 Theory and Research In Professional Writing (3 credit hours)
Introduction to research and scholarship in professional writing and writing in the workplace. Major theoretical perspectives for studying writing; current issues (such as usability, readability, collaboration, gender, authorship); and various research methods.
Corequisite: ENG 666
Typically offered in Fall only

ENG 513 Empirical Research In Composition (3 credit hours)
Reading and evaluation of empirical research in written composition; guided practice in qualitative and quantitative methods. Basic principles of research; problem definition, research design and statistical analysis, description and assessment of written products and processes.
Typically offered in Spring only

ENG 514/COM 514 History Of Rhetoric (3 credit hours)
Historical development of rhetorical theory with attention to contemporaneous rhetorical practice and philosophical trends. Major focus on the classical period with briefer coverage of medieval, Renaissance, 18th-century, and 19th-century developments. Implications for contemporary theory and practice, including pedagogical practice.
Typically offered in Fall only

ENG 515 Rhetoric Of Science and Technology (3 credit hours)
The relationships among rhetoric, scientific knowledge and technological development and of changes in how these relationships understood historically. Practice in critical analysis of scientific and technical discourse. Consideration of scientific and technical language and of public controversy concerning science and technology.
Typically offered in Fall only

ENG 516/COM 516 Rhetorical Criticism: Theory and Practice (3 credit hours)
Development, achievements, limitation of major critical methods in the 20th century, including neo-Aristotelian, generic, metaphoric, dramaticistic, feminist, social-movement, fantasy-theme and postmodern approaches. Criticism of political discourse, institutional discourse, discourses of law, medicine, religion, education, science, the media. Relations between rhetorical and literary criticism and other forms of cultural analysis.
Prerequisite: Graduate Standing or the equivalent of COM/ENG 321 or COM/ENG 411
Typically offered in Spring only

ENG 517 Advanced Technical Writing, Editing and Document Design (3 credit hours)
Advanced study of technical communication practice, including content management, document design, and technical editing and usability. For students planning careers as technical communicators.
P: ENG 314 or graduate standing
Typically offered in Fall only

ENG 518 Publication Management for Technical Communicators (3 credit hours)
Advanced study of publication and team management issues such as staffing, scheduling, cost-reduction and subcontracting. For students planning careers as technical communicators.
Prerequisite: ENG 517
Typically offered in Spring only

ENG 519 Online Information Design and Evaluation (3 credit hours)
Concepts and practices related to multimedia information design, information architectures, human-computer interaction, and genre for complex websites.
Prerequisite: ENG 517
Typically offered in Spring only

ENG 520 Science Writing for the Media (3 credit hours)
Coverage of three areas: how to write science articles for a variety of mass media, how to think critically about how mass media cover science, and how to think critically about science itself. Preparation for careers not only in mass media, but also in scientific and technological organizations.
Typically offered in Fall only

ENG 522 Writing in Nonacademic Settings (3 credit hours)
Directed work experience for English Department graduate students including work-site mentoring and evaluation and concurrent academic assignments. Academic component includes reading and discussing articles relevant to the day-to-day practice of writing.
Typically offered in Spring only
ENG 523  Language Variation Research Seminar  (3 credit hours)
Field-initiated research. Group and individual research topics focused on
current sociolinguistic issues related to language variation and changes.
Ethnographic and quantitative methods of analysis.
Prerequisite: ENG 525
Typically offered in Fall only

ENG 524  Introduction to Linguistics  (3 credit hours)
Introduction to theoretical linguistics, especially for students in language,
writing and literature curricula. Phonology, syntax, semantics, history of
linguistics; relation of linguistics to philosophy, sociology and psychology;
application of theory to analysis of texts.
Prerequisite: Graduate standing or 12 hrs. in ENG
Typically offered in Fall only

ENG 525  Variety In Language  (3 credit hours)
Language variation description, theory, method and application; focus
on regional, social, ethnic and gender varieties; sociolinguistic analysis,
basic discourse analysis.
Prerequisite: Graduate standing or 12 hrs. in ENG
Typically offered in Fall only

ENG 527/ENG 727  Discourse Analysis  (3 credit hours)
Overview of major issues, theories, and research methods in
contemporary discourse analysis. It explores how language as a form
of social practice regulates social actions, relations and identities;
how ways of speaking construct and are constructed by social order,
cultural practice, and individual agency. Texts/discourses are analyzed to
examine how speakers create meaning through formal linguistic choices;
what the micro-organization of talk reveals about social order; how critical
understanding of discourse helps to interpret complex processes of social
life.
Prerequisite: Graduate standing
Typically offered in Fall only

ENG 528  Sociophonetics  (3 credit hours)
A survey of sociophonetics: the study of language variation using modern
phonetic techniques. Acoustic analysis of consonants, vowels, prosody,
voice quality. Speech perception experiments and how they can be
applied to a variety of issues. Applications to theoretical issues in sound
change, sociolinguistics, phonetics and phonology, and cognition of
language. Graduate standing required.
Typically offered in Fall only

ENG 529  16th-Century Non-Dramatic English Literature  (3 credit hours)
Prose and poetry of the English Renaissance, excluding drama.
Special attention to major authors, including Spenser and Sidney, and
to intellectual, cultural and literary backgrounds and developments.
Introduction to pertinent methods and issues of scholarly inquiry and
critical interpretation.
Typically offered in Fall only

ENG 530  17th-Century English Literature  (3 credit hours)
A close examination of the literature of England from 1600 to 1660 with
emphasis on major literary figures and movements, development of
important literary forms and genres and relationship between literary texts
of this period and their philosophical, political and theological contexts.
Some bibliographical and textual assignments. Content and focus varies
according to instructor's emphasis, but writers covered usually include
Donne, Herbert, Crashaw, Marvell and Browne.
Typically offered in Spring only

ENG 531  American Colonial Literature  (3 credit hours)
Survey of American literature and thought from the beginning to adoption
of the constitution. Representative works such as travel and exploration
reports, Indian captivity narratives, diaries, journals, auto biographies,
sermons and poetry.
Typically offered in Spring only

ENG 532  Narrative Analysis  (3 credit hours)
Introduction to theories concerning the structure, use, and interpretation
of narratively organized discourse; application of methods of narrative
analysis to both spoken and written narratives.
Prerequisite: Graduate standing
Typically offered in Fall only

ENG 533  Bilingualism and Language Contact  (3 credit hours)
Linguistic, cultural and socio-political aspects of bi- and multilingualism
in a global context. Issues and implications of bilingualism from both
theoretical and practical perspectives. Topics include: language
maintenance and shift; child and adult bilingualism; relationship
between language, culture and identity in bi- and multilingual situations;
psycholinguistic aspects and linguistic outcomes of bilingual contact,
such as code-switching, convergence and language attrition; language
ideology, the politics of language choice and language policy;
globalization and intercultural communication. Must hold graduate
standing or get consent of instructor for advanced undergraduate
students.
Typically offered in Spring only

ENG 534  Quantitative Analysis in Sociolinguistics  (3 credit hours)
The quantitative methods specific to sociolinguistic variation are
examined in detail, focusing both on gaining experience using
quantitative analysis software and on understanding fundamental
concepts underlying the quantitative analysis of language variation.
This course takes students beyond the basic familiarity with quantitative
analysis gained in ENG 523, both in depth of investigation and in
attention to the link between method and theory.
Prerequisite: ENG 523
Typically offered in Fall only

ENG 536  Research Methods in Phonology  (3 credit hours)
This course explores laboratory and computational tools for investigating
linguistic sound systems (e.g., speech perception experiments, speech
production tools such as ultrasound imaging, and computational tools
such as automated transcription and acoustic measurement). Requires
enrollment in the Sociolinguistics MA or PhD program or permission of
instructor.
Requisite: Enrollment in the Sociolinguistics concentrations of the MA
English or PhD Sociology programs or permission of instructor.
Typically offered in Fall only
ENG 539/FL 539 Seminar In World Literature (3 credit hours)
Rotating topics in world literature, including treatment of the subject's theoretical or methodological framework. Possible subjects: colonialism and literature; orality and literature; the Renaissance; the Enlightenment; translation; comparison of North and South American literatures; African literary traditions; post-modernism and gender. Readings in English (original languages encouraged but not required).

Typically offered in Spring only

ENG 540 History Of Literary Criticism (3 credit hours)

Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

ENG 541/FL 541 Literary and Cultural Theory (3 credit hours)
A survey of literary theory in the 20th century from New Criticism to postmodernism. Examines the virtues and pitfalls of these approaches to the study of culture and literature. A course on issues, concepts, theorists and the sociohistorical and political context in which the theorists are writing. Taught in English. No formal pre-requisites. However, students who have not had advanced literature will be disadvantaged.

Typically offered in Fall only

ENG 543 Introduction to Digital Humanities (3 credit hours)
This course invites students of all technical abilities to explore the ongoing digital transformation of resources, tools, and methods in the humanities. As an introduction, this course is a gateway into a variety of representative subfields in digital humanities. It is designed to generate curiosity about how this emerging arena of scholarly activity might intersect with students' own disciplines, research interests, and pedagogies. It aims to provide a working knowledge of: 1) backgrounds of new media and humanities computing, 2) debates and outlooks for the digital humanities today, as well as 3) hands-on experience collaborating on, creating, and critiquing digital humanities projects.

Prerequisite: Graduate standing
Typically offered in Fall only

ENG 548/AFS 548/ENG 448/AFS 448 African-American Literature (3 credit hours)
Survey of African-American literature and its relationships to American culture, with an emphasis on fiction and poetry since 1945. Writers such as Bontemps, Morrison, Hurston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

Prerequisite: Junior standing.
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring and Summer

ENG 549 Modern African Literature (3 credit hours)
The works of the most important writers shaping modern African literature in English (and English translation). Selections from East, West, North and South Africa, spanning colonial through post-colonial Africa—from literature of protest and culture conflict to that of disillusionment, reappraisal and feminism.

Typically offered in Spring only

ENG 550 English Romantic Period (3 credit hours)
A detailed study of the six major romantic poets—Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats; some attention as well to the political, social and literary background and to a few minor writers and critics.

Typically offered in Fall only

ENG 551/ENG 451 Chaucer (3 credit hours)
Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales.

R: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

ENG 554/COM 554 Contemporary Rhetorical Theory (3 credit hours)
Contemporary rhetorical theory covering the 20th and 21st centuries. Conceptual connections with and disruptions of the classical tradition and its successors; relationship between rhetorical theory and philosophical trends, institutional histories, socioeconomic circumstances, and pedagogical needs. Attention to current issues such as the revival of invention, rhetorical agency, and ethics.

Typically offered in Spring only

ENG 555 American Romantic Period (3 credit hours)
The literary culture of the United States from 1820s through 1860s, setting works of transcendentalists and other romantic writers within sociohistorical contexts. Consideration of writing by women, slave narratives and popular fiction as well as such major figures as Emerson, Hawthorne, Thoreau and Melville.

Typically offered in Fall only

ENG 558 Studies In Shakespeare (3 credit hours)
An intensive study of a particular phase of the Shakespeare canon. Emphasis will normally be on one dramatic genre (tragedy, comedy, history), but occasionally the focus may be more limited.

Typically offered in Fall and Summer

ENG 560 Victorian Poetry and Critical Prose (3 credit hours)
The literature of Victorian England: 1837-1901; the major poets and their, successors; relationship between rhetorical theory and philosophical trends, institutional histories, socioeconomic circumstances, and pedagogical needs. Attention to current issues such as the revival of invention, rhetorical agency, and ethics.

Typically offered in Spring only

ENG 561 Milton (3 credit hours)
An intensive reading of Milton with attention to background materials in history and culture of seventeenth-century England.

Typically offered in Spring only

ENG 562 18TH-Century English Literature (3 credit hours)
British writers of the period 1600-1790 studied in historical and cultural contexts. Usually includes works by Dryden, Swift, Pope, Defoe, Mandeville, Boswell and Johnson, but addition of other significant writers possible.

Typically offered in Fall only
ENG 563 18TH-Century English Novel (3 credit hours)
Selected British novels of the Restoration and eighteenth century from a variety of contemporary critical perspectives. Such writers as Fielding, Richardson, Sterne, Burney, Smollett and Austen.
Typically offered in Spring only

ENG 564 Victorian Novel (3 credit hours)
Study of selected British novels published between 1837 and 1901 in contexts of the development of the genre, historical period and current literary theory. Such writers as Dickens, Thackeray, Bronte, Trollope, Eliot, Meredith and Hardy.
Typically offered in Spring only

ENG 565 American Realism and Naturalism (3 credit hours)
Study of literary culture of United States from 1860s to early 1900s with emphasis on fiction by such realists and naturalists as Twain, Howells, Chesnutt, James, Crane, Wharton, Dreiser and Norris. Inclusion of prose of writers such as Adams and DuBois possible.
Typically offered in Spring only

ENG 570 20TH-Century British Prose (3 credit hours)
Examination of British fiction of this century and relationship of significant intellectual, historical and political issues. Inclusion of such writers as Joyce, Conrad, Woolf, Lawrence, Beckett and Murdoch possible but also post-colonial novelists as well.
Typically offered in Fall only

ENG 571 20TH-Century British Poetry (3 credit hours)
Development of English poetry from its late Victorian phase through Modernism to present post-war scene. Inclusion of such writers as Hardy, Yeats, Eliot, Smith, Auden, Larkin, Heaney, Wolcott and Hill possible.
Typically offered in Spring only

ENG 572 Modern British Drama (3 credit hours)
Survey of modern British drama from its beginnings at turn of the century to present.
Typically offered in Fall only

ENG 573 Modern American Drama (3 credit hours)
A survey of modern American drama centering on major figures.
Typically offered in Fall only

ENG 575 Southern Writers (3 credit hours)
Introduction to literary culture of “the South,” tracing the roots of the twentieth-century “Southern Renaissance” in such ante-bellum genres as plantation fiction, Southwestern humor, fugitive-slave narration and pastoral elegy. Examination of persistence of “Southern” writing within increasingly standardized culture of the United States.
Typically offered in Spring only

ENG 576 20TH-Century American Poetry (3 credit hours)
Development of modern American poetry from rebellion against the romantic and genteel verse of the 1890’s; special attention to Robinson, Frost, Pound, Williams, Stevens and Ransom.
Typically offered in Spring only

ENG 577 20th-Century American Prose (3 credit hours)
An examination of representative American writers of novel and short fiction.
Typically offered in Spring only

ENG 578 English Drama To 1642 (3 credit hours)
Elizabethan and Jacobean drama from 1580 to 1642, excluding Shakespeare. Coverage of such writers as Marlowe, Jonson, Webster, Beaumont and Fletcher, Heywood, Tourneur and Ford.
Prerequisite: ENG 261 and upper division or Graduate standing
Typically offered in Fall only

ENG 579 Restoration and 18th-Century Drama (3 credit hours)
Representative British plays of the period 1660-1780 studied in cultural, social and ethical contexts. Usually includes works by Etheredge, Wycherley, Behn, Dryden, Otway, Vanburgh, Farquhar, Congreve, Lillo, Gay, Goldsmith and Sheridan.
Typically offered in Spring only

ENG 580 Literary Postmodernism (3 credit hours)
Post-1945 literary theory in relationship with representative avant-garde writers. Theoretical and argumentative essays in such areas as chaos theory, deconstruction, feminism and the limits of fiction. Fiction readings by Calvino, Pynchon, Barthelme, Cortazar and others.
Prerequisite: Graduate standing
Typically offered in Spring only

ENG 581/COM 581 Visual Rhetoric: Theory and Criticism (3 credit hours)
Application of visual theory to rhetoric and of rhetorical theory to visual forms of communication. Discussion and analysis may include advertising, photography, news and informational media, political communication, instructional material, scientific visualization, visual arts, public commemorative artifacts, internet and other digital media.
R: Graduate Students Only
Typically offered in Spring only

ENG 582 Studies in Literature (3 credit hours)
Variation in content. Selected problems and issues in literature.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENG 583 Studies In Rhetoric and Writing (3 credit hours)
Variation in content. Selected problems and issues in rhetoric and writing.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENG 584 Studies In Linguistics (3 credit hours)
Variation in content. Selected problems and issues in linguistics.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENG 585 Studies In Film (3 credit hours)
Variation in content. Selected problems and issues in film.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENG 586 Studies In Theory (3 credit hours)
Variation in content. Selected problems and issues in theory.
Prerequisite: Graduate standing
Typically offered in Fall and Spring
ENG 587  Interdisciplinary Studies in English  (3 credit hours)
Content varies. Selected topics and issues that cross disciplinary boundaries in English Studies. May be repeated for credit with different topics. Graduate standing is required.

Typically offered in Fall and Spring

ENG 588  Fiction Writing Workshop  (3 credit hours)
Advanced work in techniques of writing fiction for students with substantial experience in writing. Workshop sessions with students commenting on each other's work.

Prerequisite: ENG 488 or ENG 489
Typically offered in Fall and Spring

ENG 589  Poetry Writing Workshop  (3 credit hours)
Advanced work in techniques of writing poetry for students with substantial experience in writing. Workshop sessions with students commenting on each other's work.

Prerequisite: ENG 488 or ENG 489
Typically offered in Fall and Spring

ENG 590  Studies In Creative Writing  (3 credit hours)
Techniques special to a particular kind of writing within the traditional genres of prose, poetry or drama, such as "Speculative Fiction" or "The Long Poem or Poetic Sequence." Various subjects.

Prerequisite: ENG 588 or 589
Typically offered in Spring only

ENG 591  Studies in National Cinemas  (3 credit hours)
Aesthetic developments and historical importance of national cinema traditions in specific cultural contexts. Focus on the relation between cinema and linguistic, literary and artistic developments within a national setting or in regional or international contexts. Topics, which change each year, may include Italian Neorealism, French New Wave, and British Social Realism.

Typically offered in Spring only

ENG 592  Special Topics in Film Styles and Genres  (1-6 credit hours)
Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester. Students cannot obtain credit for both ENG 492 and ENG 592.

Typically offered in Fall and Spring

ENG 610  Special Topics English  (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

ENG 624  Teaching College Composition  (3 credit hours)
Preparation for teaching college composition. Introduction to pedagogical principles and practices. Practice in setting course goals, designing writing assignments to meet those goals, developing instructional activities to support assignments, and evaluating student writing. The course is scheduled as a 5-day workshop before classes begin, followed by weekly meetings and mentoring during the fall semester.

Prerequisite: ENG 511 and mentored assistantship in ENG 101
Typically offered in Fall only

ENG 626  Advanced Writing for Empirical Research  (3 credit hours)
A seminar and workshop for graduate students in empirical research fields working on grant proposals, theses and dissertations, papers for professional journals, conference proposals, and other significant research texts. Intensive practice and feedback on writing, grounded in an introduction to theory and research on writing processes, products, and contexts. Requirements include three major writing projects designed by the student, review and discussion of drafts written by other workshop members, analysis and presentation of discipline-specific communication patterns and practices.

Prerequisite: Graduate standing
Typically offered in Fall only

ENG 636  Directed Readings  (1-6 credit hours)
Intensive study of a specific topic from various specializations of the English faculty. Negotiation between the student and the director for variable credit and approved by Director of Graduate Studies.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ENG 669  Literature, Methods, and the Profession  (3 credit hours)
This course initiates students into ways of thinking and practicing in English literary studies. We will explore critical traditions, research methods, and emerging approaches, including literary criticism and theory, globalization, transnationalism, and postcolonialism in literature, together with introductions to cultural studies, rhetoric, composition, film studies, and media studies as they influence literary criticism and theories. The course also prepares students to begin formulating their own research and professional pathways with attention to practical considerations of how to become a professional in graduate school. You will become familiar with faculty from the department, develop research plans, and discover resources to start trajectories that include careers in writing, media, and teaching.

Typically offered in Fall only

ENG 675  Projects in Technical Communication  (3 credit hours)
Capstone course for M.S. in Technical Communication. Students engage in major semester-long individual project under direction of instructor.

Prerequisite: ENG 518
Typically offered in Spring only

ENG 676  Master's Project in English  (3 credit hours)
Individual capstone project in English Studies. Topic and mode of study determined in consultation with faculty project advisor. For students in the final semester of the English MA program.

Typically offered in Fall and Spring

ENG 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall and Spring
ENG 688  Non-Thesis Masters Continuous Registration - Half Time Registration  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall only

ENG 690  Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ENG 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall and Spring

ENG 695  Master's Thesis Research  (1-9 credit hours)
Thesis research.
Prerequisite: Master's student
Typically offered in Fall and Spring

ENG 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

ENG 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ENG 722  Linguistics and Literacy  (3 credit hours)
Focus on two-way relationship between linguistic theory and literacy. Metalinguistic awareness and acquisition of literacy, orthography and phonology, oral vs. written language, oral vs. literate cultures, and metalinguistic assumptions in linguistic theory.
Prerequisite: ENG 525
Typically offered in Spring only

ENG 727/ENG 527  Discourse Analysis  (3 credit hours)
Overview of major issues, theories, and research methods in contemporary discourse analysis. It explores how language as a form of social practice regulates social actions, relations and identities; how ways of speaking construct and are constructed by social order, cultural practice, and individual agency. Texts/discourses are analyzed to examine how speakers create meaning through formal linguistic choices; what the micro-organization of talk reveals about social order; how critical understanding of discourse helps to interpret complex processes of social life.
Prerequisite: Graduate standing
Typically offered in Spring only

ENG 729  Language Variation and Social Theory  (3 credit hours)
Although the field of sociolinguistic variation has developed its own body of theory, its central questions continue to call for engagement with theory in related socio-cultural disciplines. This course examines sociolinguists' explicit and implicit incorporation of social theory into the analysis of language variation; it also explores the many ways in which social theory could yet enrich, and be enriched by, empirical sociolinguistic analysis.
Prerequisite: ENG 523
Typically offered in Spring only

ENG 730  Ethnolinguistic Variation  (3 credit hours)
This course examines the nature of ethnolinguistic variation in the English-speaking diaspora, with particular attention to the ethnic varieties in the United States, including African American English, Hispanic English, and Native American English.
Prerequisite: ENG 525
Typically offered in Spring only

ENG 731  Applied Sociolinguistics  (3 credit hours)
This course will introduce the main research concentrations and methods in Applied Sociolinguistics, including first language acquisition and teaching, second language learning, bilingualism, and clinical assessment and treatment of communication disorders. Students will be introduced to the basic foundations of language variation from linguistic and sociocultural/historical perspectives and learn how sociolinguistic variation affects clinical and educational processes and organizations.
Prerequisite: ENG 525
Typically offered in Spring only

ENG 798  Special Topics in English Studies  (3-6 credit hours)
Intensive exploration of specialized or emerging topics in an area of language, literature, rhetoric, film, or other aspect of English studies. Emphasis on student research and writing. May be used to test and develop new courses. May be repeated for credit.
Typically offered in Fall and Spring

ENG 810  Directed Readings in English Studies  (1-6 credit hours)
Intensive study of a specific topic from various specializations of the English faculty. Negotiation between the student and the director for the variable credit and approved by the director of Graduate Studies. May be repeated for credit.
Typically offered in Fall and Spring

ENG 896  Summer Dissert Res  (1 credit hours)
Entomology (ENT)

ENT 110 General Entomology (3 credit hours)
Considers how insects live, their internal and external structures and their functions, classification and identification and control when desirable. Recognition of economically important beneficial and destructive insects and mites occurring in North Carolina and neighboring states, stressing information on their life histories, damage and control.

Requisite: Agricultural Institute Only
Typically offered in Fall only

ENT 121 Pesticides and Their Utilization (3 credit hours)
Basic characterization, classification, chemical and physical properties of pesticides. Use of pesticides including environmental effects; Federal and State laws and regulations relating to their manufacture, distribution and use; safety procedures including handling and storage; and application equipment including types, calibration, use and maintenance. TOTH

Requisite: Agricultural Institute Only
Typically offered in Fall only

ENT 132 Urban Pest Management (3 credit hours)
Insects and related arthropods found in residential and industrial buildings, nature of damage, and their control. Identification and life history of the different pest species, methods to detect their presence, and integrated pest management strategies. Hands-on learning of species in laboratory with emphasis on current control techniques. Field trips required. Agricultural Institute Students only.

Requisite: Agricultural Institute Only
Typically offered in Fall only

ENT 163 Ornamental & Turf Insects (3 credit hours)
Practical course in the biology, recognition, and management of common insect and related arthropod pests that attack ornamentals and turf. WALDVOGEL

Requisite: Agricultural Institute Only
Typically offered in Fall only

ENT 190 Current Topics in Pest Management (1 credit hours)
Discussions of current topics of pest management. Topics selected by the students and instructors to include different phases of pest management. Discussions led by leaders in the various facets of the industry.

Requisite: Agricultural Institute Only
Typically offered in Spring only

ENT 201 Insects and People (3 credit hours)
An introduction to the fascinating world of insects and how they interact with people. Included is a brief survey of insect history, diversity, structure and function, and behavior. This is followed by examples of beneficial and harmful insects in a variety of human activities including some sampling of the profound impacts insects have had on history, society and culture.

GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

ENT 203 An Introduction to the Honey Bee and Beekeeping (3 credit hours)
Introduction to honey bee biology and a fundamental understanding of beekeeping management including crop pollination by bees. Examination of the relationships between honey bees and humans from prehistoric through modern times and the behavior and soci

GEP Natural Sciences
Typically offered in Fall only

ENT 207 Insects and Human Disease (3 credit hours)
This course is an introduction to the many interactions between insects, other arthropods and humans that result in disease, ranging from simple anxiety, phobias, discomfort and pain, to transmission of pathogenic organisms causing sickness and even death. Included will be an understanding of the special physical and chemical adaptations of insects that enable them to cause us harm. The major groups of insects, mites, ticks and related arthropods associated with human suffering and disease as well as an introduction to the diseases transmitted by them will be presented. Finally, the course will present information on how major outbreaks of disease transmitted by the insects have influenced human populations, demographics, warfare, religion, and societal structure throughout recorded history.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall only

ENT 212 Basic Entomology (1 credit hours)
This course offers a brief and basic introduction to the world of insects and the discipline of entomology. It is intended as a primer for several other more specialized entomology classes such as forensic entomology and forest entomology.

Typically offered in Fall and Spring

ENT 305 Introduction to Forensic Entomology (3 credit hours)
This course provides a broad overview of forensic entomology—a specialized field of entomology employed in medicocriminal investigations. Forensic entomology relies on knowledge of insect ecology, biology, taxonomy, physiology and development to elucidate the circumstances surrounding death. The role of arthropods associated with decomposed human remains is one of several valued disciplines in forensic sciences. Understanding the general principles of forensic entomology and their application will be the focus of this course.

GEP Natural Sciences
Typically offered in Fall only

ENT 401 Honey Bee Biology and Management (3 credit hours)
A hands-on course in honey bee management including bee pollination of selected crops based on an understanding of bee biology, bee behavior, bee pathology, and bee botany. Students must be able to provide their transportation to field sites or arrange to work with a beekeeping mentor. Students may choose, but are not required, to purchase their own beekeeping equipment and hive.

Prerequisite: (ENT 201, ENT 203, ENT 425, BIO 105 or PB 200)
Typically offered in Spring only
ENT 402/FOR 402 Forest Entomology (3 credit hours)
Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.

Prerequisite: Junior standing.
GEP Natural Sciences
Typically offered in Spring only

ENT 425 General Entomology (3 credit hours)
This course explores the science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and management of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments.

Prerequisite: BIO 181 or BIO 140 or BIO 350
GEP Natural Sciences
Typically offered in Fall only

ENT 470/PP 470/CS 470 Advanced Turfgrass Pest Management (2 credit hours)
Characteristics and ecology of turfgrass weed, insect, and disease pests; identification and diagnosis of turfgrass pests, strategies for managing pests including cultural, mechanical, biological, and chemical methods; development of integrated pest management programs, characteristics and modes of action for herbicides, insecticides, fungicides, and plant growth regulators; behavior and fate of pesticides in soil; and the development and management of pesticide resistant pest populations.

Prerequisite: C- or better in CS 200
Typically offered in Spring only

ENT 492 External Learning Experience (1-6 credit hours)
A learning experience within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

Prerequisite: Sophomore standing
Typically offered in Fall and Spring

ENT 493 Special Problems in Entomology (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

Prerequisite: Sophomore standing
Typically offered in Fall and Spring

ENT 495 Special Topics in Entomology (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

ENT 502 Insect Diversity (4 credit hours)
Diversity of insect biology and structure with emphasis upon identification of adults; includes speciation, evolutionary relationships, approaches to classification, nomenclature, zoogeography and techniques of collection.

Prerequisite: ENT 425 or Graduate Standing
Typically offered in Fall only

ENT 503 Insect Morphology and Physiology (3 credit hours)
The objectives are to acquaint students with the internal morphology, histology, and ultra-structure and system functions of insects. The laboratory will assist in recognizing the internal anatomy and associated external structure of insects and provide practical experience in the study of insect function.

Prerequisite: (CH 221 or CH 225) and (CH 223 or CH 227) and ENT 425 or Graduate Standing

ENT 504 Professional Development for Entomologists (2 credit hours)
A successful professional career in entomology is not limited to understanding just the science of Entomology. Also required is an understanding of career paths, professional ethics, written and verbal communication, safety, how to work with animals and human subjects, personal interactions, vita preparation, networking, and future directions of the discipline. These skills are essential to taking the knowledge obtained in entomology and applying them to a career in the discipline.

Graduate Standing required.
Typically offered in Fall only

ENT 506/GES 506 Principles of Genetic Pest Management (3 credit hours)
Introduction to the biological aspects of genetic pest management (GPM). Genetic techniques for GPM, including historical uses (such as the sterile insect technique) and approaches that are currently in development. Practical issues relating to the deployment of GPM, including ecological and economic considerations.

Typically offered in Fall only

ENT 509/AEC 509 Biology of Aquatic Insects (3 credit hours)
Life history descriptions and identification of aquatic insects. Emphasis on behavioral and physiological adaptations to diverse habitats and the role of insects in aquatic ecosystem function and as indicators of water quality. The course includes 3-4 Saturday collecting trips to a local pond and streams in the mountains, piedmont and coastal plain. Collecting trips are not required, but are strongly encouraged.

Typically offered in Spring only

ENT 510 Writing Proposals in Agriculture, Biology, and Ecology (2 credit hours)
Participants will be guided through the process of writing, with the intention to submit, a fellowship or grant proposal to an appropriate program of their selection and effective peer review of grant or fellowship proposals. The course includes a combination of lectures, in class activities, and direct practice. Students will also interact with a wide variety of experts in grant writing and evaluation who serve as weekly guest reviewers.

Typically offered in Fall only

ENT 520 Insect Behavior (3 credit hours)
This course stresses comprehensive coverage of the principles of animal behavior using insects as models and examples. Physiology, genetics, mechanisms, behavioral ecology, and evolution of insect behavior will be covered.

Typically offered in Spring only
ENT 526 Organic Agriculture: Principles and Practices (3 credit hours)
This is a multidisciplinary class, and lectures cover many aspects of organic production given by a number of experts from both on and off campus. Classes also include discussions of issues and controversies surrounding organic production, as well as field trips to selected farms. This course is restricted to upper level undergraduate, graduate, or post-baccalaureate continuing education students.

Typically offered in Spring only

ENT 550 Fundamentals of Arthropod Management (3 credit hours)
The principles underlying modern methods for protecting food, clothing, shelter and health from insect attack.

Prerequisite: ENT 425 or Graduate Standing
Typically offered in Fall only

ENT 560 Techniques in Molecular Ecology and Evolution (3 credit hours)
Laboratory-intensive course providing hands-on experience in application of several commonly used techniques in molecular ecology and evolution. Lectures cover theory and application of specific techniques in the context of case studies from the primary literature. By end of course, students should be comfortable with theory and application of molecular markers in studies of ecology and evolution, and should be able to incorporate one or more techniques into their thesis research. Graduate standing or permission of the instructors required.

Typically offered in Spring only

ENT 582/ZO 582 Medical and Veterinary Entomology (3 credit hours)
The morphology, taxonomy, biology and control of the arthropod parasites and disease vectors of man and animals. The ecology and behavior of vectors in relation to disease transmission and control.

Prerequisite: ENT 425 and ZO 315
Typically offered in Spring only

ENT 591 Special Topics in Entomology (1-6 credit hours)
A variable credit lecture and laboratory series offering topics such as advanced beekeeping, morphology, physiology, systematics, behavior, biological control, nursery and ornamental pests, host plant resistance, information retrieval, biological monitoring and sampling, population modeling, extension entomology, computer methods and urban, forest and stored product pests.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ENT 601 Seminar (1 credit hours)
Discussion of entomological topics selected and assigned by seminar chair.

Prerequisite: Graduate standing in ENT or closely allied fields
Typically offered in Fall and Spring

ENT 604 Insect Natural History and Field Ecology (1 credit hours)
Diversity of ecological roles and lifestyles of insects and related arthropods using techniques in field ecology. Two week-long field trips to Coastal Plain and Mountains with orientation walks, evening lectures, and field projects. Taught during the two weeks prior to the Fall semester.

Prerequisite: Graduate standing in Entomology
Typically offered in Fall only

ENT 620 Special Problems (1-6 credit hours)
Original research on special problems in entomology not related to a thesis problem. Provides experience and training in research. Credits Arranged.

Typically offered in Spring only

ENT 641 Agricultural Entomology Practicum (3 credit hours)
Practical experience in research, extension and commercial aspects of insect pest management on a broad range of agricultural crops under actual field conditions. Class meets 9 hours each Friday for 10 weeks from early June to mid-August. Students should register for Fall term.

Prerequisite: Economic entomology (ENT 762 recommended)
Typically offered in Fall only

ENT 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Spring only

ENT 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Spring only

ENT 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ENT 695 Master's Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ENT 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

ENT 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
ENT 726 Biological Control of Insects and Weeds (3 credit hours)
Overview of the field of biological control and its role in Integrated Pest Management programs. Emphasis on the diversity and sometimes unusual interactions of insect parasites and predators with their hosts/prey, controversies in biological control, critical analysis of selected projects, and basic conceptual and "hands-on" tools for approaching biological control research and implementing projects.

Prerequisite: ENT 425 or Graduate Standing

Typically offered in Fall only

ENT 727/PP 727 Ecology of Soil Ecosystems (3 credit hours)
This course will focus on the interactions between soil organisms and their environment, and the ecological consequences of these diverse complex interactions. In particular, it will explore the scientific evidence that illustrates links between soil organisms, ecosystem functioning and the quality of air and water systems, and examine why and how the related research was conducted. This course will bring together theory and research trends from different subject areas: soil microbiology, entomology and ecosystem ecology.

Prerequisite: One course in: (SSC 332, SSC 511, SSC 521, or SSC 532), or ecology (BO 360 or CS 430), or microbiology (MB 351), or consent of instructor.

Typically offered in Spring only

ENT 731 Insect Ecology (3 credit hours)
The interrelationships among insects and components of their effective environments which result in dynamic spatial and temporal patterns of particular species. Also, the diverse roles of insects in structure and function of communities and ecosystems.

Prerequisite: ENT 425 or Graduate standing

Typically offered in Spring only

ENT 762 Insect Pest Management In Agricultural Crops (3 credit hours)
Critical review of the biology and ecology of representative beneficial and injurious insects and arachnids of agricultural crops and the advantages and limitations of advanced concepts of their management in selected agroecosystems.

Prerequisite: Graduate Standing

Typically offered in Spring only

ENT 791 Special Topics In Entomology (1-6 credit hours)
A variable credit lecture and laboratory series offering topics such as advanced beekeeping, morphology, physiology, systematics, behavior, biological control, nursery and ornamental pests, host plant resistance, information retrieval, biological monitoring and sampling, population modelling, extension entomology, computer methods and urban, forest and stored product pests.

Prerequisite: Graduate standing

Typically offered in Fall and Spring

ENT 801 Seminar (1 credit hours)
Discussion of entomological topics selected and assigned by seminar chair.

Prerequisite: Graduate standing in ENT or closely allied fields

Typically offered in Fall and Spring

ENT 804 Insect Natural History and Field Ecology (1 credit hours)
Diversity of ecological roles and lifestyles of insects and related arthropods using techniques in field ecology. Two week-long field trips to Coastal Plain and Mountains with orientation walks, evening lectures, and field projects. Taught during the two weeks prior to the Fall semester.

Prerequisite: Graduate standing in Entomology

Typically offered in Fall only

ENT 820 Special Problems (1-6 credit hours)
Original research on special problems in entomology not related to a thesis problem. Provides experience and training in research.

Typically offered in Spring only

ENT 841 Agricultural Entomology Practicum (3 credit hours)
Practical experience in research, extension and commercial aspects of insect pest management on a broad range of agricultural crops under actual field conditions. Class meets 9 hours each Friday for 10 weeks from early June to mid-August. Students should register for fall semester.

Prerequisite: Economic entomology (ENT 762 recommended)

Typically offered in Fall only

ENT 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

ENT 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Summer only

ENT 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

ENT 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

ENT 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student

Typically offered in Summer only

ENT 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer
Entrepreneurship in Music and the Arts (EMA)

EMA 110 Introduction to Arts Entrepreneurship (3 credit hours)
This course introduces students to the basic components of an entrepreneurial lifestyle in the arts for those interested in starting an arts business. Students explore fundamental issues arts entrepreneurs encounter and how they can be addressed before.

EMA 293 Independent Study in Arts Entrepreneurship (1-3 credit hours)
Independent study offering under the direction of a faculty member. Requirements for the independent study will be determined by the student and faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Stu

EMA 295 Special Topics in Arts Entrepreneurship (1-3 credit hours)
Timely topical courses or experimental course offerings in Arts Entrepreneurship.

EMA 365 Foundations in Arts Entrepreneurship (3 credit hours)
This course will introduce and outline the role, purpose, and perception of "art" in various marketplaces and contexts for the emerging arts entrepreneur. Topics include: issues in marketing aesthetic products, consumer identification through art, models of consumer behavior, art and technology, macro-economic issues that affect the arts industries, arts policy and access.

EMA 370 Practical Arts Entrepreneurship (3 credit hours)
This course will introduce and outline the cultural and economic environment of the arts in the United States. Topics include: the start-up process of for- and non-profit entities, economic and social impact of art and artists in communities, public and private arts support, non-profit culture and basic grantsmanship, arts policy, creative economy efforts, the role of geography, demand and infrastructure considerations in entrepreneurial decision-making, competition analysis and marketing.

EMA 375 Understanding the Arts Economies (3 credit hours)
This course explores arts and arts-related economies of critical importance to the emerging arts entrepreneur. Topics include: creative, experimental and hybrid economies, Arts infrastructure in urban and rural areas, arts clusters, patronage, broader economic conditions effecting arts economies, the relationship of "art" to segmented technology economies.

EMA 430 Capstone Experience in Arts Entrepreneurship (3 credit hours)
Students analyze arts and arts-related businesses through the use of case studies in addition to executing an entrepreneurial project concerning the arts in a Raleigh community. This class introduces students to the decision-making skills necessary to.

Prerequisite: EMA 375
Typically offered in Spring only

EMA 493 Advanced Independent Study in Arts Entrepreneurship (1-3 credit hours)
Advanced Independent Study offering under the direction of a faculty member. Requirements for the independent study will be determined by the student and faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Stu

Typically offered in Fall, Spring, and Summer

Entrepreneurship Initiative (EI)

EI 100 Entrepreneurial Thinking in the Albright Entrepreneurs Village (1 credit hour)
Course involves active discussion about current events, case studies and assigned reading to evaluate strategies needed to think like an entrepreneur. Our students will think critically and apply basic skills needed when joining or forming teams to launch ideas or ventures. This course will host only residents of the Albright Entrepreneurs Village to discuss these ideas and build upon the living and learning community’s learning outcomes.

R: Albright Entrepreneurs Village
Typically offered in Fall only

EI 201 Exploring Interdisciplinary Entrepreneurial Thinking (3 credit hours)
Course covers the perspectives of entrepreneurial thinking from an interdisciplinary perspective including: expectations and understanding of successful entrepreneurs as well as entrepreneurial opportunities in a variety of disciplines and entities including sciences, technology, humanities and social sciences. Primary focus will be on developing the student's entrepreneurial mindset.

EI 331 Interdisciplinary Entrepreneurial Thinking I: Skills and Planning Basics (3 credit hours)
Course covers the development and application of critical skills in entrepreneurship as well as the fundamentals of entrepreneurial planning including interdisciplinary opportunity identification and feasibility analysis. Some individual off campus trav

Prerequisite: EI 201
GEP Interdisciplinary Perspectives
Typically offered in Spring only
EI 495 Independent Study in Entrepreneurship (3 credit hours)
The Independent Study in Entrepreneurship (EI 495) is designed to give students the opportunity to create their own experiential learning activity within the scope of an academic environment. EI 495 projects should be designed to meet the criteria for a 3 credit hour course. Before moving forward with the request to enroll in EI 495, the student should first work with their Independent Study sponsor to define the Independent Study contract. This course is restricted to students who have obtained faculty permission to enroll.

Typically offered in Fall, Spring, and Summer

Environmental Assessment (EA)

EA 501 Environmental Stressors (3 credit hours)
Introduces students to how organisms are affected by and respond to changes or stressors - both natural and human-induced - in the environment. With a focus on the concepts most significant to the field of environmental assessment, the course emphasizes the fundamental processes and effects of pollutants and naturally-occurring substances in the environment, including emerging issues and historically significant cases.

Prerequisite: Graduate standing

Typically offered in Fall only

EA 502 Environmental Risk Assessment (3 credit hours)
This course provides students with an appreciation and understanding of the principles of environmental risk assessment including: Hazard Identification, Toxicity Assessment, Exposure Assessment, and Risk Characterization. Emphasis is placed on contemporary problems in human health and the environment, and it will be based on the most current methodologies described in the "Risk Assessment Guidance for Superfund." Enrollment in the course requires graduate standing or consent of the instructor. Two semester sequence of college biology & college chemistry.

Prerequisite: Two semester sequence of college biology & college chemistry.

Typically offered in Spring only

EA 503 Environmental Exposure Assessment (3 credit hours)
Provides students with an appreciation and understanding of the principles of environmental exposure assessment including the sources, transport and fate of chemicals in the environment. Emphasis is on contemporary problems in human health and the environment, covering topics such as: transformation and degradation processes, classes of contaminants a well as predicting environmental fate and exposure. Enrollment in the course requires graduate standing or consent of the instructor. Two semester sequence of college biology & college chemistry.

Prerequisite: Two semester sequence of college biology & college chemistry.

Typically offered in Fall only

EA 504 Environmental Monitoring and Analysis (3 credit hours)
Monitoring and analysis of chemical and biological impacts to the environment. Theory of chemical, physical, biological, and ecological monitoring. Planning and conducting environmental sampling and monitoring programs. Management, analysis, and quality assurance and control. Enrollment in the course requires graduate standing or consent of the instructor.

Prerequisite: One Year College Biology and One Year College Chemistry

Typically offered in Summer only

EA 505 Environmental Assessment Law & Policy (3 credit hours)
This course provides students with an appreciation and understanding of the principles of environmental law and policy. Emphasis is on the US legal system and litigation process relevant to environmental law, covering topics such as: the National Environmental Policy Act (NEPA), the Pollution Prevention Act (PPA), the Clean Water Act, and the Clean Air Act. Throughout the course, a case study is integrated into the conceptual lecture material with the intent of providing practical examples to conceptual material.

Graduate standing and EA 501 and EA 502 or EA 503

Typically offered in Spring only

EA 506 Water Quality Assessment (3 credit hours)
Introduces students to topics fundamental to the understanding of aquatic systems and the processes that influence water quality. Covered topics include the hydrologic cycle, water chemistry, aquatic ecology, aquatic toxicology, water quality laws and standards, water quality assessment and techniques, and water pollution control and treatment. Emphasis is on contemporary water quality issues such as nutrient enrichment, introduced species, contaminants, and climate change.

Prerequisite: Graduate standing

Typically offered in Spring only

EA 520 Renewable Energy Policy and Economics (3 credit hours)
This course will cover global frameworks, as well as local, utility, state and federal policy and incentives that foster renewable energy implementation. It will also cover fundamental concepts of finance and economics to build a renewable energy project model that show how these policies affect the economics of a renewable energy project.

Prerequisite: Graduate standing

Typically offered in Fall only

EA 521 Fundamentals of Renewable Energy Site Assessment (3 credit hours)
This course will cover solar site assessment, wind assessment, and bioenergy with required exercises using current industry tools to assess the viability of the resource. Overview of the historical and current role of wind, solar, and bioenergy power technologies globally and the direction of each sector's evolution for the future, particularly in the USA. The course emphasizes the technology behind power generation for wind, solar, and bioenergy sectors. Students will evaluate policy and permitting issues and, consequently, determine if a site is appropriate for implementation of either or all of these technologies.

Prerequisite: Graduate Standing

Typically offered in Spring only
**Environmental Science (ES)**

**ES 100 Introduction to Environmental Sciences** (3 credit hours)
Interrelationships between human populations and the natural environment. Human population trends, agriculture, air and water pollution, biological diversity, forest and land use, energy and mineral resources, and toxic substances. Consideration of related economic factors, laws, politics, political behavior, and ethical questions.

_GEP Global Knowledge, GEP Interdisciplinary Perspectives_
_Typically offered in Fall, Spring, and Summer_

**ES 111 Applications of Environmental Sciences** (1 credit hours)
Applications of Environmental Sciences provides Environmental Sciences majors deeper exploration of topics presented in Introduction to Environmental Sciences (ES 100) through hands-on activities, small-group discussion, and interaction with environmental professionals. Students build skills in data analysis, collaboration, and communication; learn more about Environmental Sciences focal areas and how to select theirs; and begin developing peer networks and mentor relationships with others in the field. Course is restricted to Environmental Sciences majors.

Corequisite: ES 100 or student has received transfer or AP credit for ES100; Environmental Sciences majors only
_Typically offered in Spring only_

**ES 113 Earth from Space** (3 credit hours)
This course takes an orbital perspective on Earth and its natural resources. Particular attention is paid to how humans are changing Earth, challenges to sustainably managing natural resources, and how satellite Earth observation has enabled these discoveries. Students will gain a fundamental understanding of how satellite sensor systems work, how they enable us to understand the dynamic Earth, and the role that remote sensing plays in natural resource challenges.

_GEP Global Knowledge, GEP Natural Sciences_
_Typically offered in Fall only_

**ES 200 Climate Change and Sustainability** (3 credit hours)
This course explores the relationships between humans and the environment with interdisciplinary content. Focus is on past impacts of climate change on human activities and future prospects. Course content is based on lectures with students also respons

_GEP Global Knowledge, GEP Interdisciplinary Perspectives_
_Typically offered in Fall and Spring_

**ES 295 Special Topics in Environmental Science** (1-4 credit hours)
Provides instruction on rapidly emerging curriculum. Also provides courses on an experimental basis before incorporation into the curriculum. See specific course offering for course details.

_Typically offered in Fall and Spring_

**ES 300 Energy and Environment** (3 credit hours)
This course explores relationships between humans, energy, and the environment with interdisciplinary content. Themes include environmental impacts of energy production, distribution and use with discussion of new technologies. Half of the course content is from subject lectures and half from self-selected student projects. Student projects emphasize analytical approaches to solving environmental problems, and enhance skills in writing, seminars, and team work.

Prerequisite: CH 101 or PY 212 or PY 208
_GEP Global Knowledge, GEP Interdisciplinary Perspectives_
_Typically offered in Fall and Spring_

**EA 522 Photovoltaic Design and Assessment** (3 credit hours)
This course covers fundamental principles of the application, design, installation, and operation & maintenance of Photovoltaic (PV) systems in order to properly assess the best system options for a specific project or application. The course will begin with some background on electric energy and its use and delivery. In addition, the course will cover economic implications of the site and PV system considerations. Building on this foundation we will then take an in-depth look at solar photovoltaic function and design to aide students in assessing the environmental, and financial, sustainability of the project. This interdisciplinary approach allows the student to gain a comprehensive understanding of photovoltaics beyond the technical, and caters to individuals across a range of experience and expertise.

Prerequisite: Graduate Standing
_Typically offered in Fall only_

**EA 523 Assessment of Renewable Energy Storage Systems** (3 credit hours)
Energy Storage and operations and maintenance have become two areas in clean energy, particularly in the PV industry that have been rapidly evolving. This course will offer the basics of battery technology, as well as current market trends and incentives, to provide students timeless tools to assess the best possible option for a specific renewable energy + storage project. Meanwhile, the operations and maintenance portion will go through industry best practices that not only deal with technical management of a solar asset, but also understanding financial implications of the project. This interdisciplinary approach allows students of diverse STEM and non-STEM professional experience and expertise to gain a comprehensive understanding of this aspect of the solar industry.

Prerequisite: Graduate Standing and EA 522
_Typically offered in Spring only_

**EA 590 Special Topics in Environmental Assessment** (1-6 credit hours)

**EA 665 Professional Project** (1-6 credit hours)
Environmental assessment project conducted under the mentorship of a member of the graduate faculty.

Prerequisite: EA 502, EA 503, and EA 504
_Typically offered in Fall, Spring, and Summer_
ES 400 Analysis of Environmental Issues (3 credit hours)
A capstone course for students in environmental sciences or related majors. The course teaches use of analytical approaches for solving environmental problems, and for communicating results. The course emphasizes development of student projects that lead to environmental decision-making, such as devising a resource management plan, developing a predictive model, prioritizing risk, identifying tipping points, designing new software or technologies, or predicting outcomes of environmental policies. Individual student projects fit within a team framework to simulate a work environment. Students enhance writing and seminar skills. Student may incur extra expenses with projects for this course.

Prerequisite: ES 100, ES 200, ES 300 and Senior standing
Typically offered in Fall and Spring

ES 449/PRT 449 Human Dimensions of Natural Resources in Australia/New Zealand (3 credit hours)
This 3.5 week study abroad program examines human dimensions of natural and environmental conservation in Australia. The course will involve an orientation and lectures from faculty at James Cook University. Students will explore the natural environments in Australia including Great Barrier Reef, Tropical Rainforest and Outback and be introduced to Australian culture and history through interactions with communities. Educational travel, active participation, lectures, seminars, and reflective exercises facilitate learning to improve understanding of relationships between human societies and the natural environment. Students must pay program fees, airfare, some meals, and incidentals.

Corequisite: PRT 450
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Summer only

ES 450/PRT 450 Sustaining Natural Resources in Australia/New Zealand (3 credit hours)
This 3.5 week study abroad program will examine issues related to natural history and environmental conservation in Australia. The course will involve an orientation and lectures from Australian university faculty. Students will explore natural environments in Australia including the Great Barrier Reef, Tropical Rainforest and Outback; learn about sustainable development and protection of the natural environment through educational travel, field trips, active participation, lecture presentations and seminars, written assignments, research projects and reflective exercises. Students must apply through NCSU Study Abroad Office. Students must pay program fees, airfare, some meals and incidentals.

Corequisite: PRT 449
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Summer only

ES 495 Special Topics in Environmental Science (1-6 credit hours)
This course provides instruction on rapidly emerging environmental themes not currently covered in the undergraduate curriculum. Also provides courses on an experimental basis. See specific course offering for course detail.

Prerequisite: Junior standing
Typically offered in Fall and Spring

ES 496 Environmental Science Internship (1-3 credit hours)
Students can earn 1-3 credits for completing internships in the public or private sectors. Emphasis is placed on gaining work experience needed to explore and plan careers in the environmental field. Students must prepare an internship proposal. Student

Typically offered in Fall, Spring, and Summer

ES 497 Professional Development in Environmental Science (1-3 credit hours)
The course provides 1-3 credits for students who develop skills necessary to organize, promote, and participate in an event such as a workshop, conference or a seminar. Examples of acceptable events include organizing a panel of speakers on a specific topic. A speaker series, a career fair, or a workshop. The formats and topics of events are determined by the organizing student(s). Each student prepares an event proposal before the student can register for ED 497. Students must provide own transportation for professional development in environmental sciences. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

ES 498 Research in Environmental Science (1-3 credit hours)
Students can earn 1 credit in ES 498 for every 50 hours of research during a semester up to a total of 3 credits for 150 of research in a semester. A student cannot complete more than 3 credits of ES 498 research in a single semester, or more than 6 credits in their program of study. Research can be traditional laboratory and/or fieldwork, or other creative activity. The student must produce a final report, seminar, or product that can be evaluated. Typically, the work for 1-3 credit of ES 498 research will be completed in one semester. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

ES 499 Thesis in Environmental Science (3 credit hours)
ES 499 thesis provides academic credit for students who participate in original, inquiry-based learning and discovery in environmental sciences. Students present the thesis to a community of peers and experts for evaluation. ES 499 thesis requires a thesis proposal signed by the student, ES faculty advisor, a thesis host, and a supporting faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

Environmental Technology (ET)

ET 105 Introduction to Environmental Regulations (1 credit hours)
ET 105 is a 1 hour lecture/discussion class, required of all environmental technology majors. The course reviews all the major federal and state regulations and laws addressing, water air and soil pollution; solid, toxic and hazardous waste, occupational safety/health and environmental management systems. For ET majors only.

Typically offered in Spring only
ET 120 Introduction to Renewable Energy Technologies and Assessments (3 credit hours)
Overview of the various renewable energy assessment technologies. Students will learn what assessments and measurements can be taken to determine if renewable energy technologies will be effective in a particular location. Topics include biomass and biofuels, geothermal systems, solar thermal systems, photovoltaics, wind energy, and hydroelectric.

Typically offered in Spring only

ET 201 Environmental Technology Laboratory I (1 credit hours)
Use of field and laboratory instrumentation for monitoring water quantity and quality. Management, analysis, interpretation, and oral and written reporting of complex environmental data sets. Hands-on, real-world experience in water quality monitoring and maintenance. Required field trips may extend beyond class time.

Typically offered in Fall only

ET 202 Environmental Technology Laboratory II (1 credit hours)
Use of field and laboratory instrumentation for monitoring plants, soils, and natural systems. Management, analysis, interpretation, and oral and written reporting of complex environmental datasets. Hands-on, real-world experience in plant and soil quality monitoring and maintenance. Required field trips may extend beyond class time.

Typically offered in Spring only

ET 203 Pollution Prevention (1 credit hours)
This course studies the prevention of the pollution of air, water, and terrestrial ecosystems. State of the art technological solutions are discussed. The social, economic, legal and ethical dimensions of pollution prevention are integrated into the scientific and technological challenges facing developed and developing economies.

Prerequisite: ES 100
Typically offered in Fall only

ET 220 Solar Photovoltaics Assessment (3 credit hours)
This course introduces specific elements in photovoltaic (PV) systems technologies including efficiency, modules, inverters, charge controllers, batteries, and system installation. Topics include National Electric Code (NEC), electrical specifications, photovoltaic system components, array design and power integration requirements that combine to form a unified structure. Upon completion, students should be able to demonstrate an understanding of various photovoltaic designs and proper installation of NEC compliant solar electric power systems.

Prerequisite: ET 120
Typically offered in Fall only

ET 255 Hydro, Wind, and Bioenergy Assessment (3 credit hours)
Overview of the historical and current role of wind, hydro-electric, and bioenergy power technologies globally and the direction of each sector's evolution for the future particularly in the USA. The course emphasizes the technology behind power generation for wind, hydro, and bioenergy sectors. Students will evaluate policy and permitting issues and, consequently, determine if a site is appropriate for implementation of either or all of these technologies.

Prerequisite: ET 120
Typically offered in Spring only

ET 262 Renewable Energy Adoption: Barriers and Incentives (3 credit hours)
The understanding of the economic, social, and legal barriers and incentives to renewable energy adoption is an important facet to helping renewable energies reach their potential. This course explores mechanisms that can be used and that have been used successfully in the US and in other parts of the world to remove those barriers and to promote greater use of renewable resources, particularly in rural areas and on agricultural and forested lands.

Typically offered in Fall only

ET 293 Independent Study in Environmental Technology & Management (1-6 credit hours)
Independent Study for Environmental Technology & Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students"

Typically offered in Fall, Spring, and Summer

ET 294 Independent Study in Environmental Technology & Management (1-6 credit hours)
Independent Study for Environmental Technology & Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students"

Typically offered in Fall, Spring, and Summer

ET 295 Special Topics in Environmental Technology & Management (1-6 credit hours)
Special Topics in Environmental Technology & Management at the 200 Level for offering courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

ET 301 Environmental Technology Laboratory III (1 credit hours)
Assessment of and response to environmental hazards caused by hazardous materials releases. Regulatory requirements associated with hazardous materials releases. Utilization of chemical protective clothing and respiratory protection. Students passing th

Typically offered in Fall and Summer

ET 302 Environmental Technology Laboratory IV (1 credit hours)
Use of field and laboratory instrumentation for monitoring outdoor and indoor air quality. Management, analysis, interpretation, and oral and written reporting of complex environmental data sets. Hands-on, real-world experience in air quality monitoring and maintenance. Required field trips may extend beyond class time.

Typically offered in Spring only

ET 303 Laboratory Safety Systems and Management (1 credit hours)
Theory and practice of regulation, management, and auditing of laboratory safety. Laboratory field trips may extend beyond class time.

Typically offered in Spring only
ET 310 Environmental Monitoring and Analysis (3 credit hours)
Monitoring and analysis of chemical, biological, and radiation impacts to the environment. Theory of chemical, physical, biological, and ecological monitoring. Planning and conducting environmental sampling and monitoring programs. Management, analysis, and quality assurance and control. Risk assessment in environmental technology. Laboratory practice and safety.
Prerequisites: CH 101 or 100; BIO 181; ET students only
Typically offered in Spring only

ET 320/MEA 320 Fundamentals of Air Pollution (3 credit hours)
Air pollution sources, and the influence of natural and anthropogenic processes on the atmosphere. Roles of local, state and federal governments in air pollution control and importance of the Clean Air Act and its amendments.
Prerequisite: (MA 121, MA 131, or MA 141) and (PY 131 or PY 201 or PY 205 or PY 211)
Typically offered in Spring only

ET 330 Environmental Technology Practicum (3 credit hours)
Preparation for practicum, including resume writing, interviewing skills, cover letters, and practicum search techniques and resources. Professional practice as an environmental technologist. Written and oral communications of the practicum experience.
Typically offered in Fall, Spring, and Summer

ET 340 Environmental Technology Laboratory V (1 credit hour)
Scientific and legal definitions of brownfield and EPA Superfund sites. Physical, chemical, and biological methods for remediating contaminated sites. Impacts of hazardous waste management on public and private sector organizations. Field trips to public and private brownfield and Superfund remediation sites to examine real-world applications of principles. Required field trips may extend beyond class time.
Typically offered in Fall only

ET 401 Environmental Technology Laboratory V (1 credit hours)
Scientific and legal definitions of brownfield and EPA Superfund sites. Physical, chemical, and biological methods for remediating contaminated sites. Impacts of hazardous waste management on public and private sector organizations. Field trips to public and private brownfield and Superfund remediation sites to examine real-world applications of principles. Required field trips may extend beyond class time.

ET 455 Adaptive Management and Governance (3 credit hours)
Some environmental and natural resource problems are more difficult to resolve than others. The purpose of this course is to understand the factors that condition intractable or "wicked" environmental and natural resources conflicts. These factors include narrow conceptions of science, rigid bureaucratic structures and narrow policy targets. We also explore some of the alternatives for addressing intractable environmental and natural resource problems- including adaptive management and governance.
Junior standing or above
Typically offered in Fall only

ET 460 Practice of Environmental Technology (3 credit hours)
This capstone course will provide the opportunity to actively learn and apply the theory and practice of environmental project management and monitoring in order to perform a baseline Environmental Management System (EMS) assessment. EMS requires data collection, data analysis, report preparation, and professional recommendations to organizations on how to structure an EMS that conforms to internationally recognized guidelines and standards. Environmental Management Systems are proven tools specifically designed to help organizations manage their activities to meet their environmental policies and goals. Project management and EMS work skills are transferable across private industry, government, and not-for-profit organizations. This course will provide participants opportunities to advance work skills in project planning, stakeholder engagement, budgeting, and resource management when developing EMS initiatives. Course participants, as teams, will create and execute an EMS project work plan through practical hands-on experiences, local field-site visits, class exercises, and relevant case studies.
Prerequisite: ET 310 or SSC 442; and ET Senior Only
Typically offered in Spring only

ET 493 Independent Study in Environmental Technology & Management (1-6 credit hours)
Independent Study for Environmental Technology & Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in No
Typically offered in Fall, Spring, and Summer

ET 494 Independent Study in Environmental Technology & Management (1-6 credit hours)
Independent Study for Environmental Technology & Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in No
Typically offered in Fall, Spring, and Summer

ET 495 Special Topics in Environmental Technology & Management (1-6 credit hours)
Special Topics in Environmental Technology & Management at the 400 level for offering courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

Fashion and Textile Design (FTD)

FTD 104 Fashion and Textile Design First Year Studio I (6 credit hours)
This course provides Fashion and Textile Design freshman with a comprehensive introduction to foundational design concepts and methods representative of the creative thought and processes of fashion and textile design disciplines. The coursework encourages entering freshmen to think creatively through design and art, and the world around them, as they secure a skillful level of craftsmanship in the design and making of textile products. Design language, design elements and principles, and design communication and theory will be studied through readings and applications and will be experienced in person through field trips. Additional costs may be incurred for field trips.
Co-requisite: D 100
Typically offered in Fall only
FTD 105  Fashion and Textile Design First Year Studio II  (6 credit hours)
This course is the continuation of the comprehensive introduction to foundational design concepts and methods representative of creative thought and activity across design and artistic disciplines, started in FTD FY Studio I. The course work encourages first-year students to think critically and in depth about concept, context, material, and design process, for textile and fashion product development. There will be readings and applications in advanced design theory, including processes, methods, philosophies and related concepts. The class will involve field trips to experience these advanced design principles in person. Additional costs may be incurred.
Prerequisites: D 100 and FTD 104; Co-requisites: D 101 and FTD 200
Typically offered in Spring only

FTD 200  Design Skills Workshop  (3 credit hours)
First course in developing student's use of design tools for the production of prototype products from textile materials, beginning with the selection of appropriate fabric and other raw materials and extending through critiquing the product. Concepts of ethical and sustainable design are built into the analysis and design of the product. A variety of techniques for designing sewn textile products are explored, as well as methods and safe practices for using equipment in the studio. FTD Majors Only.
Prerequisite: TT 105 and Corequisite: D 105
Typically offered in Spring only

FTD 201  Computer-Aided Textile Design and Color Studio  (6 credit hours)
Application of industry textile design and visualization software to conception, design, development and presentation of creative textiles and textile products. Essential creative skills for textile design, such as motif and repeat development, will be introduced. Textile design solutions will be sampled using industrial technologies such as a digital printing, electronic knitting and computer-driven weaving. Color will be explored as a primary designer's tool including use in textile design, sensitivity and skills in communicating color, color perception and color theories, and color forecasting, creative projects will build skills in CAD for textiles and color. Additional costs may be incurred for course materials/equipment. FTD majors only.
Prerequisite: D101, D103, FTD 105, and a grade of C or better in FTD 200
Typically offered in Fall only

FTD 215  Fashion Design 1  (3 credit hours)
Studio course which introduces students to the basic rules and principles of flat pattern-making for apparel products. Advanced applications will be demonstrated through workshops utilizing concept-driven problems and follow-up critiques. Concurrent pr
Prerequisite: Grade of C or better in FTD 200 and Corequisite: FTD 201
Typically offered in Fall only

FTD 216  Fashion Workroom Practices  (3 credit hours)
Studio course introducing the basic concepts and practices for the creation of final garments and extending through quality analysis of the final product. Incorporates workroom techniques for production of a variety of sewn product applications using va
Prerequisite: (Grade of C or better in FTD 200) or (Grade of C or better in FTM 219)
Typically offered in Spring only

FTD 218  Fashion Illustration  (3 credit hours)
Concepts and practices for the fashion figure and fashion illustration, including the analysis of fashion figure structure details, proportion, and fashion figures clothed with different apparel and materials. The training of effective drawing of different fashion styles, wearing status and occasions, and the study of applying multiple illustration approaches to enhance fashion design and presentation. Additional costs may be incurred for course materials/equipment. FTD and FTM majors only.
Prerequisite: ADN 281
Typically offered in Spring only

FTD 321  Fashion Design by Draping  (3 credit hours)
Exploration of three-dimensional methods of apparel design using textile substrates. Design and execution of draped garment structures will be explored in a studio setting. Additional costs may be incurred for course materials/equipment. FTD and FTM m
Prerequisite: (C or better in FTD 215 and FTM 216) or (C or better in FTM 219 and FTM 315)
Typically offered in Fall only

FTD 373  Yarn Design Studio  (3 credit hours)
Design of yarns and sample production, including the creation of novelty yarns, fancy yarns, and innovative effects in spun and plied fibers. Exploration of color, luster, twist, and slab variations in yarns to address both functional and aesthetic challenges. Studio experiences in creating innovative yarns appropriate for use in different fabric formation technologies. Additional costs may be incurred for course materials/equipment. FTD majors only.
Prerequisite: TT 221 or TTM 106 and a grade of C or better in FTD 201
Typically offered in Spring only

FTD 374  Surface Design and Texture  (3 credit hours)
Exploration of innovative surface design and texture techniques for commercial and art applications. Embroidery, applique, stitching, fabric manipulation and aesthetic finishing processes for creative and functional design will be taught in state of the art facilities including digital printing, screen printing, cad embroidery, and industrial cad software for print design. Additional costs may be incurred for course materials/equipment. FTD majors only.
Prerequisite: TT 105 and a grade of C or better in FTD 200 and FTD 201
Typically offered in Spring only

FTD 375  Woven Textile Design Studio I  (3 credit hours)
Design and sample production of woven fabrics. Exploration of basic structures, color and textural effects. Development of design abilities through creative projects executed using hand production methods, including an introduction to computer-integrated woven textile design systems and industrial processes. Study of actual fabrics and digital images, presentations will be made. Studio experience will be augmented, when possible, through outside speakers and field trips to mills. Additional costs may be incurred for course materials/equipment. FTD majors only.
Prerequisite: Grade of C or better in both TT252 and FTD 373
Typically offered in Fall only
FTD 376 Knitted Textile Design Studio I (3 credit hours)
Design and sample production of hand and machine knitted textiles. Exploration of basic structures, terms and definitions, including knitting notation and terminology. Development of creative knitted products utilizing design abilities and appropriate yarns through hand and machine production methods. Introduction to computer integrated knit design system and industrial knitting products and processes. Additional costs may be incurred for course material/equipment. FTD majors only.
Prerequisite: Grade of C or better in both TT252 and FTD 373
Typically offered in Fall only

FTD 419 Fashion Design 2 (3 credit hours)
Studio course which poses fashion problems to be solved with an emphasis on elements of design. Explores use of experimentation and development of “studies” as an aid in developing design ideas. Uses combination of flat pattern and CAD. Introduction to grading, marker making, and computer-controlled cutting. Additional costs may be incurred for course materials/equipment. FTD majors only.
Prerequisite: Grade of C or better in FTD 215, FTD 216, FTM 317, and FTD 321
Typically offered in Fall only

FTD 420 Fashion Collection Preparation (3 credit hours)
Studio course exploring sources of inspiration requiring students to research, develop and translate ideas into a line plan for a collection of garments. Stresses the extension and elaboration of ideas within a specific market. Integrates knowledge across the curriculum. Student may work with a firm, contest, or current theme to develop a fashion design statement. Additional costs may be incurred for course materials/equipment. FTD and FTM majors: Fashion Design and Fashion Development concentrations only.
Prerequisite: Grade of C or better in FTM 318 or (FTD 321 and co-requisite of FTD 419)
Typically offered in Fall only

FTD 476 Knitted Textile Design Studio II (3 credit hours)
Further development of knit design beyond basic design concepts and knit structures to product application. Development of creative knitted products utilizing design abilities through hand and machine production methods, including advanced methods of utilizing computer-integrated design system for both technical structures of knits and designing of garments and shaped panels. Exploration in yarn, color, and pattern design using electronic jacquard, fully fashion and seamless knitting equipment and cad systems. Consideration of other knit technologies such as warp knitting, terry, and crochet. Students will develop specifications for knitted products, and enhance understanding of industrial products and processes. Additional costs may be incurred for course material/equipment. FTD majors only.
Prerequisite: Grade of C or better in FTD 376
Typically offered in Fall only

FTD 479 Senior Textile Design Studio (6 credit hours)
Design and execution of creative projects integrating learning within curriculum, solution of textile design problems through synthesis of knowledge and skills gained through previous courses, preparation of work for portfolio, exhibition and participation in industry focused design competitions. Professional textile design practices and methods including advanced portfolio development concepts and presentation, development of textile collections suited to specified end use with emphasis on ideation, refinement, and design development, presentation and visual communication. The student will be expected to work with design, science, engineering, technology, and management disciplines. Additional costs may be incurred for course materials/equipment. Senior Standing, BS Fashion and Textile Design, Textile Design majors ONLY.
Prerequisite: FTD 374, FTD 475, FTD 476
Typically offered in Spring only

Fashion and Textile Management (FTM)

FTM 217 The Textile Industry (3 credit hours)
Study of the structure and organization of the integrated textile complex and its strategic functions. Critical stages involved in the manufacture of textile and apparel products. Fundamental aspects of cost management and finance as related to the industry
Prerequisite: TT 105
Typically offered in Fall, Spring, and Summer

FTM 219 Fashion Product Analysis (3 credit hours)
Concepts and practices for the production and evaluation of fashion goods, beginning with selection of fabric and other raw materials and extending through quality analysis of the final product. Provide techniques for production of a variety of garment applications, as well as methods for evaluation.

Typically offered in Fall and Spring
FTM 220  **Principles of Retailing and Supply Chain Management in Textiles**  (3 credit hours)
Introduction to theories and principles in fashion and textiles retailing and supply chain management including; the framework of textile retailing, textile retail strategies, textile supply chains and investigation of the strategic planning process. Emphasis placed on conducting an environmental scan, identifying and targeting the consumer, analyzing the trade area, site selection and textile product merchandising planning.
Prerequisite: FTM 217
Typically offered in Fall, Spring, and Summer

FTM 271  **Computer-Aided Textile Design**  (3 credit hours)
Introduction to the operation of design software for woven, knitted and printed textiles. Adobe Photoshop, Pointcarre’ and Monarch programs will be taught. Peripheral equipment essential to the design process will be included. Field trips to areatextile design centers. Credit not allowed for students enrolled in TT curriculum with the exception of the dual degree in the Bachelor of Art and Design and BS in Textile Technology.
Typically offered in Fall and Spring

FTM 282  **Introduction to Textile Brand Management and Marketing**  (3 credit hours)
An introduction to the essential elements of brand management and marketing with specific reference to the marketing of textile and apparel goods with the integrated textile complex (from fiber to retail). The course covers both the principles and practice of marketing, in general, and provides an introduction of major concepts of brand management and marketing with a focus on branding activities used in by major textile and apparel firms within the integrated textile supply chain.
Typically offered in Fall and Spring

FTM 310  **Entrepreneurship & New Product Development in Textiles**  (3 credit hours)
Academic dimensions of the entrepreneurship body of knowledge. Integration of new product development (NPD) process and entrepreneurship in textiles. Critical thinking skills for the textile entrepreneurial mindset. Teams exercise entrepreneurial skills
Prerequisite: Junior standing
Typically offered in Fall and Spring

FTM 315  **Fashion Product Design**  (3 credit hours)
Concepts and practices for the design and development of fashion apparel items, beginning with selection of fabric and other raw materials and extending through flat pattern development, pattern engineering, and generation of final garments. Provide techniques for development of styled patterns, which address issues of body measurements, body shape, comfort and fit.
Prerequisite: FTM 217 and FTM 219
Typically offered in Fall and Spring

FTM 317  **Computer-Aided-Design for Apparel**  (3 credit hours)
Introduction to the operation of industry design software for apparel & other sewn products. Euphoria and/or Artworks visual design programs, Gerber Accumark or Lectra pattern design programs, and other programs used by the industry to create, market and/or visualize products will be taught. Peripheral equipment essential to the design process will be included.
Prerequisite: FTD 215 or Corequisite: FTM 315
Typically offered in Fall and Spring

FTM 318  **Fashion Development Processes**  (3 credit hours)
The principles of apparel manufacturing including computerization of the design; marker making and production areas; spreading and cutting technology; apparel assembly systems; production systems evaluations; fusing and pressing; production capacity; an
Prerequisite: FTM 317
Typically offered in Fall and Spring

FTM 320  **Retail Merchandising in Fashion and Textiles**  (3 credit hours)
An in-depth study of textile product merchandising and its functions, focusing on a comprehensive approach to textile product merchandising that links manufacturing and retailing to the consumer through the merchandising process. Textile merchandising as a process is studied in newly restructured consumer-centric businesses and textile product strategy needed for employees to function successfully in today's global, integrated world of merchandising.
Prerequisite: FTM 220
Typically offered in Fall only

FTM 380/TT 380  **Management and Control of Textile and Apparel Systems**  (3 credit hours)
Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.
Prerequisite: FTM 217
Typically offered in Fall only

FTM 382  **Intermediate Textile Brand Management and Marketing**  (3 credit hours)
This course builds on the introduction of the basic concepts introduced in TAM 282 by providing an in-depth examination of the major theories and concepts associated with brand management and brand marketing. Included is the identification and analysis
Prerequisite: FTM 282 and (EC 201 or ARE 201)
Typically offered in Fall, Spring, and Summer

FTM 384  **Visual Merchandising Principles and Management**  (3 credit hours)
Study and application of techniques in the effective display of merchandise, from fiber to finished product. The focus of the course placed on the integration of textile and apparel product characteristics, target market characteristics and the latest merchandising technology and concepts.
Prerequisite: Junior standing or higher, FTM 217, Corequisite: FTM 382
Typically offered in Spring only

FTM 385  **Fashion and the Consumer**  (3 credit hours)
This course focuses on consumer decision process for textile products, including the study of environmental, individual, psychological and marketing influences on behavior of consumers in the textile consumption process. Further examination will include influences on the process, including fashion theories, the mass media, demographics and psychographics, and societal trends. Current development and research in the textile consumer decision process are reviewed.
Prerequisite: FTM 217, FTM 282
Typically offered in Fall, Spring, and Summer
FTM 387 Textile Brand Communications & Promotions (3 credit hours)
Examines the utilization of textile brand marketing communication and promotion tools to build, maintain or expand a brand's value in the textile complex marketplace. Includes examination of principles and theories for Integrated Brand Marketing (IBMC) and how these strategies and tactics are used within the textile complex advance brand positioning. Knowledge of IBMC will be demonstrated via case studies, examination and textile industry-related application projects. FTM Majors Only
Prerequisite: FTM 382
Typically offered in Fall and Spring

FTM 400 Major Fashion Designers (3 credit hours)
Study of fashion designers from the early 1800s to the present. Emphasis will be placed on historical and cultural events that may have influenced the work of fashion designers during the time and trends that have emerged. Of specific interest will be m

GEP Visual and Performing Arts
Typically offered in Spring and Summer

FTM 415 Fashion Product Development (3 credit hours)
Fashion product development for specific target markets. Line production using various methods of generating patterns for mass-produced apparel with emphasis on "flat pattern" design techniques. Relationship of body configuration to pattern shape, specifications to garment size and fit, standards for judging fit, distinctions between ease and style fullness, and design analysis procedures are included.
Prerequisite: FTM 318
Typically offered in Fall and Spring

FTM 416 The Fashion Industry (3 credit hours)
Planning and sourcing of fashion apparel products to meet the needs of the consumer. Emphasis is placed on the role of the merchandiser and merchandising function together with the measures of performance required by the fashion businesses. The interactions of the merchandiser with the functions of marketing, design, development and sourcing during pre-production are studied with respect to successful sourcing. Sourcing is studied from the requirements of compliance, product quality, cost, and manufacturing capability.
Prerequisite: Senior standing
Typically offered in Fall and Spring

FTM 420 Retail Buying in Fashion and Textiles (3 credit hours)
Overview and analysis of the components of buying and selling products at he retail level. Management of profit factors to improve performance in textile merchandising driven organizations. Analysis of the practices, procedures and systems that track textile merchandising decisions and aid in meeting profit goals. The course consists of an integrated framework that applies merchandising theory and mathematical processes to textile retail problems.
Prerequisite: FTM 320
Typically offered in Spring only

FTM 431 Quality Management and Control In Textile Manufacturing (3 credit hours)
Principles of quality and process management and control in textile/apparel manufacturing with emphases in quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.
Prerequisite: TT 221, TT 252, TT 331, and ST 361 or BUS 350

FTM 460 Textile Market Research (3 credit hours)
Data from textile and apparel industry firms are utilized to explore the role of marketing research in managerial decision-making within the textile and apparel industry, and allow students to develop basic skills in the market research process (problem identification to final reporting). Topics included are problem formulation, research design, data collection (instruments and sampling), and data analysis techniques (qualitative and quantitative).
Prerequisites: FTM 382 and (ST 311, ST 361, or ST 370)
Typically offered in Spring only

FTM 480/TT 480 Operations Management Decisions for Textiles (3 credit hours)
Quantitative techniques for decision making and management in the textile complex. Applications include vendor selection, plant location, retail inventory management, forcasting demand, project management, and logistics planning. Techniques covered include simulation, PERT/CPM, mathematical modeling.
Prerequisite: TT/FTM 380 and ACC 210 and ST 311 or ST 370 and ((MA 131 and 132) or MA 141)
Typically offered in Fall only

FTM 481 Product Costing in the Textile and Apparel Industry (3 credit hours)
Capstone course covering cost issues in yarn manufacturing, fabric formation, finishing, apparel production and retail operations. Traditional and activity-based costing systems will be addressed. Relevance of costing to managerial decisions as well as cost reduction strategies will be emphasized.
Typically offered in Spring and Summer

FTM 482 Advanced Textile Brand Management and Marketing (3 credit hours)
An applied textile marketing course that integrates textile product development, brand management, and global marketing. This course provides an overview of the global textile and apparel industries, their distribution channels and markets—with positioning the US textile, apparel, and retail industries in the global competitive environment. The course includes diverse textile end uses, including apparel, nonwovens, home textiles, transportation textiles and medical textiles. Development and implementation strategies of launching textile products in the global marketplace are analyzed.
Prerequisite: FTM 382
Typically offered in Fall, Spring, and Summer
FTM 483 Global Trade & Sourcing  (3 credit hours)
This course provides students with an understanding and appreciation of the global textile and apparel market. Included is the explanation and guidance in understanding the uniqueness of textile and apparel regulations in global trade. Students will learn global sourcing strategies and the identification and analysis of major strategic decisions used in global sourcing, as impacted by global trade dynamics. Students will be assigned practical application projects that require utilization of academic knowledge with industry application.

Prerequisite: FTM 282 and EC 201 or ARE 201 or EC 205
Typically offered in Fall and Spring

FTM 484 Strategic Planning and Decision Making in the Textile and Fashion Industries  (3 credit hours)
The course provides a framework for understanding and analyzing strategic planning and decision making in the textile and apparel supply chain, from fiber through retail. It integrates theory and practice through lectures, case studies, and exercises to provide students an understanding of the competitive dynamics in the textile industry, including structural and behavioral components and the role of entrepreneurship.

Prerequisite: BUS 320 or FTM/TT 380, and TT 221 or equivalent
Typically offered in Fall and Summer

FTM 485/TT 485 Textile Computer Integrated Enterprise  (3 credit hours)
Survey of information technology in textile and apparel industries. Topics discussed include: computer aided design (CAD); computer aided manufacturing (CAM); computer aided engineering (CAE); material handling systems; automation and robotics; logistics and warehousing systems; retail product tracking, and Internet resources.

Prerequisite: TT/FTM 380
Typically offered in Fall only

FTM 486/TT 486 Supply Chain Management in the Textile Industry  (3 credit hours)
Study of the operations necessary to produce and distribute a product, starting with the procurement of the raw material used in making the goods and ending with the delivery of the finished product. Topics covered include approaches to solving problems in manufacturing, sourcing, transportation logistics, and retail operations within the Integrated Textile Complex. Credit cannot be given for both TAM486 and MT386.

Prerequisite: TT/FTM 380
Typically offered in Spring only

FTM 487 Textile and Apparel Labor Management  (3 credit hours)
Labor management problems. Emphasis directed toward role of production supervision in textile and apparel plants. Study of NLRB decisions and court opinions involving textile and apparel corporations.

Prerequisite: Senior standing
Typically offered in Fall and Spring

FTM 490 Development Projects in Textile and Apparel Management  (1-3 credit hours)
Directed research in Textile and Apparel Management through experimental, theoretical and literature studies in textile and apparel-related problems. Courses may be taken twice provided projects are different subject matter.

Prerequisite: Junior standing and 2.75 GPA
Typically offered in Fall and Spring

FTM 491 Special Topics in Textile and Apparel Management  (1-4 credit hours)
Special topics related to textile and apparel management.

Prerequisite: Senior standing

FTM 494 International Industrial Internship in Textile Management  (3 credit hours)
Professional level work experience in textile management abroad, relating academic training, international textile management and technology to industrial practice under professional guidance. Grading based on written report and oral presentation. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: At least FL 202 for internships in non-English speaking countries, Minimum GPA 2.5, Junior standing
Typically offered in Fall and Spring

FTM 497 Senior Fashion Collection Studio  (6 credit hours)
Advanced fashion product design. Design and production of a "collection" using various methods of generating patterns for garments, such as flat pattern, draping, and CAD techniques. Relationships of body configuration and fabrication to garment design. Emphasis on ideation, creativity, communication, theme development, fit, quality, and exhibition of a fashion collection. Work culminates in a Fashion show or Static exhibition format.

Prerequisite: FTM 318
Typically offered in Fall and Spring

FTM 499 Textile Senior Project  (4 credit hours)
This is a project based course to be taken in the last semester of the Senior year. In this capstone course the students work in cross-functional teams to research and solve applied problems in textile related fields. The results of the projects will

Prerequisite: Senior standing

Feed Mill (FM)

FM 272 Swine Feed Mill Management  (1 credit hours)
Principles of feed manufacturing, equipment operation, feed and ingredient quality assurance and regulatory compliance in a modern feed milling operation. Overview of feed mill regulations and safety.

"Restriction: Restricted to non-ANS (Animal Science) students. ANS students cannot take the course for credit."
Typically offered in Fall only
**FM 425/PO 425/NTR 525/FM 525/ANS 525/PO 525/NTR 425/ANS 425 Feed Manufacturing Technology (3 credit hours)**

Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225

Typically offered in Fall and Spring

**FM 426/PO 426 Feed Manufacturing Technology Laboratory (1 credit hours)**

Laboratory associated with feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture. PO/ANS/FM 425 is a required course for the Poultry Science Technology Concentration (TPS); the Feed Milling Minor (FEM); and the Feed Mill Certificate.

Corequisite: PO 425 or ANS 425 or FM 425 and FEM minor or 11PLTRYBS

Typically offered in Spring only

**FM 460 Feed Mill Operations and Leadership (3 credit hours)**

Principles and current practices of modern feed mill operations. Topics include managing employees, team building, safety, budgets, regulations, and key performance indicators.

Prerequisite: ANS 425 or FM 425 or PO 425

Typically offered in Spring only

**FM 480 Feed Quality Assurance & Formulation (3 credit hours)**

Introduction to the principles of ingredient and feed quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of approved suppliers, ingredient specifications, feed manufacturing procedures, and formulation based on dynamic ingredient matrices.

Prerequisite: PO(ANS) 425

Typically offered in Fall only

**FM 490 Feed Science Seminar (1 credit hours)**

Exploration of topics related with current and future potential to influence the feed industry. Guest lectures from feed industry leaders and university representatives will include: vertically integrated and commercial feed production, current research topics, government regulations, trade organizations, and quality assurance.

Typically offered in Fall only

**FM 494 Feed Mill Learning Experience (1 credit hours)**

Hands-on laboratory teaching students how to safely operate feed mill equipment and manufacture feed using a computer system.

Prerequisite: PO(ANS) 425

Typically offered in Fall, Spring, and Summer

**FM 525/ANS 525/PO 525/NTR 425/ANS 425/FM 425/PO 425/NTR 525 Feed Manufacturing Technology (3 credit hours)**

Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225

Typically offered in Fall and Spring

**FM 580/PO 580 Feed and Ingredient Quality Assurance (3 credit hours)**

The course will teach students the principles of feed and ingredient quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of an approved supplier list, ingredient specifications, feed manufacturing quality assurance procedures, and risk based feed safety programs.

Prerequisite: NTR(FM) 525

Typically offered in Fall only

**FM 594 Advanced Feed Mill Practicum (1 credit hours)**

This course will teach students the principles of operating a modern feed mill. Students will receive ingredients, grind grain, manufacture feed, and perform quality checks on finished feed products. Students will complete safety, quality assurance, and feed processing training units as part of their training.

Prerequisite: NTR(FM) 525

Typically offered in Fall and Spring

**FM 706/NTR 706 Vitamin Metabolism (3 credit hours)**

Structures, chemical and physical properties, functions, distribution, absorption, transport, metabolism, storage, excretion, deficiencies, and toxicity of vitamins in humans and domestic animals. Interactions between vitamins and other factors affecting vitamin metabolism or bioavailability as well as the nutritional significance of essential fatty acids and metabolism of prostaglandins, prostacyclins and leukotrienes. Application of knowledge will include critical review of scientific literature, experimental design, and formulation of vitamin supplements.

Prerequisite: ANS(NTR,PO) 415 and BCH 453

Typically offered in Fall only

**FM 790/NTR 790 Advanced Feed Formulation (3 credit hours)**

Principles of feed and ingredient quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of an approved supplier list, ingredient specifications, feed manufacturing quality assurance procedures, and risk based feed safety programs.

Prerequisite: NTR(FM) 525

Typically offered in Fall only

**Fiber and Polymer Science (FPS)**

**FPS 696 Summer Thesis Res (1 credit hours)**
FPS 710/TC 710 Science of Dye Chemistry, Dyeing, Printing and Finishing (3 credit hours)
The primary course purpose is to gain a strong fundamental understanding of the chemistry and technology of preparation, dyes, dyeing and finishes. Emphasis will be on the chemistry of different bleach activators, surfactants, photophysics and photochemistry of FWA, modulations of dyes structures to influence color, textural strength, light fastness, wash fastness and aggregation. Chemistry of different dye classes will be studied with emphasis on structure-property relationships and dye-fiber interactions. Dyeing isotherms (Nernst and Langmuir), kinetics of dyeing with emphasis on derivation of Nernst and Langmuir based on thermodynamics and kinetics principles will be covered with practical examples of dyeing at different temperature and how to calculate thermodynamic parameters of dyeing (entropy, standard affinity and isotherm constants of Nernst and Langmuir).
Chemistry of different finishes, including soil release, chemistry of flame retardants and mechanisms of flame retardancy, antimicrobial and water and oil repellency, will be covered with emphasis on structure-property relationships.
Prerequisite: Graduate Standing and C or better in CH221 or CH225 and CH223 or CH227
Typically offered in Fall and Spring

FPS 750/TTM 750 Advances in Fabric Formation, Structure, and Properties (3 credit hours)
The course covers different aspects of the processing of yarns to products (braided, knitted, woven, and their composites) and the interrelation between the production mechanics and structure, geometry and properties of fiber assembly. Topics in the field are assigned and each student is expected to thoroughly study the topics and write critical papers based on structured assignments and specific questions. Conduct projects from concept to fabric formation, analyses, and evaluation.
Prerequisite: TT 550 or TT 551 (or TT 451) or equivalent
Typically offered in Spring only

FPS 770 Advances in Polymer Science (3 credit hours)
This course provides an overview of the unique features of polymer materials that distinguish them from those composed of small-molecules or atoms (Polymer Physics) and the connections between their detailed molecular structures and their properties
Restriction: Graduate Standing in Fiber and Polymer Science, Textile Chemistry, Textile Engineering, Material Science and Engineering, Chemical Engineering, Chemistry and Physics, or by permission of the instructor.
Typically offered in Fall only

FPS 792 Special Topics in Fiber Science (1-6 credit hours)

FPS 801 Seminar (1 credit hours)
Typically offered in Fall and Spring

FPS 830 Independent Study (1-3 credit hours)
Typically offered in Fall and Spring

FPS 876 Special Project in Fiber and Polymer Sciences (1-12 credit hours)
Typically offered in Fall only

FPS 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

FPS 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

FPS 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

FPS 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

FPS 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

FPS 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

Financial Mathematics (FIM)

FIM 500 Career Development for Quants (3 credit hours)
Enhance your professional and career development skills while you are in the Financial Math program with seminar topics on networking, LinkedIn, resumes, interviews, presentations and business writing tips. Learn about workplace etiquette and business ethics. You will also gain resources and important industry information from guest speakers and alumni. Become Base SAS Certified and Bloomberg Certified, and gain hands-on experience with these tools by participating in group and individual projects. Course includes one or more projects that expose students to applications in the area of financial mathematics. Students that wish to develop SAS programming skills are encouraged to take ST 555/556.
Must be in the Masters of Financial Mathematics program.
Typically offered in Fall only
FIM 528/MA 528/ECG 528/MBA 528 Options and Derivatives
Pricing (3 credit hours)
The course covers (i) structure and operation of derivative markets, (ii) valuation of derivatives, (iii) hedging of derivatives, and (iv) applications of derivatives in areas of risk management and financial engineering. Models and pricing techniques include Black-Scholes model, binomial trees, Monte-Carlo simulation. Specific topics include simple no-arbitrage pricing relations for futures/forward contracts; put-call parity relationship; delta, gamma, and vega hedging; implied volatility and statistical properties; dynamic hedging strategies; interest-rate risk, pricing of fixed-income product; credit risk, pricing of defaultable securities.
Prerequisites: MA 341 and MA 405 and MA 421
Typically offered in Fall only

FIM 548/MA 548 Monte Carlo Methods for Financial Math (3 credit hours)
Monte Carlo (MC) methods for accurate option pricing, hedging and risk management. Modeling using stochastic asset models (e.g. geometric Brownian motion) and parameter estimation. Stochastic models, including use of random number generators, random paths and discretization methods (e.g. Euler-Maruyama method), and variance reduction. Implementation using Matlab. Incorporation of the latest developments regarding MC methods and their uses in Finance.
Prerequisites: (MA 421 or ST 421), MA 341, and MA 405
Typically offered in Spring only

FIM 549/MA 549 Financial Risk Analysis (3 credit hours)
This course focuses on mathematical methods to analyze and manage risks associated with financial derivatives. Topics covered include aggregate loss distributions, extreme value theory, default probabilities, Value-at-Risk and expected shortfall, coherent risk measures, correlation and copula, applications of principle component analysis and Monte Carlo simulations in financial risk management, how to use stochastic differential equations to price financial risk derivatives, and how to back-test and stress-test models.
Prerequisites: MA 405 and (MA 421 or ST 421) and (MA/ST 412 or MA/ ST 413)
Typically offered in Spring only

FIM 590 Special Topics in FIM (1-6 credit hours)
Special Topics in FIM

FIM 601 Seminar in Financial Mathematics (1 credit hours)
Seminar in Financial Mathematics
Prerequisite: FIM 500
Typically offered in Fall and Spring

FIM 610 Special Topics in Financial Mathematics (1-6 credit hours)
Special Topics in Financial Mathematics

FIM 620 Special Problems in FIM (1-6 credit hours)
Special Problems in FIM

FIM 650 Internship in Financial Mathematics (1-9 credit hours)
The internship experience provides the students the opportunity to use quantitative financial mathematics in a workplace under the supervision of a practitioner. Links academic theory to practice. Develop a heightened awareness of workplace issues as th

Must be a student registered in the Masters of Financial Mathematics program.
Typically offered in Fall, Spring, and Summer

FIM 675 Project in Financial Mathematics (1-3 credit hours)
The project provides the students the opportunity to apply quantitative financial mathematics to a problem of practical interest under the supervision of faculty and/or practitioners. Links academic theory to applications. Examine a practical problem fr

Must be a student registered in the Masters of Financial Mathematics program.
Typically offered in Fall, Spring, and Summer

FIM 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
Non-Thesis Masters Continuous Registration - Half Time Registration
Typically offered in Spring only

FIM 689 Non-Thesis Masters Continuous Registration - Full Time Registration (3 credit hours)
Non-Thesis Masters Continuous Registration - Full Time Registration
Typically offered in Fall and Spring

FIM 693 Master's Supervised Research (1-9 credit hours)
Master's Supervised Research
Typically offered in Fall, Spring, and Summer

Fisheries & Wildlife Sciences (FW)

FW 221 Conservation of Natural Resources (3 credit hours)
This course examines the importance of natural resources and their role in the progress of human civilization. Physical, biological and ecological principles are described that underlie sustainability of natural resources, particularly as these relate to the consequence of human impacts as resources are used to meet societal needs. The course emphasizes renewable natural resources, the importance of habitat, and a broadly-international context. The course has an optimistic perspective that life on Earth can and will be better in the future if we learn and practice good resource management today.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

FW 293 Independent Study in Fisheries, Wildlife, and Conservation Biology (1-6 credit hours)
Independent Study for Fisheries, Wildlife, and Conservation Biology students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

FW 294 Independent Study in Fisheries, Wildlife, and Conservation Biology (1-6 credit hours)
Independent Study for Fisheries, Wildlife, and Conservation Biology students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer
FW 311 Piedmont Wildlife Ecology and Management (3 credit hours)
This 3-week course will involve relationships of wildlife and habitat, the use of GIS and GPS, the use of new technology (PIT tags, radio telemetry), and field identification of habitats and animals. This course is taught off-campus at Hill Forest. It is a 3-week residential camp with side trips and overnight trips. Class meets all day for 3 weeks. Additional charge for room and board. Students must provide their own transportation to Hill Forest. Junior standing in one of the following: FOM, NRE, SFW, SFF, SZO, ESC.

Typically offered in Summer only

FW 312 Fisheries Techniques and Management (1 credit hours)
Field exercises in aquatic environments emphasizing assessment of habitat, fish, invertebrates, plants, and ecological relationships to form the basis of describing and solving management dilemmas. Taught off-campus at Hill Forest. 5 day residential camp. Local travel required to various aquatic ecosystems. Additional charges for room and board.

Corequisite: FW 311 and FW 313
Typically offered in Summer only

FW 313 Mountain Wildlife Ecology and Management (1 credit hours)
Visit different mountain communities along an elevation gradient from 2,000 to 6,000 feet and observe changes in plant and animal communities. Discuss wildlife and fisheries management issues, interact with agency personnel responsible for managing mountain fisheries and wildlife. One-week field trip to the North Carolina mountains. Additional charges for room and board.

Corequisite: FW 311 and FW 312
Typically offered in Summer only

FW 314 Coastal Ecology and Management (1 credit hours)
Hands-on study of the fishery and wildlife resources associated with North Carolina coastal plain habitats. These habitats will include estuarine, ocean, longleaf pine savanna, pocosin, and Carolina bays. Common techniques and concepts used in terrestrial, marine, and estuarine ecology and management will be taught. Field identification of habitats, animals, and plants. Use of multiple sampling gear including bottom trawl, beam trawl, beach seine, gill nets, and coverboards. Use of water quality measurement equipment. This course meets all day for 1 week off-campus at CMAST in Morehead City, NC. Additional charge for room and board and boat rental. Students must provide their own transportation to CMAST.

Prerequisite: BIO 181
Typically offered in Summer only

FW 333 Conservation Biology in Practice (3 credit hours)
An introductory course designed to focus on the scientific fundamentals of conservation biology, including population dynamics, extinction and its causes, metapopulations, modeling, population viability analysis, the design and management of protected areas, rare species management, and captive breeding and release programs. Students will participate in active learning exercises, projects, and debates. Projects will require students to make their own arrangements for transportation to field locations within Wake County.

Prerequisite: FW 221 or PB 360 or BIO 360 or FOR 260
Typically offered in Fall only

FW 353 Wildlife Management (3 credit hours)
Historical development of Wildlife Management from anecdotal, observational practices to modern, scientific approaches used around the world. Principles of population analysis, management, protection and conservation of animals, particularly those of conservation, aesthetic, sport or food values in urban, rural and wilderness areas. Ethics of hunting and trapping. Contradictory objectives challenging modern wildlife managers.

R: Sophomore Standing
Typically offered in Fall only

FW 373 Vertebrate Natural History (3 credit hours)
This course provides an introduction to the natural history of vertebrates, including fish, amphibians, reptiles, birds, and mammals. The emphasis is on systematics, identification, and natural history of each vertebrate group.

Prerequisite: BIO 360 or PB 360
Typically offered in Spring only

FW 403 Urban Wildlife Management (3 credit hours)
Issues facing wildlife in urbanizing landscapes and the general courses of action to minimize the negative effects of urbanization on native wildlife. Large-scale planning and zoning for roads, developments and open space; meso-scale planning and landscaping of new neighborhoods and other developments; and small-scale landscaping for backyard habitats. Coexistence between wildlife and humans in urban environments and management of wildlife damage to human property.

Prerequisite: Junior standing.
GEP Natural Sciences
Typically offered in Fall only

FW 404 Wildlife Habitat Management (3 credit hours)
Relationships between forest and wildlife management and the effects of silvicultural systems on wildlife. Species-habitat requirements, forest wildlife management techniques, and forest-wildlife policies and economics.

Prerequisite: Junior standing
Typically offered in Fall only

FW 405 Tropical Wildlife Ecology (3 credit hours)
This course provides an overview of tropical wildlife ecology and management, sustainable land use, and local culture. The course addresses the challenges of natural resource conservation in a developing country and the sustainable approaches that may be used to conserve natural resources there. Various methods to sample wildlife will be employed during the visit to a tropical country (Ecuador, Nicaragua, etc.), but emphasis will be on the use of mist nets in long-term bird monitoring program. Expenses associated with this course are the responsibility of the student. Requires instructor approval. Students register for this course through the Study Abroad Office.

Typically offered in Fall only
FW 411/FW 511 Human Dimensions of Wildlife and Fisheries (3 credit hours)
Study of human interactions with wildlife and fisheries, including principles important for understanding and addressing wildlife management and conservation challenges. Discussions of wildlife at the urban fringe, human attitudes towards hunting and fishing, and the public trust approach to wildlife management are included.
Juniors and Seniors Only
Typically offered in Spring only

FW 415 Professional Development in Fisheries, Wildlife, and Conservation Biology (1 credit hours)
This course provides guidance for students in the fall semester of their senior year in preparation for graduate school or a career in the field of Fisheries, Wildlife, and Conservation Biology. Junior or Senior standing.
Typically offered in Fall only

FW 444/FW 544 Mammalogy (3 credit hours)
The biology of mammals: evolution, functional morphology, reproduction, behavior, ecology, population biology, classification and identification. One weekend field trip planned. One independent field research project is required. Graduate students will prepare a full written report of their research projects, which will not be required of the undergraduates.
Prerequisite: PB 360 or BIO 360 or FOR 260
Typically offered in Fall only

FW 445 Human Dimensions of Conservation Biology in the Bahamas (3 credit hours)
This course examines the fundamental concepts, problems, and methods regarding human dimensions of conservation biology in The Bahamas. Combining lecture, lab, and fieldwork, students directly experience the process of science, with students conducting semester-long, group research projects tackling important unanswered questions involving conservation biology in The Bahamas. Gaining first-hand experience at the interface of basic and applied sciences, students will spend eight weeks on campus and two weeks in the largely undeveloped Andros Island in The Bahamas, home to the third largest coral reef in the world and over 1.5 million acres of national parks.
Prerequisite: One 200-level or higher course in ES, ET, FOR, FW, NR, PB, PRT, or ZO.
Typically offered in Fall only

FW 453 Principles of Wildlife Science (4 credit hours)
Principles and applications of population dynamics and biology to the management of terrestrial vertebrates. Predicting population levels, composition and growth rates with and without management constraints. Strategies for wildlife conservation, utilization, and enhancement. Laboratories stress the collection and analysis of data, and often meet in outdoor environments.
Prerequisite: FW 353 and ST 311
Typically offered in Spring only

FW 460/FW 560 International Wildlife Management and Conservation (3 credit hours)
An international perspective on wildlife management and conservation through investigation and comparison of historical events, policies, international conservation organizations and transfrontier conservation areas. Fundamental principles necessary in managing the African savannah ecosystem, protected areas and game ranches. Identifying global biomes, zoogeography and the impacts of ecotourism. Cannot receive credit for both FW 460/560.
Prerequisite: Junior standing and above.
Typically offered in Spring only

FW 465/FW 565 African Ecology and Conservation (4 credit hours)
This course provides an international perspective on desert ecology, the African savanna ecosystem, African wildlife ecology and management. In addition, the management of a large national park of international importance, conservation of predators and their conflict with humans, and international tourism are discussed. Various sampling techniques are practiced during field work. A combination of lectures, field lectures, field work, field excursions, data analyses and home work form an integral part of the course.
Prerequisite: One 200-level or higher course in ES, ET, FOR, FW, NR, PB, PRT, or ZO
GEP Global Knowledge, GEP Natural Sciences
Typically offered in Summer only

FW 492 External Learning Experience (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall and Spring

FW 493 Independent Study in Fisheries, Wildlife, and Conservation Biology (1-6 credit hours)
Independent Study for Fisheries, Wildlife, and Conservation Biology students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

FW 494 Independent Study in Fisheries, Wildlife, and Conservation Biology (1-6 credit hours)
Independent Study for Fisheries, Wildlife, and Conservation Biology students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer
**FW 495 Special Topics in Fisheries and Wildlife Science** (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

_Typically offered in Fall, Spring, and Summer_

**FW 511/FW 411 Human Dimensions of Wildlife and Fisheries** (3 credit hours)
Study of human interactions with wildlife and fisheries, including principles important for understanding and addressing wildlife management and conservation challenges. Discussions of wildlife at the urban fringe, human attitudes towards hunting and fishing, and the public trust approach to wildlife management are included.

Juniors and Seniors Only
_Typically offered in Spring only_

**FW 515/AEC 515 Fish Physiology** (3 credit hours)
The biology of fishes: physiology, anatomy, endocrinology, behavior and genetics. Designed especially for graduate students in fisheries. Several trips to research laboratories taken.

_Typically offered in Fall only_

**FW 544/FW 444 Mammalogy** (3 credit hours)
The biology of mammals: evolution, functional morphology, reproduction, behavior, ecology, population biology, classification and identification. One weekend field trip planned. One independent field research project is required. Graduate students will prepare a full written report of their research projects, which will not be required of the undergraduates.

Prerequisite: PB 360 or BIO 360 or FOR 260
_Typically offered in Fall only_

**FW 553/ZO 553 Principles Of Wildlife Science** (3 credit hours)
The principles of wildlife management and their application studied in the laboratory and in the field.

Prerequisite: BIO 260 or BIO/PR 360
_Typically offered in Spring only_

**FW 560/FW 460 International Wildlife Management and Conservation** (3 credit hours)
An international perspective on wildlife management and conservation through investigation and comparison of historical events, policies, international conservation organizations and transfrontier conservation areas. Fundamental principles necessary in managing the African savannah ecosystem, protected areas and game ranches. Identifying global biomes, zoogeography and the impacts of ecotourism. Cannot receive credit for both FW 460/560.

Prerequisite: Junior standing and above.
_Typically offered in Spring only_

**FW 565/FW 465 African Ecology and Conservation** (4 credit hours)
This course provides an international perspective on desert ecology, the African savanna ecosystem, African wildlife ecology and management. In addition, the management of a large national park of international importance, conservation of predators and their conflict with humans, and international tourism are discussed. Various sampling techniques are practiced during field work. A combination of lectures, field lectures, field work, field excursions, data analyses and home work form an integral part of the course.

Prerequisite: One 200-level or higher course in ES, ET FOR, FW, NR, PB, PRT, or ZO GEP Global Knowledge, GEP Natural Sciences
_Typically offered in Summer only_

**FW 586/AEC 586 Aquaculture** (3 credit hours)
Biological and general principles of aquaculture. Emphasis on the present status of aquaculture, species involved, techniques employed, and problems encountered. Discussion of recent advances in research and development and identification of areas of future research and development.

Prerequisite: BO 360 or ZO 260 or Graduate standing or Senior standing
_Typically offered in Spring only_

**FW 587/AEC 587 Aquaculture Laboratory** (1 credit hours)
Methods and techniques of cultivating aquatic organisms. Field trips and reports on local hatcheries and facilities required. (Three to four overnight field trips taken on week days to coastal areas, state hatcheries, and private hatcheries; students responsible for shared room costs and their meals. Four field trips also taken on laboratory day within driving range of Raleigh.)

Prerequisite: BO 360 or ZO 260 or Graduate standing or Senior standing.
Corequisite: ZO 586
_Typically offered in Fall only_

**FW 595 Special Topics in Fisheries and Wildlife Sciences** (1-6 credit hours)
Special topics in various aspects of fisheries and wildlife sciences are developed under the direction of a graduate faculty member. Also used to test and develop new courses.

_Typically offered in Fall, Spring, and Summer_

**FW 602 Seminar In Wildlife Management** (1 credit hours)
Current topics and issues in wildlife biology and management. Students select and research topics, give seminars and lead group discussions.

_Typically offered in Fall only_

**FW 610 Special Topics in Fisheries and Wildlife Sciences** (1-6 credit hours)
Special topics in various aspects of fisheries and wildlife science are developed under the direction of a graduate faculty member. Also used to develop new courses.

_Typically offered in Fall, Spring, and Summer_

**FW 685 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
_Typically offered in Fall, Spring, and Summer_
FW 693 Master’s Supervised Research  (1-9 credit hours)  
Instruction in research and research under the mentorship of a member of the Graduate Faculty.  
Prerequisite: Master’s student  
Typically offered in Fall, Spring, and Summer  

FW 695 Master’s Thesis Research  (1-9 credit hours)  
Thesis research.  
Prerequisite: Master’s student  
Typically offered in Fall, Spring, and Summer  

FW 696 Summer Thesis Research  (1 credit hours)  
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.  
Prerequisite: Master’s student  
Typically offered in Summer only  

FW 720 Epidemiology of Wildlife Diseases  (3 credit hours)  
Concepts related to infectious disease outbreaks in free-ranging species of wildlife. Numerous examples of wildlife diseases will be used to illustrate factors affecting host-agent-environment interactions in fish, amphibians, birds, and both aquatic and terrestrial mammals. Enrollment in the Fisheries and Wildlife graduate program or Masters of Veterinary Public Health program; clinical residents or veterinary students at the College of Veterinary Medicine.  

FW 726/AEC 726 Quantitative Fisheries Management  (3 credit hours)  
Current methods for assessment and management of exploited fish populations, including sampling methods, data analysis and modeling. A required research paper or project.  
Typically offered in Fall only  

FW 730 Ethics in Fisheries and Wildlife Sciences  (2 credit hours)  
Students will explore historical and current thinking concerning the search for truth about natural systems, and the complex ethics scientists and practitioners who operate in the public sector must consider. Standards of professional and ethical behavior specific to Fisheries and Wildlife Sciences will be addressed. Faculty will introduce topics and guide discussions; students will give seminars and lead some discussions. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Fall only  

FW 801 Issues in Fisheries and Wildlife Sciences Doctoral Seminar  (2 credit hours)  
Current topics and issues in Fisheries and Wildlife Sciences Research. Students select and research topics, give seminars on Ph.D. proposals, and lead group discussions. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Spring only  

FW 802 Seminar in Fisheries and Wildlife  (1 credit hours)  
Current topics and issues in fisheries and wildlife biology and management. Students select and research topics, give seminars, and lead group discussions. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Fall only  

FW 810 Special Topics in Fisheries and Wildlife  (1-6 credit hours)  
Individual students or groups of students, under direction of a faculty member, will explore topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems or research not related to dissertation. Also used to develop and test new 800-level courses. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Spring and Summer  

FW 885 Doctoral Supervised Teaching  (1-3 credit hours)  
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Fall and Spring  

FW 889 Doctoral Supervised Research  (1-9 credit hours)  
Instruction in research and research under the mentorship of a member of the Graduate Faculty. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Fall, Spring, and Summer  

FW 895 Doctoral Dissertation Research  (1-9 credit hours)  
Dissertation Research. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Fall, Spring, and Summer  

FW 896 Summer Doctoral Dissertation Research  (1 credit hours)  
Summer Dissertation Research. For doctoral students in Fisheries and Wildlife Sciences.  
Typically offered in Summer only  

Food Science (FS)  

FS 201 Introduction to Food Science  (3 credit hours)  
Food science is an exciting, multidisciplinary career that draws on chemistry, microbiology, and engineering principles to produce, preserve, and protect the foods that we eat every day. This course is designed to help you understand the journey of foods from “farm to fork”, the effect of diet on human health, and the laws governing food labeling and marketing. It’s science you can eat!  

GEP Natural Sciences  
Typically offered in Fall, Spring, and Summer  

FS 231 Principles of Food and Bioprocess Engineering  (4 credit hours)  
Engineering concepts and their applications to the food and bioprocessing industries. Mass and energy balances and principles related to fluid flow, heat transfer, refrigeration and freezing, psychrometrics, and selected unit operations found in these industries.  
Prerequisite: PY 211 or PY 205 and PY 206  
Typically offered in Spring only  

Typically offered in Fall only  

FS 250 Basics of Food Safety & Quality (3 credit hours)
This course examines the programs that maintain food safety and quality in food processing environments. It is based on international standards for food safety prerequisite programs in food manufacturing. Students will learn how to evaluate and manage pre-requisite programs for food safety. Examples include Good Manufacturing Practices (GMPs), Sanitation Standard Operating Procedures (SSOPs), Sanitation Control Procedures, and Preventive Controls.

Typically offered in Fall only

FS 290 Careers in Food and Bioprocessing Sciences (1 credit hour)
Careers and opportunities related to food and bioprocessing industries and regulatory agencies. Development of professional enhancement skills. Resume preparation, interviewing techniques, leadership development, oral and written communication, and team building. Benefits of undergraduate research, internships, and graduate education.

Typically offered in Fall only

FS 295 Special Topics in Food Science (1-4 credit hours)
Offerings of new or experimental courses in Food Science at the early undergraduate level.

Typically offered in Fall, Spring, and Summer

FS 301/NTR 301 Introduction to Human Nutrition (3 credit hours)
Functions, dietary sources, digestion and absorption, deficiencies and excesses of essential nutrients in humans; dietary guidelines; food labels; the study of diet-disease relationships; the role of diet in heart disease, diabetes, hypertension, osteoporosis; energy balance and weight control; dietary supplement regulation; diet and athletic performance.

Prerequisite: Sophomore standing
GEP Natural Sciences

Typically offered in Fall, Spring, and Summer

FS 322/PO 322/ANS 322 Muscle Foods and Eggs (3 credit hours)
Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante- and post-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processed meat items.

Prerequisite: ZO 160, BIO 181 or BIO 183

Typically offered in Fall only

FS 324/ANS 324 Milk and Dairy Products (3 credit hours)
Introduction to the manufacture of dairy products. Dairy processing procedures from the farm, through the dairy plant, and to the consumer are studied. The course consists of 15 learning modules, three exams, and a project.

Prerequisite: BIO 181 or 183, CH 101

Typically offered in Fall only

FS 325/BBS 325 Introduction to Brewing Science and Technology (3 credit hours)
For centuries brewing has been and remains a vitally important application of fermentation science, both economically and socially. This course will provide a detailed description of the fundamental chemical and biological processes involved in brewing beer, as well as the physical and hygienic aspects of modern beer production. Successful completion of this course will provide students with the understanding of the science and technology underlying the key steps in a commercial brewing process and provide the basic knowledge necessary for an entry level position in a commercial brewery.

Prerequisite: CH 101 and BIO 183 or BIO 181

Typically offered in Spring only

FS 326/BBS 326 Brewing Practices and Analyses (3 credit hours)
This course will provide a hands on learning experience to both complement the classroom lectures offered in BBS/FS 325 and acquaint the student with the equipment and practices encountered in real-world analytical labs of breweries of all scales. The laboratory experience will replicate the sequence of events encountered in actual beer production and illustrate the relevant evaluations and analyses which are concurrent with those processing steps, stressing at each stage not only the execution of the appropriate analytical or testing techniques, but also corrective action that may be taken should undesirable results be obtained.

Prerequisite: BBS/FS 325 Introduction to Brewing Science and Technology

Typically offered in Fall only

FS 330 Science of Food Preparation (3 credit hours)
Basic elements of culinary practices are taught in conjunction with the scientific basis for how flavor, texture, and appearance of foods are created or maintained during food preparation.

Prerequisite: FS 201 and CH 101

Typically offered in Spring only

FS 352 Introduction to Microbiological Food Safety Hazards (3 credit hours)
For non-science students. The course is designed to provide an introduction to the more prominent microbial foodborne safety hazards and their control. Lessons are provided on specific pathogens, their pathogenesis and transmission and the scientific basis for specific control options. In addition, the course provides up-to-date information on current "hot-topics" in food microbiology, including food safety regulations and emerging food safety issues. Course is offered to non-science majors. Students may not receive credit for both FS 352 and FS 405.

Typically offered in Fall and Spring

FS 354 Food Sanitation (3 credit hours)
Discussion of hygienic practices, requirements for sanitation programs, and modern sanitation practices in food processing facilities. At the end of this course, students will have the knowledge to develop and maintain a sanitation program.

Prerequisite: FS/ANS/PO 350 or equivalent HACCP industry experience

Typically offered in Fall and Spring
FS 401/NTR 501/FS 501/NTR 401  Advanced Nutrition and Metabolism (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.

Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225) Typically offered in Fall only

FS 402/FS 502 Chemistry of Food and Bioprocessed Materials (4 credit hours)
The course focuses on the properties of biological molecules (e.g., proteins, enzymes, lipids, carbohydrates and pigments) found in foods and pharmaceuticals. Basic elements of molecules, such as structure and reactive groups, are presented in regard to how they affect the properties of foods and pharmaceuticals. Reactions such as Maillard browning and lipid oxidation are discussed regarding mechanisms, products and controlling processes. Laboratory experiments emphasize basic concepts discussed in lecture and provide a practical working knowledge of select analytical equipment.

Prerequisite: CH 220 or 221 or 225 Typically offered in Fall only

FS 403  Analytical Techniques in Food & Bioprocessing Science (4 credit hours)
Principles, methods and techniques for quantitative physical and chemical analyses of food, nutraceutical, and pharmaceutical products. Results of analyses evaluated in terms of quality standards and governing regulations.

Prerequisite: FS 402 Typically offered in Spring only

FS 405/MB 405/FS 505/MB 505  Food Microbiology (3 credit hours)
Microorganisms of importance in foods and their metabolic activities. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes. Credit will not be given for both FS/MB 405 and FS/MB 505.

Prerequisite: MB 351 Typically offered in Spring only

FS 406/MB 406/FS 506/MB 506  Food Microbiology Lab (1 credit hour)
Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.

Prerequisite: MB 351 and Corequisite: FS 405 or FS 505 Typically offered in Spring only

FS 416/FS 516 Quality Control in Food and Bioprocessing (3 credit hours)
This course provides an overview of the principles of quality management, assurance and control in the food and bioprocessing industries. The objectives are for students to be able to identify government regulations, private industry standards, and customer expectations that are relevant to food and bioprocessing, apply root cause analysis methodologies, apply and evaluate control charts for monitoring process control for variables and attributes, conduct process capability analyses, apply statistical hypothesis testing, and design producer and/or customer-centered sampling plans. Lab activities alternate between guest speakers from industry and exercises in which students develop their abilities to apply computer programs to solve quality problems. Note: students may not earn credit for taking both FS 416 and FS 516.

Restriction: FS, Bioprocessing, PSC, ANS, and NT students. Others may enroll with permission from the instructor. Section 601 is restricted to true distance education students (not regular term students).

Typically offered in Fall only

FS 421/FS 521  Food Preservation (3 credit hours)
Food preservation methods. Emphasis on thermal, freezing, drying and fermentation processes and corresponding physical, chemical and organoleptic changes to products. Application of preservation schemes to the development of an overall processing operation.

Prerequisite: FS 231 and FS 405 Typically offered in Fall only

FS 426/BEC 426/BBS 526/FS 526/BEC 526/BBS 426  Upstream Biomanufacturing Laboratory (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.

Prerequisite: (MB 351 and FS 231) CHE/BEC 463 Typically offered in Fall and Spring

FS 435/FS 535  Food Safety Management Systems (3 credit hours)
This course teaches students how to develop and implement food safety management systems. It begins with the Hazard Analysis and Critical Control Points (HACCP) system and then teaches the Hazard Analysis and Risk-Based Preventive Controls (HARPC) system.

Prerequisite: FS 250 Typically offered in Fall only

FS 453/FS 553  Food Laws and Regulations (3 credit hours)
Federal and state laws and regulations, and case law history affecting food production, processing, packaging, marketing, and distribution of food and food products. History of food law, enactment of laws and regulations, legal research, and regulatory agencies. Credit will not be given for both FS 453 and FS 553.

Prerequisite: Junior standing.
FS 462/HS 462/FS 562/FS 562 Postharvest Physiology (3 credit hours)
Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

Prerequisite: PB 421
Typically offered in Spring only

FS 471 Professionalism & Project Preparation in Food & Bioprocessing Science (1 credit hours)
Discipline-specific professional development: teamwork, problem-solving and communication skills. Resume and interview preparation. Experimental design, literature review, budgeting and planning in preparation for the FS 475 Problems and Design in Food and Bioprocessing Science capstone course.

P: FS 201 and FS 231 and Senior Standing in Food Science or Bioprocessing Science
Typically offered in Fall only

FS 475 Problems and Design in Food and Bioprocessing Science (3 credit hours)
Team approach to problem solving and product/process design and development. Ingredient functionality; formulation, safety, processing, packaging, sensory evaluation, regulatory issues, hazard analysis, critical control points (HACCP), nutritional labeling and other pertinent scientific, technical, marketing and financial aspects. Oral and written presentations are required.

Prerequisite: FS 231, FS 402, FS 405 or BAE(BBS) 425
Typically offered in Spring only

FS 481 Research Experience in Food and Bioprocessing Sciences (3 credit hours)
Students actively engage in a research initiative at the USDA-Agriculture Research Service Food Science Research Unit. Students become familiar with the settings of food science laboratories, conduct literature reviews, manage the basic scientific structure applied to problem solving, are introduced to experimental design and data processing and synthesis to solve complex problems, and understand the unpredictable nature of scientific research. At the end of the course, students will be able to structure an informative public presentation on the results of the study and present their findings to diverse audiences. As part of the learning process students will acquire and/or further develop selected laboratory techniques associated with basic microbiology and chemistry. Course limited to rising juniors and seniors in good standing. Sophomores would need instructor approval to join the course.

Restriction: Juniors and Seniors Only
Typically offered in Summer only

FS 492 External Learning Experience (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by the student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

Prerequisite: Sophomore standing
Typically offered in Summer only

FS 493 Special Problems in Food Science (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by the student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

Prerequisite: Sophomore standing
Typically offered in Fall and Spring

FS 495 Special Topics in Food Science (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

FS 501/NTR 401/FS 401/NTR 501 Advanced Nutrition and Metabolism (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.

Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225)
Typically offered in Fall and Summer

FS 502/FS 402 Chemistry of Food and Bioprocessed Materials (4 credit hours)
The course focuses on the properties of biological molecules (e.g., proteins, enzymes, lipids, carbohydrates and pigments) found in foods and pharmaceuticals. Basic elements of molecules, such as structure and reactive groups, are presented in regard to how they affect the properties of foods and pharmaceuticals. Reactions such as Maillard browning and lipid oxidation are discussed regarding mechanisms, products and controlling processes. Laboratory experiments emphasize basic concepts discussed in lecture and provide a practical working knowledge of select analytical equipment.

Prerequisite: CH 220 or 221 or 225
Typically offered in Fall only

FS 505/MB 505/FS 405/MB 405 Food Microbiology (3 credit hours)
Microorganisms of importance in foods and their metabolic activities. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes. Credit will not be given for both FS/MB 405 and FS/MB 505.

Prerequisite: MB 351
Typically offered in Spring only
FS 506/MB 506/FS 406/MB 406 Food Microbiology Lab (1 credit hour)
Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.
Prerequisite: MB 351 and Corequisite: FS 405 or FS 505
Typically offered in Spring only

FS 516/FS 416 Quality Control in Food and Bioprocessing (3 credit hours)
This course provides an overview of the principles of quality management, assurance and control in the food and bioprocessing industries. The objectives are for students to be able to identify government regulations, private industry standards, and customer expectations that are relevant to food and bioprocessing, apply root cause analysis methodologies, apply and evaluate control charts for monitoring process control for variables and attributes, conduct process capability analyses, apply statistical hypothesis testing, and design producer and/or customer-centered sampling plans. Lab activities alternate between guest speakers from industry and exercises in which students develop their abilities to apply computer programs to solve quality problems. Note: students may not earn credit for taking both FS 416 and FS 516.
Restriction: FS, Bioprocessing, PSC, ANS, and NT students. Others may enroll with permission from the instructor. Section 601 is restricted to true distance education students (not regular term students).
Typically offered in Fall only

FS 520/FSA 520 Pre-Harvest Food Safety (3 credit hours)
Dairy, beef, swine, poultry, and seafood modules: production, government regulation of products, use of antimicrobials in production, and the emergence of resistant human pathogens. Field fruit and vegetable crops section: hazards in food including pesticide residues and philosophy and practice of organic farming and public's perception of food and biotechnology.
Typically offered in Fall only

FS 521/FS 421 Food Preservation (3 credit hours)
Food preservation methods. Emphasis on thermal, freezing, drying and fermentation processes and corresponding physical, chemical and organoleptic changes to products. Application of preservation schemes to the development of an overall processing operation.
Prerequisite: FS 231 and FS 405
Typically offered in Fall only

FS 522 Food Packaging (3 credit hours)
This course deals with the history of packaging, types of packages, and packaging equipment, factors involved in choice of package, aseptic packaging, shelf-life studies, modified atmospheric packaging, active packaging, packaging for e-commerce, automatic identification and data capture, closures, seal integrity, tamper evidence, graphic design & printing, distribution, labeling, environmental issues, regulatory agencies and stipulations, new frontiers in packaging, and packaging resources. Restricted to students enrolled in (or degree received) in the Food Bioprocessing and Nutrition Sciences Program or a closely related program such as the Biological & Agricultural Engineering Program.
Typically offered in Spring only

FS 526/BEC 526/BBS 426/FS 426/BEC 426/BBS 526 Upstream Biomanufacturing Laboratory (2 credit hours)
This course is an introduction to current food manufacturing practice (CGMP) as applied to the growth of microbial cells in bioreactors. Hands-on experience is obtained in the operation and control of 30 liter bioreactors to study agitation, oxygen transfer, cleaning, sterilization, media preparation and the growth of recombinant E. coli for protein production. Credit will not be awarded in both BBS 426 and BBS/FS 526. This is an eight week course.
Prerequisite: (MB 351 and FS 231) CHE/BEC 463
Typically offered in Fall and Spring

FS 530/FSA 530 Post-Harvest Food Safety (3 credit hours)
Background on the current issues and developments associated with post-harvest food safety, including biological, chemical, and physical food safety hazards. Additionally, regulations governing food safety and consumer perceptions.
Prerequisite: MB 351/352
Typically offered in Fall only

FS 535/FS 435 Food Safety Management Systems (3 credit hours)
This course teaches students how to develop and implement food safety management systems. It begins with the Hazard Analysis and Critical Control Points (HACCP) system and then teaches the Hazard Analysis and Risk-Based Preventive Controls (HARPC) system
Prerequisite: FS 250
Typically offered in Fall only

FS 540/FSA 540 Food Safety and Public Health (3 credit hours)
Issues and developments related to the relationship between food safety and public health, including emerging foodborne pathogens; virulence and pathogenicity; foodborne toxins; epidemiological techniques used in the investigation of foodborne disease; rapid detection methods; and quantitative microbial risk assessment in food safety.
Prerequisite: MB 351/352
Typically offered in Spring only

FS 550 Food Industry Study Tour (2 credit hours)
The Food Industry Study Tour is designed to give students a behind the scenes look into the food processing industry. This week-long trip, will allow students to travel throughout North Carolina and the Southeast region, touring various meat, dairy, seafood, produce, cereal, snack food, beverage, and candy production facilities. The class trip will run 5-6 days during the week of Spring Break holiday. Enrollment is limited and subject to the permission of the instructor.
Typically offered in Spring only
FS 553/FS 453  Food Laws and Regulations  (3 credit hours)
Federal and state laws and regulations, and case law history affecting food production, processing, packaging, marketing, and distribution of food and food products. History of food law, enactment of laws and regulations, legal research, and regulatory agencies. Credit will not be given for both FS 453 and FS 553.
Prerequisite: Junior standing.

FS 554/NTR 554  Lactation, Milk, and Nutrition  (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry, and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.
Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421
Typically offered in Spring only

FS 555/NTR 555  Exercise Nutrition  (3 credit hours)
Metabolism of macro- and micronutrients as affected by exercise and physical activity. Effects of dietary patterns, specific foods, dietary supplements and ergogenic aids on sports performance. Reading and discussion of current literature and individual or group projects.
Prerequisite: NTR 400/500
Typically offered in Spring only

FS 557/NTR 557  Nutraceuticals and Functional Foods  (3 credit hours)
This course evaluates the weight of evidence from peer-reviewed scientific literature relating food bioactives, whole foods, and diets to disease prevention, athletic performance, and cognitive development/enhancement. Data are viewed in the context of processing effects, global food and supplement regulations, as well as commercial marketing claims. Key concepts include dose-response, signal transduction, and the use of advanced technologies such as genomics, proteomics and metabolomics. Students will work in teams to develop and write a critical review manuscript suitable for publication.
Typically offered in Fall only

FS 562/FS 462/HS 462/HS 562  Postharvest Physiology  (3 credit hours)
Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.
Prerequisite: PB 421
Typically offered in Spring only

FS 567  Sensory Analysis of Foods  (3 credit hours)
Techniques of sensory analysis and data interpretation, a crucial aspect of food science research and marketing both at the academic and industrial levels. Fundamental and applied aspects of sensory analysis of foods, including human senses, descriptive analysis, scaling, consumer testing and sensory-instrumental relationships.
Prerequisite: Statistics 511
Typically offered in Spring only

FS 580/FSA 580  Professional Development and Ethics in Food Safety  (1 credit hours)
Professional development and ethics related to food safety. Food safety communications to lay-audiences and the media; the ethical frontier between science/policy and science/profit. Planned student and faculty presentations as well as guest lectures.
Prerequisite: FSA 520 or FSA 530 or FS 540
Typically offered in Spring only

FS 591  Special Problems In Food Science  (1-6 credit hours)
Analysis of scientific, engineering and economic problems of current interest in foods. Problems designed to provide training and experience in research.
Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

FS 592  Special Research Projects in Food Science  (1-6 credit hours)
Typically offered in Spring only

FS 620  Special Problems In Food Science  (1-6 credit hours)
Analysis of scientific, engineering and economic problems of current interest in foods. Problems designed to provide training and experience in research.
Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

FS 623  Special Research Problems In Food Science  (1-6 credit hours)
Directed research in a specialized phase of food science designed to provide experience in research methodology and philosophy.
Typically offered in Spring only

FS 685  Special Problems In Food Science  (1-6 credit hours)
Directed research in a specialized phase of food science designed to provide experience in research methodology and philosophy.
1812  Food Science (FS)
FS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.
Prerequisite: Master’s student
Typically offered in Summer only

FS 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-
time enrollment for the master’s degree and are writing and defending
their theses.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

FS 725/MB 725 Fermentation Microbiology (3 credit hours)
Fermentation bioprocessing and characteristics, function and ecology of
responsible microorganisms. Fermentative activities, growth responses
and culture interactions related to metabolism, physiology and genetics of
lactic acid bacteria and selected yeasts and molds. Current developments
in starter culture technology and genetics; application to food and
industrial fermentations.
Prerequisite: BCH 451, MB 351
Typically offered in Spring only

FS 741 Thermal Processing of Foods (3 credit hours)
Fluid flow, heat transfer, food preservation, kinetics of chemical,
microbiological, and enzymatic reactions, decimal reduction time,
pasteurization, sterilization, cook value, process lethality, canning of
foods, thermal process evaluation, quality considerations, optimization,
shelf-life studies, thermal processing equipment, hot-fill, extended
shelf-life products, heat exchanger design, pumps, sanitation, aseptic
processing, minimal processing, NFPA bulletins, alternative processing
technologies, regulatory issues, HACCP.
Prerequisite: FS 231
Typically offered in Spring only

FS 751 Food Ingredient Technology In Product Development (4
credit hours)
Chemistry and functional properties of major food ingredient materials.
Legal and regulatory restrictions, as well as consumer biases, in
existence with respect to selection of ingredients, package materials,
processes and labeling statements. Necessary skills and techniques for
efficiently and successfully conducting food product development projects
in a competitive corporate setting.
Prerequisite: FS 402, FS 405, FS 421
Typically offered in Fall only

FS 785/BAE 785 Food Rheology (3 credit hours)
Principles and methods for measuring rheological properties. Theories of
elastic, viscous, viscoelastic and viscoplastic behavior and relationships
to food texture and commodity damage during harvest, handling and
processing. Influence of time, composition and processing.
Prerequisite: FS 231 or MAE 314
Typically offered in Fall only

FS 791 Special Problems in Food Science (1-6 credit hours)
Directed research in a specialized phase of food science designed to
provide experience in research methodology and philosophy. Credits
Arranged.
Typically offered in Fall only

FS 792 Special Research Projects in Food Science (1-6 credit
hours)
Credits Arranged
Typically offered in Fall, Spring, and Summer

FS 820 Special Problems In Food Science (1-6 credit hours)
Analysis of scientific, engineering and economic problems of current
interest in foods. Problems designed to provide training and experience in
research.
Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

FS 823 Special Research Problems In Food Science (1-6 credit
hours)
Directed research in a specialized phase of food science designed to
provide experience in research methodology and philosophy.
Typically offered in Spring only

FS 885 Special Research Projects In Food Science (1-6 credit
hours)
Directed research in a specialized phase of food science designed to
provide experience in research methodology and philosophy.
Typically offered in Fall only

FS 900 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral
preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

FS 933 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member
of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

FS 955 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
**FS 896 Summer Dissertation Research** (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
*Typically offered in Summer only*

**FS 899 Doctoral Dissertation Preparation** (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
*Typically offered in Summer only*

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**Food Science (FSA)**

**FSA 520/FS 520 Pre-Harvest Food Safety** (3 credit hours)
Dairy, beef, swine, poultry, and seafood modules: production, government regulation of products, use of antimicrobials in production, and the emergence of resistant human pathogens. Field fruit and vegetable crops section: hazards in food including pesticide residues and philosophy and practice of organic farming and public's perception of food and biotechnology.

*Typically offered in Fall only*

**FSA 530/FS 530 Post-Harvest Food Safety** (3 credit hours)
Background on the current issues and developments associated with post-harvest food safety, including biological, chemical, and physical food safety hazards. Additionally, regulations governing food safety and consumer perceptions.

Prerequisite: MB 351/352
*Typically offered in Fall only*

**FSA 540/FS 540 Food Safety and Public Health** (3 credit hours)
Issues and developments related to the relationship between food safety and public health, including emerging foodborne pathogens; virulence and pathogenicity; foodborne toxins; epidemiological techniques used in the investigation of foodborne disease; rapid detection methods; and quantitative microbial risk assessment in food safety.

Prerequisite: MB 351/352
*Typically offered in Spring only*

**FSA 580/FS 580 Professional Development and Ethics in Food Safety** (1 credit hours)
Professional development and ethics related to food safety. Food safety communications to lay-audiences and the media; the ethical frontier between science/policy and science/profit. Planned student and faculty presentations as well as guest lectures.

Prerequisite: FSA 520 or FSA 530 or FS 540
*Typically offered in Spring only*

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**Foreign Language - Chinese (FLC)**

**FLC 101 Elementary Chinese I** (3 credit hours)

Corequisite: FLC 103
*Typically offered in Fall only*

**FLC 102 Elementary Chinese II** (3 credit hours)
Continuation of basic skills. Emphasis on speaking and listening with some reading, writing and Chinese culture.

Corequisite: FLC 104
*Typically offered in Spring only*

**FLC 103 Elementary Chinese I Conversation** (1 credit hours)
Supplements conversational practice and handwriting skills for FLC 101. Students will gain practice at using their speaking skills in a variety of basic social situations.

Corequisite: FLC 101
*Typically offered in Fall only*

**FLC 104 Elementary Chinese II Conversation** (1 credit hours)
Supplements conversational practice and handwriting skills for FLC 102. Students are encouraged to use their speaking skills in a variety of typical social situations. Special attention is given to naturalness of speech.

Prerequisite: FLC 101 and FLC 103; Corequisite: FLC 102
*Typically offered in Spring only*

**FLC 201 Intermediate Chinese I** (3 credit hours)
Continuation of basic skills. Greater emphasis on reading, writing and Chinese cultural traditions.

Prerequisite: FLC 102; Corequisite: FLC 203
*Typically offered in Fall only*

**FLC 202 Intermediate Chinese II** (3 credit hours)
Continuation of basic skills. Focus on reading, writing, Chinese cultural traditions and patterns of behavior.

Corequisite: FLC 204
*GEP Global Knowledge*
*Typically offered in Spring only*

**FLC 203 Intermediate Chinese I Conversation** (1 credit hours)
Supplements conversational practice and handwriting skills for FLC 201. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to naturalness of speech and intonation.

Prerequisite: FLC 102 and FLC 104; Corequisite: FLC 201
*Typically offered in Fall only*

**FLC 204 Intermediate Chinese II Conversation** (1 credit hours)
Supplements conversational practice and handwriting skills for FLC 202. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to naturalness of speech and intonation.

Prerequisite: FLC 201 and FLC 203; Corequisite: FLC 202
*Typically offered in Spring only*
FLC 301  Intermediate Chinese III  (3 credit hours)
Last of the foundation courses in Chinese. Continued practice in speaking and understanding Chinese with new emphasis on writing and on the reading of cultural and literary texts.
Prerequisite: FLC 202
Typically offered in Fall only

FLC 302  Intermediate Chinese IV  (3 credit hours)
Continued practice in speaking and understanding Chinese with greater emphasis on reading and writing. Continued study of cultural and literary texts.
Prerequisite: FLC 301
Typically offered in Spring only

FLC 351  Modern Chinese Popular Culture  (3 credit hours)
Introduction to basic aspects of cultural practices and production in Chinese society, including consumer culture, education, work life, family relationships, everyday religious practices, aesthetic traditions, national identity, and gender. Reading and analysis of representative works of modern Chinese visual and print culture including literature, film, advertising, digital media and consumer products with attention to cultural analysis as well as to historical and cultural background.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLC 401  Advanced Chinese: Readings in Literature and Social Sciences  (3 credit hours)
Continued training in the foundations of Chinese language, with emphasis on nuances of written Chinese. This course introduces advanced Chinese language students to modern literature and social science texts. Students read and analyze some of the finest works of 20th c. Chinese intellectuals, authors and social critics. The class explores a wide range of prose forms, styles, and subject matter. Emphasis will be placed on developing advanced-level proficiency in reading & writing, and on literary analysis & discussion of cultural & historical contexts.
Prerequisite: FLC 302
Typically offered in Fall only

FLC 402  Advanced Chinese: Readings in Literature and Science  (3 credit hours)
Continued training in the foundations of Chinese language, with emphasis on nuances of written Chinese. This course introduces advanced Chinese language students to modern literature and science texts. Students read and analyze some of the finest works of 20th c. Chinese intellectuals, authors and proponents of scientific advancement as well as original scientific research in Chinese. The class explores a wide range of prose forms, styles, and subject matter. Emphasis will be placed on developing advanced-level proficiency in reading & writing, and on literary analysis & discussion of cultural & historical contexts.
Prerequisite: FLC 302
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

Foreign Language - English (FLE)

FLE 100  Introduction to Academic Writing  (4 credit hours)
For non-native speakers of English. Intensive introduction to critical writing and reading in academic contexts. Exploration of writing processes and academic literacy skills: interpreting assignments; comprehending, analyzing, and evaluating college-level texts; inventing, drafting, and revising; seeking, providing, and responding to constructive feedback; collaborating effectively under varied learning models. Extensive writing practice and individualized coaching. Attention to grammar and conventions of standard written English. Intended as preparation for FLE 101. Only for non-native speakers of English. Requires C- or better. Credit for FLE 100 is not allowed if student has prior credit for FLE 101
Typically offered in Fall and Spring

FLE 101  Academic Writing and Research  (4 credit hours)
For non-native speakers of English intensive instruction in academic writing and research. Basic principles of rhetoric and strategies for academic inquiry and argument. Instruction and practice in critical reading, including the generative and responsible use of print and electronic sources for academic research, adapted for non-native speakers. Exploration of literate practices across a range of academic domains, laying the foundation for further writing development in college. Continued attention to grammar and conventions of standard written English. Satisfies freshman English requirements. Successful completion of FLE 101 requires a C- or better. Credit for FLE 101 is not allowed if the student has already fulfilled the first-year writing requirement.
Typically offered in Fall, Spring, and Summer

FLE 201  Oral Communication in English for International Students  (3 credit hours)
Oral communication in English; active and interactive speaking skills, listening comprehension and reading. Specific tasks in spoken English such as communicating information, making inquiries, requests and complaints. Individual and group work in the form of oral reports, role play, presentations, etc. Listening to lectures and note taking skills.
Typically offered in Fall and Spring

FLE 400  American English Pronunciation for International Students  (3 credit hours)
Typically offered in Fall and Spring

FLE 401  Advanced Oral Communication in English for International Students  (3 credit hours)
Oral communication in English; pronunciation skills, reading, aural comprehension and oral skills; communication strategies and cross-cultural communication; individual and group activities such as presenting information, teaching a class, fielding questions and leading a discussion.
Typically offered in Fall and Spring
FLF 402 Advanced Written Communication in English for International Students (3 credit hours)
Written communication skills for graduate students; integrated writing tasks focusing on writing, reading, grammar and comprehension, specifically geared to the needs of research students and teaching assistants. Reading, critical analysis and synthesis of written material such as journal articles, research reports, etc.

Typically offered in Fall and Spring

Foreign Language - French (FLF)

FLF 101 Elementary French I (3 credit hours)
First in a four-course sequence to develop language skills. Oral and written practice in classroom and language laboratory. Readings in French culture and civilization.

Typically offered in Fall, Spring, and Summer

FLF 102 Elementary French II (3 credit hours)
Continuation of FLF 101 with intensive practice in spoken French. Readings in French culture and civilization.

Prerequisite: FLF 101
Typically offered in Fall, Spring, and Summer

FLF 110 Accelerated Elementary French (3 credit hours)
Content of FLF 101 and 102, at an accelerated pace, for students with previous study of French (1-2 years in high school) who placed into the course based on results of the NC State French Placement Test. Includes a refresher of 101 material before recovering 102 material. Development of skills in listening, speaking, reading, writing and understanding Francophone cultures. Significant amount of work outside of class. Fulfills the FL 102 requirement.

Prerequisite: Placement into this course determined by The Department of Foreign Languages and Literatures Placement Test: http://saw.chass.ncsu.edu/fl/place.htm
Typically offered in Fall and Spring

FLF 201 Intermediate French I (3 credit hours)
Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussions of French culture, civilization and literature.

Prerequisite: FLF 102 or FLF 110
Typically offered in Fall, Spring, and Summer

FLF 202 Intermediate French II (3 credit hours)
Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of France and the Francophone world.

Prerequisite: FLF 201 or FLF 212

FLF 202 with consent of instructor.

GEP Global Knowledge

Typically offered in Fall and Spring

FLF 203 French: Language, Culture, and Technology (3 credit hours)
A study of the language structures and vocabulary necessary for an intermediate level of communication in French together with cultural and technological issues of our global society, in the context of the French-speaking world and the European Union. Students are responsible for providing their own transportation for required field trip. Fulfills the FLF 201 requirement.

Prerequisite: FLF 202 or FLF 110

GEP Global Knowledge, GEP Interdisciplinary Perspectives

Typically offered in Fall only

FLF 301 Survey of French Literature from the Middle Ages through the Enlightenment (3 credit hours)
Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

Prerequisite: An advanced language skills course (FLF 308 or FLF 310 or FLF 315) or FLF 202 with permission of instructor.

GEP Global Knowledge, GEP Humanities

Typically offered in Fall only

FLF 302 Survey of French Literature from Romanticism to the Contemporary Period (3 credit hours)
Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

Prerequisite: An advanced language skills course (FLF 308, 310, 315) or FLF 202 with consent of instructor.

GEP Global Knowledge, GEP Humanities

Typically offered in Spring only

FLF 306 French Business Communication (3 credit hours)
Study of major forms of written and oral business communication used in the French-speaking world. Extensive work with current, culturally authentic materials. Emphasis on development of practical communicative skills, with special attention to cross-cultural comparisons of French and American business practices and modes of communication.

Prerequisite: FLF 202

FLF 307 Business French (3 credit hours)
Business French vocabulary and concepts with emphasis on cultural differences and their importance in the new global village business world.

Prerequisite: FLF 202

Typically offered in Fall only

FLF 308 Advanced Conversation: Contemporary French Cultures (3 credit hours)
Conversation and reading emphasizing idiomatic and practical usage with attention to contemporary civilization and cultures of the French speaking world. Emphasis on social structures, political features, events, world views and modes of communication.

Prerequisite: FLF 202

Typically offered in Fall and Spring

FLF 309 French Phonetics and Pronunciation (3 credit hours)
A study of the oral production of standard French with the aim of improving pronunciation, fluency and skill in communication. Extensive oral practice through conversation and phonetics.

Prerequisite: FLF 202

Typically offered in Fall and Spring
FLF 310 Advanced Written Communication (3 credit hours)
An in-depth study of French written communication at the advanced level, including the more advanced aspects of the French grammar with extensive writing practice serving a variety of practical communicative needs.

Prerequisite: FLF 202
Typically offered in Fall only

FLF 315 French Civilization and Culture (3 credit hours)
French civilization and culture from its origins to the modern period. Reading and discussion of the social, cultural, economic and political structures of France, including its geography, history, music, art and national consciousness.

Prerequisite: FLF 202
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FLF 318 The Heritage of French Cinema (3 credit hours)
Survey of the major contributions of French cinema from its origins to the present. Attention to film as an artistic medium and to the cinematic representation of French history and culture. Reading, discussion, and viewing of films including Un Chien Andalou, La Passion de Jeanne d'Arc, Le Retour de Martin Guerre, La Marseillaise, Les 400 Coups, and Diva.

Prerequisite: 3 hrs. in French at 300 level
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Spring only

FLF 321 French Cultures and Contexts (3 credit hours)
An approach to important periods in the history of French culture through the reading of texts by several important writers. Films, slides, painting, music, and the Internet will be included to put the readings in a cultural context.

Prerequisites: FLF 308 and FLF 310
Typically offered in Fall and Spring

FLF 401 French Graduate Reading (3 credit hours)
Basic French grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students' areas of research. Prepares students to take the graduate foreign language certification exam.

Typically offered in Fall only

FLF 411 Approaches to French Translation (3 credit hours)
Intensive practice of translating to and from French a variety of texts selected from the areas of business, law, technology and science, as well as literature and the arts. Focus on Documentation, Research and Translation techniques and ethics.

Prerequisite: at least two French (FLF) 300 level courses

FLF 425/FLF 525 Literature, Cinema and Culture of the Francophone World (3 credit hours)
A study of a number of literary texts and films from across the spectrum of the Francophone world - West Africa, the Maghreb, and the Caribbean. Through these texts and films we will study the diversity of the French colonial empire as well as the different historical, political and cultural effects of colonialism and postcolonialism. Films, videos, internet sites will be used. Course taught in French.

Prerequisite: Junior Standing and one course in French literature.
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLF 492 Seminar in French Studies (3 credit hours)
A small-group study of a topic in literature resulting in either a substantial essay or series of essays by each student. Topics vary each semester.

Prerequisite: Junior standing and 6 hrs in French literature
Typically offered in Fall only

FLF 502 Variety in Language: French (3 credit hours)

Prerequisite: Graduate standing
Typically offered in Fall only

FLF 516 Art and Society in France (3 credit hours)
An overview of the visual arts in France, defined broadly, and their relationship to French society and culture: painting, architecture, photography, cinema, book production, gardens, fashion, cuisine, television, popular culture, and mass media will be studied. Course taught in French.

Typically offered in Fall only

FLF 521 French Cultures and Contexts (3 credit hours)
Study of important periods in the history of French culture through the reading of key literary texts. Films, slides, painting, music, and the Internet will be included to put the readings in a cultural context. Topics vary. Students cannot get credit for both 421/521.

Prerequisite: Graduate status required for FLF 521
Typically offered in Fall only
FLG 525/FLF 425 Literature, Cinema and Culture of the Francophone World (3 credit hours)
A study of a number of literary texts and films from across the spectrum of the Francophone world - West Africa, the Maghreb, and the Caribbean. Through these texts and films we will study the diversity of the French colonial empire as well as the different historical, political and cultural effects of colonialism and postcolonialism. Films, videos, internet sites will be used. Course taught in French.

Prerequisite: Junior Standing and one course in French literature.
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLF 595 Special Topics in French (3-6 credit hours)
In-depth exploration of specialized topics in French literature, culture, or language. Also used to test and develop new courses. Course taught in French

Prerequisite: Graduate standing
Typically offered in Fall and Spring

FLF 675 Special Project in French (1-3 credit hours)
Individual project in French language or literature at the graduate level. Topic and mode of study to be determined in consultation with the faculty member supervising work.

Typically offered in Spring only

FLF 630 Independent Study in French (1-3 credit hours)
Individualized study in French language or literature at the graduate level. Topic and mode of study to be determined in consultation with the student's project advisory committee within the parameters of specific options.

Prerequisite: Student must be in final semester of his or her program.
Typically offered in Fall and Spring

FLF 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hour)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Fall only

Foreign Language - German (FLG)

FLG 101 Elementary German I (3 credit hours)
The first in a four-course sequence to develop the language skills of listening, speaking, reading, and writing. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

Typically offered in Fall, Spring, and Summer

FLG 102 Elementary German II (3 credit hours)
Second in a four-course sequence to develop the language skills of listening, speaking, reading, and writing. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

Prerequisite: FLG 101
Typically offered in Fall, Spring, and Summer

FLG 201 Intermediate German I (3 credit hours)
The third of four consecutive courses in German. Intensive conversational practice to develop proficiency in speaking and listening, advanced reading and writing skills by learning complex grammatical structures and through the use of authentic texts. Acquisition of cultural knowledge about the German-speaking countries.

Prerequisite: FLG 102
Typically offered in Fall, Spring, and Summer

FLG 202 Intermediate German II (3 credit hours)
Last of four consecutive courses in German. Continued conversational practice to develop proficiency in speaking and listening. Development of advanced writing skills by refining grammatical structures and style through assignments, and of advanced reading skills through the use of cultural and literary texts from the German-speaking countries.

Prerequisite: FLG 201
GEP Global Knowledge
Typically offered in Fall, Spring, and Summer

FLG 212 German Language, Culture, Science, and Technology (3 credit hours)
Discussion of German, Austrian and Swiss scientific discoveries and technological inventions as well as their impact on global society, such as aspirin, x-rays, printing technology, diesel engine, computer, microchip, television, mp3 format, genetics, and environmental technologies. Also a fourth semester German course, with intensive practice to develop proficiency in intermediate speaking and listening, reading and writing, using materials from scientific and technological disciplines.

Prerequisite: FLG 201
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Spring only

FLG 301 Advanced German (3 credit hours)
Review and consolidation of aspects of German grammar and development of writing skills. Listening and speaking practice through group activities and oral reports. Class discussions on topics from the cultures of Germany, Austria, and Switzerland, such as film, history, and the fine arts. FLG 301 and 302 can be taken in random order.

Prerequisite: FLG 202 or FLG 212 or a score of 688 on the NC State placement test.
Typically offered in Fall and Summer

FLG 302 German Oral and Written Expression (3 credit hours)
Review and practice of spoken and written German using authentic texts and materials from contemporary Germany (short stories, films, and online media). Review of German grammar through conversation, writing, and vocabulary building exercises. Oral reports by students. FLG 301 and 302 can be taken in random order.

Prerequisite: FLG 202 or FLG 212 or a score of 688 on the NC State placement test.
Typically offered in Spring and Summer
FLG 307 Business German (3 credit hours)
Business German vocabulary and terminology. Readings and discussions on current business topics. Special consideration to intercultural communication relative to international business operations.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
Typically offered in Fall only

FLG 311 Introduction to German Translation (3 credit hours)
Introduction to theory, methods, and techniques in translation applied to materials of various fields and professions. Emphasis on written translation.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
Typically offered in Fall only

FLG 315 Germanic Civilization and Culture (3 credit hours)
Culture and civilization of the German-speaking countries. Analysis of the social, economic and political structures of Germany, Austria, and Switzerland. Lectures, reports, conversation. Taught in German.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLG 318 New German Cinema and Beyond (3 credit hours)
Survey of the major contributions to German Cinema from the 1960's to the present day. Attention to film as an artistic medium and to the cinematic representation of German history and culture. Topics covered include Nazism, German Terrorism, former East Germany, debates on the position of minorities in Germany, and German Jewish relations. Taught in German.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLG 320 Introduction to German Literature (3 credit hours)
An introduction to reading and analyzing German, Austrian, and Swiss literary texts in their cultural and historical contexts. Discussion of various genres (short story, novel, drama, poetry) formal aspects, literary periods, and a variety of critical approaches. Lectures and much discussion. Oral and written assignments.
Prerequisite: FLG 202 or FLG 212
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Spring only

FLG 323 Twentieth Century German Literature (3 credit hours)
Twentieth century literature from German-speaking countries. Readings of Mann, Kafka, Rilke, Hesse, Durrenmatt, Frisch, Grass, and a variety of poets, or concentration on one or two of these world authors. Lectures and discussions. Oral and written assignments.
Prerequisite: FLG 202 or FLG 212 or equivalent.
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLG 325 German Lyric Poetry (3 credit hours)
A historical and interpretative study of the German lyric from the fifteenth into the twentieth century with special attention to the poet's choice of theme, the ways in which that theme is treated, and the relevance of the poem to the human experience.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLG 390 German Studies Topics (3 credit hours)
Presentation of material not available in regular course offerings, or offering of new courses on a trial basis. Course may be offered through videoconferencing with other UNC campuses as an offering of the German Studies Consortium. Content determined by faculty member in consultation with the department's German section coordinator. May be repeated.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.

FLG 398 Independent Study in German (1-6 credit hours)
Individualized study in German language, culture, or literature. Topic, mode of study, and credit hours to be determined in consultation with the faculty member supervising work. Departmental approval required. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Prerequisite: FLG 202 or FLG 212 or placement at 300 level.
Typically offered in Fall, Spring, and Summer

FLG 401 German Graduate Reading (3 credit hours)
Basic German grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students' areas of research. Prepares students to take the graduate foreign language certification exam.
Typically offered in Fall only

FLG 420 Current Issues in German-Language Media (3 credit hours)
Using the internet and a textbook, the course will be constructed from current topics circulated in the German, Austrian and Swiss media, e.g. newspaper websites, radio programs and TV news in streaming video format. Overview of the different news genres, the German-language media scape, and major political, economic, social and cultural issues in the German-speaking countries. Discussion, oral presentations, written assignments.
Prerequisite: Two courses at the FLG 300 level

FLG 430 Cultural Artifacts in the German-Speaking Countries (3 credit hours)
Focus on major cultural achievements in Germany, Austria and Switzerland, including literature, film, art, and music. Topics will vary. Examples are: "Kafka and Modernism", "German/Austrian/Swiss Literature and Film-Adaptations", "German-LanguageOpera", "German Art and Society in the 20th Century", or "The Faust Theme in Literature, Art, and Music". This course is repeatable so long as a different topic is covered each time.
Prerequisite: One FLG 300-level course and one from this list: FLG 315, 316, 318, 320, 323, 325, 390.
Typically offered in Fall only
Foreign Language - Greek (GRK)

**GRK 101** Elementary Greek I (3 credit hours)
Introduction to Classical Greek. Greek alphabet, basic grammar and syntax. Readings based on Greek mythology, philosophy, and literature.

*Typically offered in Fall only*

**GRK 102** Elementary Greek II (3 credit hours)
A second course in Classical Greek, continuing and expanding the work of GRK 101, and completing the study of grammar. Readings from major authors including Herodotus, Thucydides, and Xenophon.

Prerequisite: GRK 101

*Typically offered in Spring only*

**GRK 201** Intermediate Greek I (3 credit hours)
Introduction to Greek prose. Emphasis upon improvement of reading skill through vocabulary acquisition and study of complex grammar. Introduction to Attic dialect through reading Plato, and Koine Greek through reading the New Testament. Examination of the importance of these works to Western literature and culture.

Prerequisite: GRK 102

*Typically offered in Fall only*

**GRK 202** Intermediate Greek II (3 credit hours)

Prerequisite: GRK 201

*Typically offered in Spring only*

**GRK 203** Directed Readings in Greek (3 credit hours)
Advanced Greek language course introducing students to research methods in classical studies. Readings may include Plato, Homer, Sophocles, New Testament, or others. May be taken up to two times with different readings for credit.

Prerequisite: GRK 202

Foreign Language - Hindi (FLN)

**FLN 101** Elementary Hindi-Urdu I (3 credit hours)
Introduction to standard Hindi-Urdu. Emphasis on speaking and listening, and on reading and writing in the Hindi writing system (Devanagari). Readings in South Asian culture and civilization.

Corequisite: FLN 103

*Typically offered in Fall only*

**FLN 102** Elementary Hindi-Urdu II (3 credit hours)
Continuation of FLN 101. Emphasis on oral communication and reading and writing in the Hindi writing system (Devanagari). Further readings in South Asian culture and civilization.

Prerequisite: FLN 101, Corequisite: FLN 104

*Typically offered in Spring only*

**FLN 103** Elementary Hindi-Urdu I Conversation (1 credit hours)
Required conversational practice for FLN 101. Special attention to individual pronunciation and intonation. Introduction of formal and informal speech. Use of audiovisual materials.

Corequisite: FLN 101

*Typically offered in Fall only*

**FLN 104** Elementary Hindi-Urdu II Conversation (1 credit hours)
Required conversational practice for FLN 102. Extensive use of speaking skills in variety of situations. Attention to supplemental non-verbal communication. Use of audiovisual materials.

Prerequisite: FLN 101, Corequisite: FLN 102

*Typically offered in Spring only*
FLN 201 Intermediate Hindi-Urdu I (3 credit hours)
Continuation of basic language skills. Further practice of Urdu/Hindi writing systems. Introduction to grammatical divergence of Hindi and Urdu. Readings in South Asian culture and civilization.
Prerequisite: FLN 102, Corequisite: FLN 203
Typically offered in Fall only

FLN 202 Intermediate Hindi-Urdu II (3 credit hours)
Continuation of FLN 201. Further practice of both Hindi/Urdu writing systems. Further distinction of spoken and literary Urdu and Hindi. Further readings in South Asian culture and civilization.
Prerequisite: FLN 201, Corequisite: FLN 204
GEP Global Knowledge
Typically offered in Spring only

FLN 203 Intermediate Hindi-Urdu I Conversation (1 credit hours)
Required conversational practice for FLN 201. Advancement of speaking skills through role playing, interviews, debates. Further Hindi and Urdu non-verbal communication. Use of audiovisual materials, including responses to commercial television and movies.
Prerequisite: FLN 102, Corequisite: FLN 201
Typically offered in Fall only

FLN 204 Intermediate Hindi-Urdu II Conversation (1 credit hours)
Required conversational practice for FLN 202. Refinement of speaking skills through role playing, interviews, debates. Further Hindi and Urdu non-verbal communication. Use of audiovisual materials, including responses to commercial television and movies.
Prerequisite: FLN 201, Corequisite: FLN 202
Typically offered in Spring only

FLN 301 Twentieth Century Hindi & Urdu Fiction (3 credit hours)
Introduces advanced Hindi-Urdu students to the prose fiction of major Hindi and Urdu literary figures including Munshi Premchand, Saadat Hasan Manto and others. Texts will be provided in both Hindi and Urdu scripts and/or English translation as available.
Prerequisite: FLN 202
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLN 302 Modern Hindi & Urdu Poetry (3 credit hours)
Introduces advanced Hindi-Urdu students to representative works of 19th and 20th century Hindi and Urdu poets and poetic forms. Texts will be provided in both Hindi and Urdu scripts and/or English translation as available.
Prerequisite: FLN 202
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLN 401 Hindi Literature and South Asian Cultural Contexts (3 credit hours)
Selected topics in Hindi literature and/or South Asian literature in Hindi, such as drama in modern South Asia, the twentieth-century novel, literature and the nation, narratives of pain and resistance, gender and social reform. Readings and discussion in Hindi, with emphasis on the examination of formal literary characteristics and the interconnections of texts and relevant South Asian cultural contexts. Topics will be rotated so that students can take this course for credit up to three times.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

Foreign Language - Italian (FLI)

FLI 101 Elementary Italian I (3 credit hours)
Begins the development of a balanced foundation in all four language skills. Concentrates on listening and speaking, emphasizing idiomatic Italian. Short readings in Italian culture and civilization. Class and laboratory practice, written homework.
Typically offered in Fall, Spring, and Summer

FLI 102 Elementary Italian II (3 credit hours)
Continuation of FLI 101 with emphasis on acquisition of oral skills through class practice and use of audio aids. Readings in Italian culture, civilization and literature.
Prerequisite: FLI 101
Typically offered in Fall, Spring, and Summer

FLI 201 Intermediate Italian I (3 credit hours)
Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussion of Italian culture, civilization and literature.
Prerequisite: FLI 102
GEP Global Knowledge
Typically offered in Spring and Summer

FLI 202 Intermediate Italian II (3 credit hours)
Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of Italy.
Prerequisite: FLI 201
Typically offered in Fall and Summer

FLI 204 Intermediate Italian II (3 credit hours)
Intensive practice in speaking and understanding Italian through role playing, discussion, interviews, and use of audio-visual materials.
Corequisite: FLI 202
Typically offered in Fall and Summer

FLI 208 Intermediate Italian Conversation (3 credit hours)
Advanced readings and intensive conversational practice in Italian for students beyond the intermediate level.
Prerequisite: FLI 202
Typically offered in Spring and Summer

FLI 308 Italian Reading and Conversation (3 credit hours)
Advanced readings and intensive conversational practice in Italian for students beyond the intermediate level.
Prerequisite: FLI 202
Typically offered in Spring and Summer

FLI 315 Italian Civilization and Culture (3 credit hours)
Italian culture and society from its origins to modern times, including its history, geography and national and regional identities, social images, political and economic structures, and technological and scientific development of the Italian society. As an extension of the classroom students participate in educational experiences such as excursions and Italian cooking classes. Taught in English and as NC State Study Abroad Program in Perugia, Italy.
GEP Global Knowledge, GEP Humanities
Typically offered in Summer only
FLI 318 Italian Society Through Cinema (3 credit hours)
Italian culture and society through cinema from the fascist era to the present. A study of selected films representative of major social-political, ideological, and artistic developments. Weekly film viewings. Taught in Italian.

Prerequisite: FLI 202
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

Foreign Language - Japanese (FLJ)

FLJ 101 Elementary Japanese I (3 credit hours)
Introduction to standard, formal Japanese. Emphasis on speaking and listening skills. Exposure to Japanese culture, reading, and writing.

Corequisite: FLJ 103
Typically offered in Fall only

FLJ 102 Elementary Japanese II (3 credit hours)
Continuation of basic skills. Emphasis on speaking and listening skills; inclusion of Japanese cultural factors in communication. Some reading and writing.

Prerequisite: FLJ 101, Corequisite: FLJ 104
Typically offered in Spring only

FLJ 103 Elementary Japanese I Conversation (1 credit hours)
Supplements conversational practice in FLJ 101. Students are encouraged to use their speaking skills in a variety of situations. Special attention is given to correcting and improving pronunciation and intonation.

Corequisite: FLJ 101
Typically offered in Fall only

FLJ 104 Elementary Japanese II Conversation (1 credit hours)
Supplements conversational practice in FLJ 102. Extensive use of speaking skills in a variety of situations. Special attention given to correcting and improving pronunciation and intonation.

Prerequisite: FLJ 101, Corequisite: FLJ 104
Typically offered in Spring only

FLJ 201 Intermediate Japanese I (3 credit hours)
Continuation of basic skills. Greater emphasis on reading and writing. More exposure to Japanese cultural traditions.

Prerequisite: FLJ 102 or FLJ 105, Corequisite: FLJ 203
Typically offered in Fall only

FLJ 202 Intermediate Japanese II (3 credit hours)
Continuation of the learning of the basic skills. Emphasis on reading and writing as well as on spoken Japanese and on cultural patterns of behavior.

Prerequisite: FLJ 201, Corequisite: FLJ 204
GEP Global Knowledge
Typically offered in Spring only

FLJ 203 Intermediate Japanese Conversation (1 credit hours)
Practice in spoken Japanese through use of the language in a variety of situations. Increase vocabulary and develop fluency and ease in the structural patterns of the language. May be repeated for a maximum of three credit hours.

Prerequisite: FLJ 102, Corequisite: FLJ 201, FLJ 202 or FLJ 301
Typically offered in Fall only

FLJ 204 Intermediate Japanese II Conversation (1 credit hours)

Corequisite: FLJ 202
Typically offered in Spring only

FLJ 301 Intermediate Japanese III (3 credit hours)
Continued study of Japanese language. Primary emphasis on spoken Japanese, but attention also given to reading, writing and culture.

Prerequisite: FLJ 202
Typically offered in Fall only

FLJ 302 Intermediate Japanese IV (3 credit hours)
Continued training in the foundations of Japanese language. Primary emphasis on spoken Japanese, with increased attention to reading and writing.

Prerequisite: FLJ 301
Typically offered in Spring only

FLJ 342 Classical Japanese Literature in Translation (3 credit hours)
A survey of literature in Japan from earliest recorded times through the sixteenth century. Examples from major eras and genres (folktales, poetry, philosophy, fictional narrative, theater, etc.) will be considered, with attention to historical and cultural contexts, as well as to contemporary scholarship and approaches toward traditional literature. Examples from literature outside Japan will be included for comparative purposes. No prior knowledge of Japanese required: Readings and discussions in English.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLJ 344 Early Modern Japanese Literature in Translation (3 credit hours)
A survey of literature in Japan from 1600 to late Nineteenth Century. Examples from major periods and genres (novels, poetry, philosophy, drama, miscellaneous narrative, etc.) will be considered, with attention to historical and cultural contexts, as well as to contemporary scholarship and approaches toward the literature. Examples from literature outside Japan will be included for comparative purposes. No prior knowledge of Japanese required: Readings and discussions in English.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only
FLJ 345 Modern Japanese Literature in Translation (3 credit hours)
A survey in literature in Japan from the Meiji Era through World War Two. Examples from major periods and genres (novels, poetry, philosophy, drama, miscellaneous narrative, etc.) will be considered, with attention to historical and cultural contexts, as well as to contemporary scholarship and approaches toward the literature. Examples from literature outside Japan will be included for comparative purposes. No prior knowledge of Japanese required: Readings and discussions in English.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLJ 351/ANT 351 Contemporary Culture in Japan (3 credit hours)
Introduction to basic aspects of cultural practices in Japanese society, including education, work life, family relationships, everyday religious practices, aesthetic traditions, national identity, and gender. Students will develop an understanding of the interrelationships between language and culture.

Prerequisite: FLJ 101
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLJ 401 Advanced Japanese I (3 credit hours)
Continued training in the foundations of Japanese language, with emphasis on complex verb forms. Increased attention to reading and writing.

Prerequisite: FLJ 302
Typically offered in Fall only

FLJ 402 Advanced Japanese II (3 credit hours)
Elaboration on grammatical forms learned in the previous courses with applications in reading and writing, combined with more sophisticated vocabulary and idioms and attention to development of natural reading skills.

Prerequisite: FLJ 401
Typically offered in Spring only

LAT 202 Intermediate Latin II (3 credit hours)
Lyric poetry of Catullus and Horace emphasizing vocabulary, syntax, and techniques of Latin verse. Traditions and the evolution of lyric poetry and the social role of the Roman poet.

Prerequisite: LAT 201
Typically offered in Spring only

LAT 399 Directed Readings in Latin (3 credit hours)
Advanced Latin language course introducing students to research methods in classical studies. Readings may include Vergil, Ovid, Livy, Cicero, or others. May be taken up to two times with different readings for credit.

Prerequisite: LAT 202
Typically offered in Spring only

Foreign Language - Persian (PER)

PER 101 Elementary Persian I (3 credit hours)
For students with little or no background or previous study of the language. Development of communicative abilities within an integrated skill approach (speaking, listening, reading, writing). Introduction to the Persian-speaking world, including the Iranian Ta'arof, food and diaspora. Vocabulary level: 300 words.

C: PER 103
Typically offered in Fall only

PER 102 Elementary Persian II (3 credit hours)
The second-semester continuation of Persian 101. Students learn how to talk about their daily routines and spare time activities, likes and dislikes, and build a more complex language form. They are expected to ask and answer questions on the same topics as well. Throughout the course they learn common phrases and cultural perspectives which help them create a more natural interaction with speakers of Persian. Persian-Farsi is the language base, with Tehrani accent. This is a 500-word level class and ACTFL level of ILR 0+

P: PER 101 and PER 103, or by placement test; C: PER 104
Typically offered in Spring only

PER 201 Intermediate Persian I (3 credit hours)
Persian 201 is the third semester (beginning of second-year) in Persian. It deepens the students’ familiarity with the syntax of the literary language of Persia and expands their command of the spoken vernacular of Iran through exposure to more varied

Prerequisite: Elementary Persian 102, or instructor's permission
Typically offered in Fall only

LAT 101 Elementary Latin I (3 credit hours)
Beginning course in Classical Latin, emphasizing elementary grammatical form and basic syntax. Readings based on brief selections from Roman authors, including Cicero and Catullus.

Typically offered in Fall only

LAT 102 Elementary Latin II (3 credit hours)
Continuation of Latin 101. Completion of the study of elementary grammar. Readings from a variety of Latin authors, including texts on mythological themes.

Typically offered in Spring only

LAT 201 Intermediate Latin I (3 credit hours)
Introduction to Latin prose and poetry. Emphasis on increased reading skill. Review of grammar fundamentals and exposure to new and more complex syntax. Examination of cultural significance of readings.

Prerequisite: LAT 102
Typically offered in Fall and Summer
**PER 202 Intermediate Persian II** (3 credit hours)
Persian 202 is the fourth semester, which completes the intermediate level (second year) in Persian. It further deepens the students' familiarity with the syntax of the literary language of Persia and expands their command of the spoken vernacular of Iran through exposure to more varied and sophisticated communicational contexts. It deals principally with the acquisition of the conversation register of the language, which differs considerably from the formal written style. An intermediate textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

Prerequisite: Elementary Persian (PER 201) or instructor's permission

**GEP Global Knowledge**
Typically offered in Spring only

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**Foreign Language - Portuguese (FLP)**

**FLP 101 Elementary Portuguese I** (3 credit hours)
Introduction to the fundamentals of Brazilian Portuguese: pronunciation, comprehension, and spoken syntax and grammar.

*Typically offered in Fall only*

**FLP 102 Elementary Portuguese II** (3 credit hours)
Continuation of the essentials of Brazilian Portuguese. Further stress on pronunciation and comprehension and introduction of reading and writing skills.

Prerequisite: FLP 101

*Typically offered in Spring only*

**FLP 201 Intermediate Portuguese I** (3 credit hours)
The third level of Portuguese with special attention to speaking, reading, writing and developing a cultural awareness of the cultural heritage of the Portuguese-speaking peoples of Portugal, Brazil and Portuguese-speaking Africa.

Prerequisite: FLP 102 or placement in course

*Typically offered in Fall only*

**FLP 401 Brazilian Portuguese for Spanish Speakers** (3 credit hours)
A one semester on-line intensive introductory course to Brazilian Portuguese for Spanish speakers taught in Spanish focusing on the development of: 1) Reading Comprehension in Brazilian Portuguese; 2) Basic translation skills: Spanish>Portuguese>Spanish; 3) Colloquial writing skills in Brazilian Portuguese; 4) Basic speaking ability in Brazilian Portuguese. This course is open to undergraduate, graduate and extension students with a formal knowledge of Spanish who fulfill the prerequisite. Instructor approval required.

Prerequisite: Native/Heritage Spanish Speaker or FLS 202 or Equivalent and Instructor's Approval

*Typically offered in Fall and Spring*

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**Foreign Language - Russian (FLR)**

**FLR 101 Elementary Russian I** (3 credit hours)
First in a four-course sequence to develop language skills in Russian. Oral and written practice in the classroom and language laboratory and attention to Russian cultural heritage.

*Typically offered in Fall only*

**FLR 102 Elementary Russian II** (3 credit hours)
Emphasis on acquisition of basic oral skills, with complementary reading and writing exercises and attention to Russian cultural heritage.

Prerequisite: FLR 101

*Typically offered in Spring only*

**FLR 201 Intermediate Russian I** (3 credit hours)
Basic Russian language skills continued. More emphasis given to writing and essential conversational practice. Intermediate level readings in Russian literature and culture. Class and laboratory practice; written assignments.

Prerequisite: FLR 201

**GEP Global Knowledge**
Typically offered in Spring only

**FLR 202 Intermediate Russian II** (3 credit hours)
Advanced aspects of Russian syntax through study of text. Continued attention to conversational practice and vocabulary building.

Prerequisite: FLR 201

**GEP Global Knowledge**
Typically offered in Spring only

**FLR 303 Russian Literature in Translation: The Nineteenth Century** (3 credit hours)
A study of the great Russian writers of the nineteenth century. Examination of peculiarly Russian as well as the universal aspects of this literature. All readings, lectures and discussions in English.

**GEP Global Knowledge, GEP Humanities**
Typically offered in Fall only

**FLR 304 Russian Literature in Translation: The Twentieth Century** (3 credit hours)
A study of major Russian writers of the twentieth century. Examination of peculiarly Russian as well as the universal aspects of this literature. All readings, lectures and discussions in English.

**GEP Global Knowledge, GEP Humanities**
Typically offered in Fall only

**FLR 318 Russian Cinema and Society** (3 credit hours)
Russian culture and society through cinema. A study of selected films representative of major social-political, ideological, and artistic developments. Weekly film screenings. No knowledge of Russian required.

**GEP Global Knowledge, GEP Humanities**
Typically offered in Spring only
Foreign Language - Spanish (FLS)

FLS 101 Elementary Spanish I (3 credit hours)
For students with little or no background or previous study of Spanish or those who place into course via Spanish placement exam. Development of communicative abilities within an integrated skill approach (speaking, listening, reading, writing). Introduction to the cultures of the Spanish-speaking world. Includes written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Typically offered in Fall, Spring, and Summer

FLS 102 Elementary Spanish II (3 credit hours)
Continuation of FLS 101. Development of communicative abilities within an integrated skills approach (speaking, listening, reading, writing). Introduction to the cultures of the Spanish-speaking world. Includes written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Prerequisite: FLS 101
Typically offered in Fall, Spring, and Summer

FLS 105 Intensive Elementary Spanish (6 credit hours)
An intensive course equivalent to FLS 101 plus FLS 102. Development of communicative abilities within an integrated skills approach (speaking, listening, reading, writing). Introduction to the cultures of the Spanish-speaking world. Includes written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Typically offered in Fall and Spring

FLS 110 Accelerated Elementary Spanish (3 credit hours)
Contents of FLS 101 and FLS 102 at an accelerated pace, for students placed into the course based on results of the Spanish placement test. Development of communicative abilities within an integrated skills approach (speaking, listening, reading, writing). Introduction to the cultures of the Spanish-speaking world. Includes extensive written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Prerequisite: A score of 167 or better on the Spanish placement exam is required for matriculation in this course
Typically offered in Fall and Spring

FLS 201 Intermediate Spanish I (3 credit hours)
Continued development of communicative abilities for students with previous study of elementary level Spanish. Integrated skills approach (speaking, listening, reading, writing). Students will learn to function in everyday situations, expressing opinions and doubts, and narrating and describing in present, past, and future time, and will explore cultural issues through literary and other types of readings. Includes written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Prerequisite: FLS 102,105 or 110
Typically offered in Fall, Spring, and Summer

FLS 202 Intermediate Spanish II (3 credit hours)
Development of communicative abilities at the intermediate level of the American Council on the Teaching of Foreign Language proficiency scale, with an integrated skills approach (reading, writing, speaking, listening) and additional emphasis on knowledge and competence in the cultures of the Spanish-speaking world. Includes written and oral assignments of language structures and vocabulary. Conducted entirely in Spanish. Closed to native speakers of Spanish.

Prerequisite: FLS 201 or FLS 212
GEP Global Knowledge
Typically offered in Fall, Spring, and Summer

FLS 212 Spanish: Language, Technology, Culture (3 credit hours)
A study of the language structures and vocabulary necessary for an intermediate level of communication in Spanish together with cultural and technical issues of our global society in the context of the Spanish-speaking world. Fulfills the FLS 201 requir
Prerequisite: FLS 102 or FLS 110 or FLS 105
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

FLS 295 Intermediate Special Topics in Spanish (3 credit hours)
Special Topics in language and cultures of the Spanish speaking world for students at the intermediate (200) level. Includes courses taught in Spanish study abroad programs. Course may be taken up to three times.
Prerequisite: FLS 201
Typically offered in Fall, Spring, and Summer

FLS 331 Spanish Oral and Written Expression I (3 credit hours)
Development of speaking and writing skills at the Intermediate Mid to Intermediate High levels of the American Council on the Teaching of Foreign Languages proficiency scale, as well as listening/viewing and reading skills. Focus on sentence and paragraph-length discourse, narration and description in present, past, and future time frames within a variety of topics and contexts, and communication skills such as circumlocution. Course readings, video and discussion content center upon cultural aspects of the Spanish speaking world.
Prerequisite: FLS 202
Typically offered in Fall, Spring, and Summer

FLS 332 Spanish Oral and Written Expression II (3 credit hours)
Development of speaking and writing skills at the Intermediate High levels of the American Council on the Teaching of Foreign Languages proficiency scale, as well as listening/viewing and reading skills. Focus on paragraph-length discourse, narration and detailed description in present, past, and future time frames within a variety of topics and contexts, and communication skills such as circumlocution. Course readings, video and discussion content center upon cultural aspects of the Spanish speaking world.
Prerequisite: FLS 202
Typically offered in Fall, Spring, and Summer

FLS 333 The Sounds of Spanish (3 credit hours)
A study of the pronunciation and phonological system of Spanish, with the goals of improving student pronunciation and analyzing native Spanish pronunciation. Extensive practice in phonetic transcription and pronunciation, as well as phonetic/phonological dialect variation.
Prerequisite: FLS 202
Typically offered in Fall and Spring
FLS 335 Spanish for Native and Heritage Speakers (3 credit hours)
This course is designed to meet the needs of native and heritage speakers of Spanish whose linguistic level is above that of our 200-level courses. Development of oral and writing skills at the Advanced-Mid through Superior levels of the American Council.
R: Native or heritage speaker of Spanish
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLS 336 Spanish for Business (3 credit hours)
Business Spanish vocabulary and terminology. Emphasis on everyday spoken and written Spanish. Readings and discussions of business topics. Cross-cultural considerations relative to international business operations.
P: FLS 331 or FLS 335
Typically offered in Fall only

FLS 337 Spanish for Tourism in the Hispanic World (3 credit hours)
Exploration of the tourism industry in the Spanish speaking world from cultural-historical, geographic, and linguistic perspectives. Course can lead to Tourism Certificate in Spanish from the Chamber of Commerce and Industry of Spain.
Prerequisite: FLS 202

FLS 340 Introduction to Hispanic Literatures and Cultures (3 credit hours)
Exploration of what literature is; what it means to read literature; and why one might be interested in analyzing literature. Introduction to literary terminology, as well as literary genres and movements in the Spanish language. Examination of social-cultural-historical contexts of Spain and Latin America, particularly matters of race, class, gender, and political ideas as they relate to literatures of the Spanish speaking world. Interpretation and analysis of literary texts, cultural institutions, and objects of national, mass, and popular cultures.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FLS 341 Literature and Culture of Spain I (3 credit hours)
Survey of literary and cultural contexts of medieval and early modern Spain (12th to 17th centuries). Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Spanish society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FLS 342 Literature and Culture of Spain II (3 credit hours)
Survey of literary and cultural contexts of 18th and 19th century Spain. Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Spanish society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLS 343 Literature and Culture of Spain III (3 credit hours)
Survey of literary and cultural contexts of 20th and 21st century Spain. Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Spanish society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLS 351 Literature and Culture of Latin America I (3 credit hours)
Survey of literary and cultural contexts of Latin America from the pre-conquest, colonial and early-independence periods (15th to mid 19th centuries). Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Latin American society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLS 352 Literature and Culture of Latin America II (3 credit hours)
Survey of literary and cultural contexts of Latin America from the Mid 19th to the Mid 20th centuries. Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Latin American society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FLS 353 Literature and Culture of Latin America III (3 credit hours)
Survey of literary and cultural contexts of Latin America since 1960. Examination of literary genres in connection with concurrent cultural and historical events. Exploration of literature as a reflection of the experiences and events meaningful to Latin American society during this time period. Emphasis on the ways in which literature and other cultural artifacts give voice to value systems, traditions, and beliefs.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FLS 360 Hispanic Cinema (3 credit hours)
Survey of the major contributions of Hispanic cinema from its origins to the present. Analysis of film as an artistic medium and as the cinematic representation of Hispanic histories and cultures. Reading, discussions, and viewing of films by representative directors.
Prerequisite: FLS 331 or FLS 332 or FLS 335
GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Spring only
FLS 395 Study Abroad Programs in Spanish  (3 credit hours)
Specific category of courses in Spanish involving language and/or culture taught in Spanish-speaking countries through the Department Study Abroad Program.

Prerequisite: FLS 202
Typically offered in Fall, Spring, and Summer

FLS 399 Intensive Spanish Oral Proficiency Workshop  (1 credit hours)
Extensive conversation centered upon the communicative functions of the intermediate high to advanced levels of the American Council on the Teaching of Foreign Languages (ACTFL) Oral Proficiency Scale. Assignments will include listening/viewing and speaking.

Prerequisite: 3 Hours of 300-level Spanish
Typically offered in Fall, Spring, and Summer

FLS 400 Methods and Techniques in Spanish Translation and Interpretation  (3 credit hours)
Study and practical application of theory, methods and techniques of translation based on materials relevant to various fields and professions.

Prerequisite: 12 credits of 300 level Spanish or higher
Typically offered in Spring only

FLS 401 Spanish Graduate Reading  (3 credit hours)
Basic Spanish grammar, with special attention to characteristics of formal expository style, and illustrative readings. Study of extracts from scholarly publications in students’ areas of research. Prepares students to take the graduate foreign language certification exam.

Typically offered in Fall only

FLS 402 Introduction to Spanish Linguistics  (3 credit hours)
Introduction to fundamental terminology and concepts in the study of linguistics. Overview of the Spanish phonetics and phonology, morphology, syntax, semantics, pragmatics, sociolinguistics and historical linguistics.

Prerequisite: 12 credits of 300 level Spanish or higher
Typically offered in Fall only

FLS 405 Spanish-English Comparative Grammar  (3 credit hours)
Analysis of the linguistic and grammatical structure (phonology, morphology, syntax, and discourse) of English and Spanish in order to develop a deeper understanding of how both linguistic systems function in similar and different ways.

Prerequisite: 12 credits of 300 level Spanish or higher
Typically offered in Spring only

FLS 411 Topics in the Culture of Spain  (3 credit hours)
Exploration of particular themes related to the culture of Spain, with culture broadly defined as history, social and political aspects of society, as well as human and artistic expression including use of language, literary production, performance, print, and electronic media. Themes in this course expand upon those introduced in the 300 level of the Spanish curriculum. Class discussion and assignments require greater depth and sophistication than introduction to literature and culture courses of the 300 level.

Prerequisite: 12 credits of 300-level Spanish
Typically offered in Fall and Spring

FLS 412 Topics in the Culture of Latin America and the Caribbean  (3 credit hours)
Exploration of particular themes related to the culture of Latin America and the Caribbean, with culture broadly defined as history, social and political aspects of society, as well as human and artistic expression including use of language, literary production, performance, print, and electronic media. Themes in this course expand upon those introduced in the 300 level of the Spanish curriculum. Class discussion and assignments require greater depth and sophistication than introduction to literature and culture courses of the 300 level.

Prerequisite: 12 credits of 300-level Spanish

FLS 413 Spain and the Americas in Transatlantic Perspective  (3 credit hours)
Exploration of key moments of communication, exchange and conflict between the different parts of the Spanish speaking world, from the point of contact between imperial Spain and the indigenous civilizations of the “New World”. Examination of the commonalities and distinctions of the quest for independence, modernity and democracy. Analysis of immigration across national frontiers in the present day Hispanic World and greater American continent.

Prerequisite: 12 credits of 300-level Spanish

FLS 445/FLS 545 Spanish Environmental Cultural Studies  (3 credit hours)
This seminar will serve as an exploration of environmental cultural studies in contemporary Spain. It will examine questions such as climate change, industrial agriculture, animal rights, sustainability, environmental justice, eco-feminism and others in the context of contemporary Spanish culture. The course will also serve as an introduction to environmental activism and environmental politics in Spain and at the planetary level. It will make use of theoretical and critical readings, films, literary works, and other cultural products. Students cannot receive credit for both FLS 445 and FLS 545.

P: 12 hours of 300-level Spanish
Typically offered in Fall and Spring

FLS 492/FLS 592 Seminar in Hispanic Studies  (3 credit hours)
Advanced seminar on a specific area of Hispanic studies (topics vary), leading to a major term paper and/or a series of essays by the student.

Prerequisite: 12 credits of 300 level Spanish or higher
Typically offered in Spring only

FLS 495 Advanced Study Abroad Programs in Spanish  (3 credit hours)
Specific category of courses in Spanish at the 400-level involving language and/or culture taught in Spanish-speaking countries through the Department Study Abroad Program.

Prerequisite: 12 credits of 300-level Spanish
Typically offered in Fall, Spring, and Summer

FLS 502 Linguistic Structure of Spanish  (3 credit hours)
Introduction to fundamental terminology and concepts in the study of linguistics. Overview of the Spanish sound system (phonology), principles of word formation such as derivation and inflection (morphology), structure and grammatical relations of phrases and sentences (syntax), as well as the relationship between linguistic levels. Graduate standing required.

Typically offered in Fall only
FLS 503  **Spanish Applied Linguistics**  (3 credit hours)
Overview of prominent theoretical perspectives in the acquisition of Spanish as a second language. Application of theory to the learning and teaching of the Spanish language. Analysis of issues in the acquisition of Spanish phonology, morphosyntax, semantics, and pragmatics. Graduate standing required.
Prerequisite: FLS 502 (Linguistic Structure of Spanish)

Typically offered in Spring only

FLS 504  **Spanish Language Change and Variation**  (3 credit hours)
Overview of phonological and morphosyntactic change from Latin to modern Spanish. Linguistic exploration of social and geographical dimensions Spanish language variation. Examination of issues of Spanish/English contact in the United States, including bilingualism and bilingual education. Graduate standing required.
Prerequisite: FLS 502 (Linguistic Structure of Spanish)

Typically offered in Fall only

FLS 509  **Spanish Phonetics and Phonology**  (3 credit hours)
A theoretical introduction to the phonetics and phonological system of Spanish. Topics covered include articulatory phonetics, narrow and broad transcription, and the analysis of linguistic data with the goal of understanding the underlying system of Spanish sounds. Current topics in Spanish phonology are included. Graduate standing required.
Prerequisite: FLS 502 (Linguistic Structure of Spanish)

Typically offered in Fall only

FLS 512  **Spanish in the United States**  (3 credit hours)
A study of the varieties of Spanish spoken in the United States from the linguistic perspective. The course examines the historical and socio-political motives for distinct waves of immigration as a means to understand the development of unique dialects and sociolects that are emerging across the country. Readings and lectures explore topics such as phonetic, morphosyntactic, geographic, and social variation; bilingualism and language contact; language acquisition and education; and language in the media and public space.
Prerequisite: FLS 502 or Permission of Instructor

Typically offered in Fall, Spring, and Summer

FLS 515  **History of Spanish Language**  (3 credit hours)
Overview of historical evolution of modern Spanish from spoken Latin. Focus on theories of language change as applied to the historical development of Spanish. Graduate status or instructor permission required.
Prerequisite: FLS 502 or equivalent; or permission of instructor

Typically offered in Spring only

FLS 520  **Survey of Hispanic Literature and Culture**  (3 credit hours)
This course covers literature from the 8th century on in the Peninsular context and/or from the times of the pre-Conquest in Latin America to the present. It focuses on short stories, poetry, essays and films as well as different critical and theoretical analyses of culture. Its purpose is to familiarize graduate students with Latin American and/or Peninsular literature and culture and to provide a foundation for the other course offerings in literature/culture in the graduate program. It can be taught as a survey of Peninsular or Latin American literature or both.
Prerequisite: Graduate standing

Typically offered in Fall only

FLS 528  **Don Quixote**  (3 credit hours)
This course studies the historical and political contexts of Cervante's writing, his place in Renaissance culture, and the role of Don Quixote in the formation of the modern novel. Taught in Spanish. Graduate status or permission of the instructor.

Typically offered in Fall only

FLS 530  **The Cultural Production of Spanish Democracy**  (3 credit hours)
Challenges, contradictions, accomplishments, and shortcomings in the political, social, economic, cultural, and literary dimensions of Spain in the last quarter of the 20th century. Treatment of literary texts, historical and journalistic documents, critical and theoretical essays, as well as fiction and non-fiction films, music, and other products of popular and mass culture since 1975. Particular attention to significant cultural events such as the 1992 Barcelona Olympics, and the celebration of the 500th anniversary of the "Discovery" of America. Must hold graduate standing.

Typically offered in Fall only

FLS 545/FLS 445  **Spanish Environmental Cultural Studies**  (3 credit hours)
This seminar will serve as an exploration of environmental cultural studies in contemporary Spain. It will examine questions such as climate change, industrial agriculture, animal rights, sustainability, environmental justice, eco-feminism and others in the context of contemporary Spanish culture. The course will also serve as an introduction to environmental activism and environmental politics in Spain and at the planetary level. It will make use of theoretical and critical readings, films, literary works, and other cultural products. Students cannot receive credit for both FLS 445 and FLS 545.

P: 12 hours of 300-level Spanish

Typically offered in Fall and Spring

FLS 553  **The Latin American Avant-Garde**  (3 credit hours)
An in-depth analysis of the cultural avant-garde in Latin America at the beginning of the twentieth century (1905-1939). Students will study European and Latin American theories of the avant-garde, literature, art, music, and manifestation from the period in several Latin American countries. Graduate standing required. Taught in Spanish.

Typically offered in Spring only

FLS 554  **The Sixties in Latin America**  (3 credit hours)
An in-depth analysis of the cultural production during the 60s in Latin America. Students will study novels, short stories, poetry, music, and film from several Latin American countries. Graduate standing required.

Typically offered in Fall only

FLS 563  **The Latin American Novel**  (3 credit hours)
The course offers a comprehensive view of Latin America novel (from the 19th Century until the present). It centers its attention foremost on canonical works (Isaacs, Gallegos, Vargas Llosa, Puig, etc.). Besides familiarizing students with the political, social and cultural contexts that gave rise to these texts, it also provides, through the reading of various theoretical articles, a basic introduction to narrative theory (Genette, Booth, Bal, Brooks, etc.). Graduate standing required.

Typically offered in Spring only
FLS 592/FLS 492 Seminar in Hispanic Studies (3 credit hours)
Advanced seminar on a specific area of Hispanic studies (topics vary),
leading to a major term paper and/or a series of essays by the student.

Prerequisite: 12 credits of 300 level Spanish or higher
Typically offered in Spring only

FLS 595 Special Topics in Spanish (1-3 credit hours)
In depth exploration of specialized topics in Spanish literature, culture or
language. Also used to test and develop new courses. Course taught in
Spanish.

Prerequisite: Graduate Standing or Permission of the Instructor
Typically offered in Fall and Spring

FLS 630 Independent Study in Spanish (1-3 credit hours)
Individualized study in Spanish language or literature at the graduate
level. Topic and mode of study to be determined in consultation with the
faculty member supervising work.

Typically offered in Fall only

FLS 675 Special Project in Spanish (1-3 credit hours)
Individual project in Spanish language or literature at the graduate level.
Topic and mode of study to be determined in consultation with student's
project advisory committee within the parameters of specific options.

Prerequisite: Student must be in final semester of his or her program
Typically offered in Fall and Spring

FLS 688 Non-Thesis Masters Continuous Registration - Half Time
Registration (1 credit hours)
For students in non-thesis master's programs who have completed all
credit hour requirements for their degree but need to maintain half-time
continuous registration to complete incomplete grades, projects, final
master's exam, etc.

Prerequisite: Master's student
Typically offered in Spring only

Foreign Language-Classical Studies (CLA)

CLA 110 Greek and Latin Roots of English (3 credit hours)
Study of the formation of English words from Greek and Latin roots,
designed to build English vocabulary and word power. Students who plan
to enter medical professions should take CLA 115. Students may not receive credit for both CLA 110 and CLA 115.

Typically offered in Spring only

CLA 115 Medical Terminology (3 credit hours)
Study of the formation of medical terms from their Greek and Latin
roots designed both to build vocabulary and to teach the uses of a
medical dictionary. Students may not receive credit for both CLA 110 and
CLA 115.

Typically offered in Fall, Spring, and Summer

CLA 210 Classical Mythology (3 credit hours)
Greek and Roman mythology through the writings and art of the Classical
period. Discussion of creation stories, the major gods and heroes, the
underworld and afterlife, intellectual, religious and educational role of
myth, and the most important theories of interpretation and classification.
All readings and discussion in English.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Summer

CLA 215 The Ancient World in Modern Media (3 credit hours)
Study of the ways classical myth and culture appear in modern media
such as film, TV, comics, the internet and others, with focus on why
ancient stories, ideas and images are still appealing, but also how and
why they are used in new ways with new meanings.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

CLA 320 Masterpieces of Classical Lit (3 credit hours)
Study of great works of Greek and Latin Literature in a genre such as
tragedy, comedy, epic or lyric, with attention to both literary merit and
cultural importance. All readings in English. May be taken up to three
times in different genres for credit.

R: Sophomore Standing
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

CLA 325 Gender, Ethnicity & Identity in the Ancient World (3 credit
hours)
Study of the formation of ideas and practices regarding gender, ethnicity,
and identity in the ancient Greek and Roman world, with attention to both
continuities and difference between ancient and modern views

R: Sophomore Standing
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

CLA 395 Special Topics in Classical Studies (3 credit hours)
For topics not part of regular course offerings, or offering of new courses
on a trial basis. May be taken up to three times provided the topics are
different.

CLA 398 Independent Study in Classical Studies (1-3 credit hours)
Individualized study in classical language, culture or literature. Topic,
mode of study, and credit hours to be determined in consultation with
faculty member supervising work. May be taken up to three times
provided the topic is sufficiently different. Individualized/Independent
Study and Research courses require a "Course Agreement for Students
Enrolled in Non-Standard Courses" be completed by the student and
faculty member prior to registration by the department.

R: Sophomore Standing
Foreign Languages (FL)

FL 216 Art and Society in France  (3 credit hours)
An overview of the visual arts in France, defined broadly, and their relationship to French society and culture: painting, architecture, photography, cinema, book production, gardens, fashion, food, television, popular culture, and mass media, including the Internet. The principal themes of the course are how France's cultural heritage is embodied in its rich tradition of visual expression and how artists' visual expressions have either served to represent, glorify, or critique the nation.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

FL 219/ENG 219 Studies in Great Works of Non-Western Literature  (3 credit hours)
Readings, in English translation, or non-Western literary masterpieces from the beginnings of literacy in the Middle East, Asia, and Africa to the modern period, including excerpts from texts such as the Upanishads, the Ramayana, the Sundialta, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 220/ENG 220 Studies in Great Works of Western Literature  (3 credit hours)
Readings, in English translation, of Western literary masterpieces, from the beginnings of literacy in the Middle East, Asia, and Africa to the modern period, including excerpts from texts such as the Upanishads, the Ramayana, the Sundialta, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 221/ENG 221 Literature of the Western World I  (3 credit hours)
Readings from English translations of Biblical, Classical, Medieval, and Early Renaissance literature, including works by such authors as Homer, Sophocles, Virgil, Ovid, Augustine, Dante, Machiavelli, Shakespeare, Cervantes, Moliere, Voltaire, Goethe, Austen, Flaubert, Dickinson, Tolstoy, Kafka, and Woolf. Credit will not be given for both ENG/FL 220 and either ENG/FL 221 or ENG/FL 222.

Restriction: Credit is not allowed for both ENG 220 and ENG 221 or ENG 222.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

FL 222/ENG 222 Literature of the Western World II  (3 credit hours)
Readings from English translations of Renaissance, Neo-Classical, Romantic, and Early Modern literature, emphasizing the cultures of continental Europe from the Renaissance to 1900, and including such authors as Petrarch, Erasmus, Rabelais, Machiavelli, Shakespeare, Moliere, Voltaire, Rousseau, Goethe, Flaubert, and Tolstoy. Credit is not allowed for both ENG 220 and ENG 222.

Restriction: Credit is not allowed for both ENG 222 and ENG 220.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 223/ENG 223 Contemporary World Literature I  (3 credit hours)
Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

FL 224/ENG 224 Contemporary World Literature II  (3 credit hours)
Twentieth-century literature of some of the following cultures: Asian, Middle Eastern, African, Caribbean, Native-American.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

FL 246/ENG 246 Literature of the Holocaust  (3 credit hours)
Fictional and nonfictional versions of the Holocaust, focusing on themes of survival, justice, theology, and the limits of human endurance.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FL 275/ENG 275 Literature and War  (3 credit hours)
A geographical and thematic examination of war and questions it raises, as reflected in selected writings from, Homer, Sophocles, Japan's Tale of the Heike, Shakespeare, The Bhagavad-Gita, Keegan, Kipling, Graham Green, Mulden, Michael Herr, Dexter Filkins, Lucius Shepherd as well as writers on Just War and Deterrence Theory, and military science.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 295 Special Topics in Foreign Languages and/or Literatures  (1-6 credit hours)
A special projects course on topics to be determined as needed in the departmental program.

Typically offered in Fall, Spring, and Summer

FL 298 Independent Study in Foreign Language or Literature  (1-6 credit hours)
Individualized study in a foreign language or literature. Topic, mode of study and credit hours to be determined in consultation with the faculty member supervising work. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

FL 299/ED 299 Field Experience for 21st Century Teaching  (1 credit hours)
This course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. This course is restricted to Foreign Language Education majors.

Prerequisite: ECI 204 and ED 204
Typically offered in Spring only
FL 392/ENG 392  Major World Author  (3 credit hours)
Intensive study in English, of the writings of one (or two) author(s) from outside the English and American traditions. Sample subjects: Homer, Virgil and Ovid, Lady Murasaki, Marie de France and Christine de Pizan, Dante, Cervantes, Goethe, Balzac, Flaubert, Kafka, Proust, Lessing and Gordimer, Borges and Marquez, Neruda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.
Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 393/ENG 393  Studies in Literary Genre  (3 credit hours)
Concentrated treatment of one literary genre, such as the epic, the lyric, the drama, satire, romance, autobiography, the essay, the novel, or the short story. Treatment of materials from several national or ethnic cultures and several periods. All readings in English. Course may be taken three times for credit. Course may be taken 3 times in different genres.
Prerequisite: Sophomore standing and above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 394/ENG 394  Studies in World Literature  (3 credit hours)
Study of a subject in world literature: for example, African literature, Asian literature, Hispanic literature, East European literature, Comedy, the Epic, the Lyric, Autobiography, the Faust legend, or Metamorphosis. Subjects vary according to availability of faculty. Readings in English translation.
Restriction: Sophomore Standing and Above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

FL 395  Study Abroad Programs  (1-3 credit hours)
Specific category of courses involving language and/or culture taught in foreign countries through the Department Study Abroad Program.

FL 406/ENG 406  Modernism  (3 credit hours)
Review and discuss the International Modernist movement in literature, from its nineteenth-century origins to its culmination in the early twentieth century. Identify and discuss definitions of modernity, as embodied in a variety of genres. Discuss Modernist texts within a variety of cultures that produced them.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

FL 407/ENG 407  Postmodernism  (3 credit hours)
Study literary expressions of postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century and after. Examine post modernity, as embodied in a variety of genres. Situate postmodernist texts within a variety of cultures that have produced them.
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

FL 424/FL 524  Linguistics for ESL Professionals  (3 credit hours)
Study of the diachronic nature of language and the phonological, morphological, syntactic, and semantic features of English in relation to other world language groups. Application of linguistic principles to the ESL classroom. Analysis of common errors in grammar due to first language interference. Discussion of teaching strategies based on current research in second-language acquisition. Credit will not be given for both FL 424 and FL 524.
Typically offered in Spring only

FL 427/ECI 427/FL 527  Methods and Materials in Teaching English as a Second Language  (3 credit hours)
Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools. Students cannot receive credit for both FL/ECI 427 and FL/ECI 527.
Typically offered in Fall only

FL 436/ECI 436/FL 536/ECI 536  Perspectives on English as a New Language  (3 credit hours)
Examination of the complexity of multiculturalism in American society and the challenges faced by immigrant families in adapting to U.S. institutions. Emphasis on understanding historical, legal, cultural and pedagogical issues with respect to learning English as a new language (ENL). No credit given for both FL/ECI 436 and FL/ECI 536.
Typically offered in Fall only

FL 440  Internship in Teaching English as a Second Language  (3 credit hours)
Skills and techniques required in teaching ESL in a public school setting. 15 hours of classroom observation and 30 hours in direct instruction. Demonstration of competencies essential for teaching ESL. Individualized/Independent Study and Research co
Prerequisite: Admission to ESL Licensure Program, Corequisite: Teacher Licensure in any primary area
Typically offered in Fall and Spring

FL 441  Strategies and Curriculum Design in Teaching English as a Foreign Language (TEFL)  (3 credit hours)
This course provides an overview of three main aspects of teaching English as a Foreign Language: planning, instructing, and assessing. Students will examine the most common types of curricula and practice syllabus design, lesson planning, and assessments. They will explore the characteristics of different types of learners (e.g., young learners, post-secondary adults, immigrants, etc.) and their motivation for learning English. Students will practice a variety of communicative, collaborative activities for all levels and contexts.
P: FL 427  (Methods and Materials in Teaching ESL)
Typically offered in Spring only
FL 492 Senior Seminar in Foreign Languages & Literatures (3 credit hours)
Senior seminar for foreign language majors with concentration in non-European / less-commonly taught languages. Focus on recent trends in scholarship, career guidance, senior research projects or equivalent. Conducted in English. Students will be required to provide a detailed summary of their project in the language of their concentration.
Prerequisite: FLJ 301 or FLC 301 or FLN 301 or FLA 301
Typically offered in Spring only

FL 495/FL 595 Special Topics in Foreign Languages and Literatures (1-6 credit hours)
A concentrated study of a special period, author or genre to be determined as needed in the departmental program.

FL 498 Independent Study in Foreign Language or Literature (1-6 credit hours)
Individualized study of a foreign language or literature. Topic, mode of study, and credit hours to be determined in consultation with the faculty member supervising work. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

FL 505/ECI 505 Issues and Trends in Foreign Language Education: Theory & Practice (3 credit hours)
An exploration of theory and practice issues related to foreign language teaching. Inquiry into proficiency-oriented instruction, innovative methodological approaches, the National Standards and learning scenarios, integrating culture, options for testing and assessment, content-based instruction, the role of grammar in second language acquisition, teaching foreign language students with learning disabilities, and Foreign Language in the Elementary School (FLES) in North Carolina. Students will examine case studies related to these topics and engage in a classroom action research project.
Prerequisite: Graduate standing
Typically offered in Fall and Summer

FL 506 Instructional Technology in Foreign Language Education: Addressing the Standards (3 credit hours)
Hands-on experience in appropriately selecting and applying a number of instructional technologies to foreign language teaching and learning in relation to the current National Standards. Analysis and use of effective technology tools including hardware, software, and courseware. Emphasis will be on the application of Technology-Enhanced Language Learning (TELL) as it integrates the National Standards' goals of Communication, Cultures, Connections, Comparisons, and Communities.
Restriction: Graduate standing; NC Initial/A licensure in French, Spanish or ESL
Typically offered in Summer only

FL 507 College Teaching of Foreign Languages (3 credit hours)
Principles of second language acquisition and foreign language pedagogy. Examination of problematic concepts in teaching Spanish and French. Thorough treatment of instructional technology appropriate to foreign language teaching and learning. Regular
Prerequisite: Graduate status
Typically offered in Fall only

FL 508 Second Language Acquisition Research: Interlanguage Development (3 credit hours)
This course introduces students to the objectives, methods, and findings of research investigating how classroom learners acquire French and Spanish as a second language. It examines specific features of French and Spanish interlanguage including: grammatical gender, copular ser/estar and idiomatic uses of etre/avoir, pronominalization, verbal systems, and longitudinal/cross-sections studies of interlanguage development. Course content bridges the gap between second language acquisition research, foreign language teaching methodology courses, and curriculum implementation. Graduate standing or consent of instructor required.
Prerequisite: Graduate Standing or Permission of the Instructor
Typically offered in Spring only

FL 524/FL 424 Linguistics for ESL Professionals (3 credit hours)
Study of the diachronic nature of language and the phonological, morphological, syntactic, and semantic features of English in relation to other world language groups. Application of linguistic principles to the ESL classroom. Analysis of common errors in grammar due to first language interference. Discussion of teaching strategies based on current research in second-language acquisition. Credit will not be given for both FL 424 and FL 524.
Typically offered in Spring only

FL 525/FL 425/ECI 425/ECI 525/FL 427/ECI 427 Methods and Materials in Teaching English as a Second Language (3 credit hours)
Methodologies and current approaches to teaching English as a Second Language. Techniques and strategies for teaching reading, writing, listening, speaking and culture. Selection, adaptation, and creation of instructional materials for various levels of proficiency and teaching situations. Evaluation and assessment of written and oral language proficiency through standardized and non-standardized assessment tools. Students cannot receive credit for both FL/ECI 425 and FL/ECI 525.
Typically offered in Fall only

FL 535 Teaching Academic Writing to Multilingual Learners (3 credit hours)
Students will explore current theory and research in second language writing. Topics include intercultural rhetoric, second language writing curriculum, first language grammar interference, and the development of academic vocabulary. Students will learn innovative teaching strategies and activities that help multilingual writers practice writing across genres and disciplines.
Restriction: Graduate Standing
Typically offered in Fall only

FL 536/ECI 536/FL 436/ECI 436 Perspectives on English as a New Language (3 credit hours)
Examination of the complexity of multiculturalism in American society and the challenges faced by immigrant families in adapting to U.S. institutions. Emphasis on understanding historical, legal, cultural and pedagogical issues with respect to learning English as a new language [ENL]. No credit given for both FL/ECI 436 and FL/ECI 536.
Typically offered in Fall only
**FL 539/ENG 539  Seminar In World Literature**  (3 credit hours)
Rotating topics in world literature, including treatment of the subject's theoretical or methodological framework. Possible subjects: colonialism and literature; orality and literature; the Renaissance; the Enlightenment; translation; comparison of North and South American literatures; African literary traditions; postmodernism and gender. Readings in English (original languages encouraged but not required).

Typically offered in Spring only

**FL 541/ENG 541  Literary and Cultural Theory**  (3 credit hours)
A survey of literary theory in the 20th century from New Criticism to postmodernism. Examines the virtues and pitfalls of these approaches to the study of culture and literature. A course on issues, concepts, theorists and the sociohistorical and political context in which the theorists are writing. Taught in English. No formal pre-requisites. However, students who have not had advanced literature will be disadvantaged.

Typically offered in Fall only

**FL 595/FL 495  Special Topics in Foreign Languages and Literatures**  (1-6 credit hours)
A concentrated study of a special period, author or genre to be determined as needed in the departmental program.

**Foreign Languages and Literatures - Arabic (FLA)**

**FLA 101  Beginning Arabic 101**  (3 credit hours)
Beginning Arabic is for students who have had no prior experience with the language. It is the first in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. Authentic materials from the Arabic media will be used in addition to text-related video and audio materials. An introduction to Arab culture will be integrated throughout the semester. This course is designed for true beginners who have had no previous experience with the Arabic language, either written or spoken. Credit will be allowed for either FLA 101 or FLA 111, but not for both.

Typically offered in Fall only

**FLA 102  Beginning Arabic 102**  (3 credit hours)
This course is the second in a series which develops reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. Authentic materials from the Arabic media will be used in addition to text-related video and audio materials. An introduction to Arab culture will be integrated throughout the semester. This course helps students develop oral proficiency at the intermediate level. Students will practice using their speaking skills in a variety of individual and group activities to build competency in basic social situations.

Typically offered in Fall only

**FLA 104  Beginning Arabic 102 Conversation**  (1 credit hours)
Supplements conversational practice for FLA 102 to help students develop oral proficiency at the advanced beginning level. Students will practice using their speaking skills in a variety of individual and group activities to build competency in basic social situations.

Corequisite: FLA 102
Typically offered in Spring and Summer

**FLA 201  Intermediate Arabic I**  (3 credit hours)
Intermediate Arabic I is the third in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. An increased emphasis is placed on the use of authentic materials from the Arabic media. This course includes an introduction to Arab culture and the sociohistorical and political context in which the theorists are writing. Taught in English.

Prerequisite: FLA 102 or FLA 112
Typically offered in Fall only

**FLA 202  Intermediate Arabic II**  (3 credit hours)
Intermediate Arabic II is the fourth in a series of courses which develop reading and writing skills in Modern Standard Arabic with active speaking and listening skills in both formal Arabic and the Egyptian dialect. An increased emphasis is placed on the use of authentic materials from the Arabic media. This course includes an introduction to Arab culture and the sociohistorical and political context in which the theorists are writing. Taught in English.

Prerequisite: FLA 201
Typically offered in Fall only

**FLA 203  Intermediate Arabic Conversation I**  (1 credit hours)
Supplements conversational practice for FLA level 201 or higher. This course helps students develop oral proficiency at the intermediate level. Students will practice using their speaking skills in a variety of individual and group activities to build competency in basic social situations.

Prerequisite: FLA 201
Typically offered in Spring only

**FLA 204  Intermediate Arabic Conversation II**  (1 credit hours)
Supplements conversational practice for FLA level 202 or higher. This course helps students develop oral proficiency at the intermediate high level. Students will practice using their speaking skills in a variety of individual and group activities to build competency in basic social situations.

Prerequisite: FLA 201
Typically offered in Fall only

**FLA 301  Advanced Intermediate Arabic I**  (3 credit hours)
Advanced Intermediate Arabic I is the fifth in a series of courses which develop whole language skills in Modern Standard Arabic with active speaking and listening skills in the Egyptian dialect. Upon completion of this course the student will have the opportunity to develop whole language skills in Modern Standard Arabic with active speaking and listening skills in the Egyptian dialect.

Typically offered in Fall only

**FLA 318  Egyptian Culture through Film**  (3 credit hours)
This course offers a survey of cinema in modern Egypt using film as a medium to learn about the cultural and social structures in Egypt. The course incorporates weekly screenings of feature films representing different styles and periods. Students will be required to read relevant material, take essay exam questions, write film reviews, a final paper, and give a presentation of their final paper. The course is taught in English.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only
FLA 330 Media Arabic (3 credit hours)
An introduction to the language of print and Internet news media of the Arab world, using authentic materials from Arabic newspapers, Internet news sites, and magazines. This course provides students with the tools necessary to build a core media vocabulary base, comprehend front page news stories, read critically, and detect bias, in selected news content, and develop listening skills necessary for understanding oral news reports.
Prerequisite: FLA 202
Typically offered in Spring only

FLA 440 Modern Arabic Short Story (3 credit hours)
An advanced language course which introduces students to contemporary Arabic literature through selected readings of modern Arabic short stories. Students will develop an understanding of this rich literary genre as a reflection of concurrent social structures, political landscapes, and cultural traditions in Middle Eastern societies. Emphasis will also be placed on recognizing advanced grammatical structures in Modern Standard Arabic with attention given to the increased use of vernacular expression in modern literary works. Assigned readings, writing assignments, and class discussions will be in Arabic.
Prerequisite: FLA 301 or FLA 330
Typically offered in Fall only

Forestry (FOR)

FOR 150 Critical Thinking and Data Analysis (2 credit hours)
Exploration and practical experience with basis for making resource management decisions. Learning to pose questions that drive research and analysis. Examining spreadsheet structure and functionality for manipulating data. Establishing solid grounds for conclusions and actions in natural resources contexts. Experiencing thinking processes from posing questions to articulating well-founded answers in coherent, persuasive discourse.
Typically offered in Fall and Spring

FOR 172 Forest System Mapping and Mensuration I (2 credit hours)
Concepts and application of basic forest and land resource measurement techniques used in forestry and related fields. Measuring distances and areas; orienteering; basic air photo and topographic map interpretation; introduction to GPS; measuring tree
Typically offered in Fall only

FOR 204 Silviculture (2 credit hours)
Silvical characteristics and growth requirements of forest trees; dynamics of stand growth, species-site relationships, site productivity, forest pest interactions, hydrology and nutrient cycling in forest ecosystems; emphasis on understanding and applying ecological principles to the production of multiple benefits at the forest community level.
Typically offered in Summer only

FOR 248 Forest History, Technology and Society (3 credit hours)
Examining forest resource use and issues throughout history. Tracing developments and concepts that created the context for today’s issues concerning global forest resources. Examining how wood resource availability shaped civilization’s development, and examining consequences on forest resources of civilization’s scientific, social, and technological progress.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

FOR 250 Professional Development II: Communications in Natural Resources (1 credit hours)
Development of written and oral communication skills for forestry and natural resources management. Discussion topics include interactive communication, writing to a target audience, common pitfalls in technical writing, various kinds of technical writing, poster and oral presentations, reviewing and revising writing, and responding to questions in a professional manner.
Typically offered in Spring only

FOR 252 Introduction to Forest Science (3 credit hours)
Integration of biological principles into studies of tree growth, reproduction, establishment, survival, and disturbance. Discussions of regional silviculture and of effects of humans on forest ecosystems. Instruction in forest sampling and tree identification. Many laboratories meet outdoors. Not open to Forest Management majors.
Not open to Forest Management Majors (15FOMND,15FORMTBS, 15FGM)
Typically offered in Spring only

FOR 260 Forest Ecology (4 credit hours)
Introduction to forest ecosystems, their structure and functions, and the processes that regulate them including: radiation, temperature, water, and biogeochemistry; productivity; plant populations; forest communities; succession; natural disturbances; and human influences. Must have a strong love of trees.
Typically offered in Spring only

FOR 261 Forest Communities (2 credit hours)
Study of the species composition, distribution, site requirements, and succession of the principal forest communities of southeastern North America. Identification of important member plant species. Field trips to typical examples.
Prerequisite: FOR 339 or PB 220 or PB 403
Typically offered in Summer only

FOR 264 Forest Wildlife (1 credit hours)
Diversity of fauna that inhabits forest communities in the Piedmont of North Carolina. Inventory terrestrial and aquatic habitats and identify various vertebrate and invertebrate species. Insect collection initiated. The life histories of representative
Typically offered in Summer only

FOR 265 Fire Management (1 credit hours)
Effects of wildfire and prescribed fire on forest ecosystem components and processes; fire behavior and the ecosystem and meteorologic factors that affect it; silvicultural uses of fire; organization, equipment, and tactics for wildfire suppression; fire suppression exercises on the North Carolina Division of Forest Resources’ Forest Fire Simulator.
Typically offered in Summer only
FOR 273  Forest System Mapping and Mensuration II  (3 credit hours)
Procedures and Instruments for measuring various tree and stand characteristics. Determination of stem volume and taper. Planning and implementation of forest resource samples to provide population estimates using fixed-radius and variable-radius sampling. Detailed coverage of land measurements and mapping of boundary surveys. Use of aerial photography, topographic maps, and GPS to aid in resource assessment. Incorporation of inventory data into a GIS. Basic statistical concepts applied to resource measurements. Taught off-campus at Hill Forest.
Prerequisite: FOR 172
Typically offered in Summer only

FOR 293 Independent Study in Forest Management  (1-6 credit hours)
Independent Study for Forest Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Stan
Typically offered in Fall, Spring, and Summer

FOR 294 Independent Study in Forest Management  (1-6 credit hours)
Independent Study for Forest Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Stan
Typically offered in Fall, Spring, and Summer

FOR 295 Special Topics in Forestry  (1-6 credit hours)
Study of forestry topics not covered in existing courses at the introductory level. Development of a new course on a trial basis.
Typically offered in Fall, Spring, and Summer

FOR 303 Silvics and Forest Tree Physiology  (3 credit hours)
Ecological and physiological processes influencing establishment, growth, and development of forest stands with particular emphasis on forest types of Southeastern United States; influence of resource availability on forest stand productivity; physical and biochemical processes associated with tree function, including water relations, mineral nutrition, transport and translocation, photosynthesis, respiration; internal and environmental factors regulating tree growth and development.
P: (CH 101 or 103) and [(CH 201 and 202) or (CH 203 and 204) or PY 205 or PY 211]
Typically offered in Fall only

FOR 304 Theory of Silviculture  (4 credit hours)
Ecological processes affecting the establishment and growth of forest stands with particular emphasis on forest types of the Southeastern United States. Forest stand productivity, how productivity is influenced by site, stand, climatic factors, and the application of site specific prescriptions to establish and manipulate the composition, growth, and health of forest stands.
Prerequisite: FOR 260 or PB 360 or AEC 360
Typically offered in Spring only

FOR 318/PP 318 Forest Pathology  (3 credit hours)
Major diseases of forest trees and deterioration of wood products emphasizing principles of plant pathology; diagnosis; nature, physiology, ecology, and dissemination of disease-causing agents; mechanisms of pathogenesis; epidemiology and environmental influences; principles and practices of control.
Prerequisite: PB 200
Typically offered in Fall and Spring

FOR 319 Forest Economics  (3 credit hours)
Economic approaches for evaluating the production and costs of forest management, timber harvesting activities, and nontimber forest products. Estimating the financial returns of long-term investments in timber or other forest resources, including discounted cash flow analysis and capital budgeting techniques. Property taxes and income tax treatment of timber and their effects on investment returns. Demand estimation and timber supply analyses.
Prerequisite: ARE 201 or EC 205 or EC 201
Typically offered in Fall only

FOR 330 North Carolina Forests  (3 credit hours)
An introduction and overview of forests in North Carolina with emphasis on the importance of forests in the 21st century. Topics include: history and distribution of forests, soils-sit relationships, forestry practices, non-conventional management objectives. Two required Saturday field trips.
Typically offered in Fall only

FOR 334 Operations Research Applications in Natural Resources  (1 credit hours)
Introduction to the application and use of management science in forestry and natural resources. The course will introduce decision and information theory and mathematical programming techniques including linear, non-linear and integer programming concepts. The emphasis is on problem formulation and solution using computer programs. Half semester course.
Typically offered in Spring only

FOR 339 Dendrology  (4 credit hours)
Identification and elementary silvics of woody plants of eastern North America with studies of their classification, characteristics, and habitats. Consideration of trees from northern and western North America and the Caribbean region. Field identification with trips to forest communities.
Typically offered in Fall only

FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management  (1 credit hours)
Study of ethical issues confronting natural resource management professionals, including: biodiversity conservation, private property rights, traditional religion and ecological values, community rights, environmental racism, hunting and animal rights, business ethics, and the purpose and content of professional codes of ethics.
Prerequisite: Junior standing.
Typically offered in Spring only
FOR 353 GIS and Remote Sensing for Environmental Analysis and Assessment (3 credit hours)
This course provides a survey of topics targeting the processing and analysis of remotely sensed and other geospatial data collected in forestry, environmental, and natural resource inventory and analyses. Students develop a fundamental understanding of analysis techniques and data requirements that include aerial and photogrammetry applications, geostatistical and 3D image analyses, DEM and hydrologic modeling, image enhancement techniques, land cover classifications and accuracy assessment.
Prerequisite: FOR 273
Typically offered in Fall only
FOR 374 Forest Measurement, Modeling, and Inventory (3 credit hours)
Mathematical functions required for quantifying the yield of timber and non-timber products. Procedures for planning, conducting, and analyzing forest inventories. Use of mathematical models to estimate growth and yield of forest stands and non-timber products for management decisions.
Prerequisite: FOR 273
Typically offered in Fall only
FOR 402/ENT 402 Forest Entomology (3 credit hours)
Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.
Prerequisite: Junior standing.
GEP Natural Sciences
Typically offered in Spring only
FOR 405/FOR 505 Forest Management (4 credit hours)
Fundamental principles and analytical techniques necessary in the planning, management and optimization of forest operations. Formulation of objectives and constraints, yield forecasting, forest regulation, procurement and marketing, inventory methods, and management plan preparation. Written and oral reporting.
Prerequisite: FOR 304, FOR 319, FOR 374
Typically offered in Fall only
FOR 406 Forest Inventory, Analysis and Planning (4 credit hours)
Independent project in designing and implementing a multi-resource survey; analyze stand conditions; forecast growth, yield and revenue of timber and forest products; use linear programming to prepare a long-term management plan subject to economic, social, and ecological constraints; assess economic and environmental impacts of potential actions; and report results orally and in writing.
Prerequisite: FOR 405, FOR 460
Typically offered in Spring only
FOR 408/FOR 508 Hardwood Management (3 credit hours)
Examines characteristics of and requirements for successfully manipulating stands of deciduous trees to meet specific economic, habitat and social objectives. Analyzes biological and site physical factors that affect growth and yield potential, opportunities for operational activities and expected results. Compares differences among deciduous species that affect responses to silvicultural stand manipulation.
Prerequisite: FOR 204 or Junior Standing
Typically offered in Fall only
FOR 411 Forest Tree Genetics and Biology (3 credit hours)
Genetics as it is applied in forest management for both conifers and hardwoods. The variation, evolution and genetics of forest trees. Methods for selection, breeding, seed production, and vegetative propagation. Exotics, wood properties, and tree improvement as a forest management tool.
Prerequisite: Junior standing
Typically offered in Spring only
FOR 414 World Forestry (3 credit hours)
Management of global forest resources; distribution and trends in forest cover; role of forests in economic development; international production and trade of forest products; current policy issues, including tropical deforestation, certification, and carbon sequestration; social forestry and non-timber forest products; international institutions and aid for conservation and development; identification and evaluation of sources of current information on global forestry issues.
GEP Interdisciplinary Perspectives
Typically offered in Spring only
FOR 415 World Forestry Study Tour (1 credit hours)
Field trip to Mexico and/or Central America for seven days over spring break. Examine tropical forestry issues through field visits to timber concessions, plantations, nurseries, wood products firms, protected areas, and agroforestry projects; meetings with representatives of forest research institutes, government agencies, timber industry, cooperatives, and environmental organizations; and interaction with local people. Fee for field trip determined annually. Offered during spring break, as a one-week field trip to Mexico and/or Central America.
Corequisite: FOR 414
Typically offered in Spring only
FOR 420/NR 420/FOR 520/NR 520 Watershed and Wetlands Hydrology (4 credit hours)
Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required. Credit will not be given for both FOR(NR)420 and FOR(NR)520.
Prerequisite: SSC 200 and (FOR 260 or PB 360 or AEC 360)
Typically offered in Fall only
FOR 422/FOR 522 Consulting Forestry (3 credit hours)
Forest land acquisition and ownership; ownership, appraisal, legal considerations, financial management and planning. Producing forest resources: timber, wildlife, recreation, farm products, water, minerals, specialty products, and development. Marketing forest resources: timber, recreation, farm leases, minerals, specialty products, and developed property. Forest resources consulting: forms of organization, pricing of services, consultant client relationships (Law of Agency), professional ethics and continuing education.
Prerequisite: Senior standing in Forest Management
Typically offered in Fall only
FOR 430  **Forest Health and Protection**  (3 credit hours)
This course will introduce students to the major insect and disease problems of North American forests, both native and introduced, with an emphasis on the recognition and management of pests and the damage they cause. Wild land fire, invasive plants, and climate change and their interactions with forest insect and diseases will also be covered.
Prerequisite: PB 200 or BIO 181 or BIO 183 or FOR 260 or BIO 360 or PB 360 (or other Biology or Plant Biology course).
Typically offered in Spring only

FOR 434/FOR 534  **Forest Operations and Analysis**  (3 credit hours)
Management science and operational techniques in forestry. Logging road layout and construction, and machine systems; harvesting machine optimization and selection. Harvesting, production and forest planning. Decision and inventory theory, and other techniques for solving problems typically encountered in forest operations management. Required overnight weekend field trip.
Junior standing or above
Typically offered in Spring only

FOR 472  **Forest Soils**  (4 credit hours)
The course will evaluate how forest soils form in the natural environment, but also their relations to forest management and sustainability. Coursework includes soil physical, chemical, and biological properties, and also special topics such as soil fertility, soil formation, soil taxonomy and classification, soil organic matter management, and soil C and N cycles. There are many factors that contribute to forest soils differing from traditional cultivated soils. These factors will be explored in addition the variation in management styles for forest soils. The goal of this course is to gain an understanding of the basic properties and processes of forest soils as well as evaluate the role of these soils in sustainable forest management. Two Saturday Labs will be required.
Prerequisites: CH 101 & CH 102 and PB 200 or BIO 181
Typically offered in Spring only

FOR 491/NR 491  **Special Topics in Forestry and Related Natural Resources**  (1-4 credit hours)
Independent (or group) study or research of a forestry or related natural resources topic with a faculty supervisor of the student's choice. Also courses offered on a trial basis.
Typically offered in Fall and Spring

FOR 493  **Independent Study in Forest Management**  (1-6 credit hours)
Independent Study for Forest Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses"
Typically offered in Fall, Spring, and Summer

FOR 494  **Independent Study in Forest Management**  (1-6 credit hours)
Independent Study for Forest Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses"
Typically offered in Fall, Spring, and Summer

FOR 501  **Dendrology**  (3 credit hours)
Identification and natural history of eastern woody species with studies of their taxonomic classification, physical characteristics, and typical habits. Laboratories stress sight recognition and use of identification keys and trips to natural forest communities.
Prerequisite: PB 200
Typically offered in Fall only

FOR 502  **Forest Measurements**  (1 credit hours)
One-third semester mini-course. Forest measurements covering principles, terminology, and practical field applications. Land area measurement, units of timber measure (cubic feet, cords, weight, board feet), estimating volume of standing trees, sampling techniques for forest inventory (strips, plots, points), measures of site quality and stand density, methods for projecting future timber volumes.
Typically offered in Fall only

FOR 503  **Tree Physiology**  (1 credit hours)
Theory and practice of stand regeneration, controlling composition, intermediate treatments and growth; application of the knowledge of silvics in the management of stands. Emphasis on forest communities of North America. Co-requisite course is FOR 506: Silviculture Laboratory (Optional)
Typically offered in Fall only

FOR 504  **The Practice of Silviculture**  (3 credit hours)
The theory and practice of stand regeneration, controlling composition, intermediate treatments and growth; application of the knowledge of silvics in the management of stands. Emphasis on forest communities of North America. Co-requisite course is FOR 506: Silviculture Laboratory (Optional)
Typically offered in Spring only

FOR 505/FOR 405  **Forest Management**  (4 credit hours)
Fundamental principles and analytical techniques necessary in the planning, management and optimization of forest operations. Formulation of objectives and constraints, yield forecasting, forest regulation, procurement and marketing, inventory methods, and management plan preparation. Written and oral reporting.
Prerequisite: FOR 304, FOR 319, FOR 374
Typically offered in Fall only

FOR 506  **Silviculture Laboratory**  (1 credit hours)
Development of site specific prescriptions to establish stands for a wide variety of objectives, including fiber, water, wildlife, recreation and health. Emphasis on forest communities of North America.
Corequisite: FOR 504
Typically offered in Spring only

FOR 507  **Silviculture Mini Course**  (1 credit hours)
One-third semester mini-course. A condensed version of silviculture. Ecological processed affecting establishment and growth of forest stands with particular emphasis on forest types of southeastern United States. Forest stand productivity, how productivity influenced by site, stand, climatic factors, and application of site specific prescriptions to establish and manipulate composition, growth, and health of forest stands.
Typically offered in Spring only
FOR 508/FOR 408 Hardwood Management (3 credit hours)
Examines characteristics of and requirements for successfully manipulating stands of deciduous trees to meet specific economic, habitat and social objectives. Analyzes biological and site physical factors that affect growth and yield potential, opportunities for operational activities and expected results. Compares differences among deciduous species that affect responses to silvicultural stand manipulation.

Prerequisite: FOR 204 or Junior Standing
Typically offered in Fall only

FOR 509 Forest Resource Policy (1 credit hours)
One-third semester mini-course. Principles of forest policies and processes. Political processes, institutional and interest group participation, forestry laws and programs, current issues, and policy analyses.

Typically offered in Spring only

FOR 510 Introduction to GPS (1 credit hours)
One-third semester mini-course. Introduction to collection and use of mapping grade global positioning satellite systems data. Includes review of cartographic properties, mission planning, hands-on collection of GPS points, lines, and areas, differential correction, editing, and exporting GPS files to a GIS.

Typically offered in Fall only

FOR 513 Silviculture for Intensively Managed Plantations (3 credit hours)
This course provides an up-to-date understanding of the ecological and physiological bases of forest stand productivity and a silvicultural systems framework to use this knowledge for making site specific prescriptions that are cost effective and enviro

Prerequisite: FOR 507
Typically offered in Spring only

FOR 514 Woodland Stewardship (3 credit hours)
An introduction and overview of non-industrial private forestry in the Southeast United States with emphasis on active forest management. Topics include history of human impact on forests, evolution of forest, forestry practices, timber and non timber management objectives, financial aspects of forest land management, and management planning. One required all day field trip.

Typically offered in Fall only

FOR 519 Forest Economics (3 credit hours)
Economics applied to problems in forest management, including timber demand and supply models, optimal rotation length, benefit-cost analysis of forestry projects, impacts of forest taxation and consideration of non-market forest goods and services.

Prerequisite: Basic course in economics
Typically offered in Fall only

FOR 520/NR 520/FOR 420/NR 420 Watershed and Wetlands Hydrology (4 credit hours)
Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required. Credit will not be given for both FOR(NR)420 and FOR(NR)520.

Prerequisite: SSC 200 and (FOR 260 or PB 360 or AEC 360)
Typically offered in Fall only

FOR 522/FOR 422 Consulting Forestry (3 credit hours)
Forest land acquisition and ownership: ownership, appraisal, legal considerations, financial management and planning. Producing forest resources: timber, wildlife, recreation, farm products, water, minerals, specialty products, and development. Marketing forest resources: timber, recreation, farm leases, minerals, specialty products, and developed property. Forest resources consulting: forms of organization, pricing of services, consultant client relationships (Law of Agency), professional ethics and continuing education.

Prerequisite: Senior standing in Forest Management
Typically offered in Fall only

FOR 531 Wildland Fire Science (3 credit hours)
Physical, chemical, biological, and ecological processes associated with wildland fire, particular emphasis on fire behavior, fuels, weather, climate and the associated effects on ecology, management, fire suppression, prescribed fire, and smoke emissions and exposure. Fire’s effect on national policy, social and natural history of North America. In-depth exercises in fire and smoke modeling using established predictive systems.

Typically offered in Spring only

FOR 532 Wildland Firefighter (3 credit hours)
National Wildfire Coordination Group Firefighter Type II Certification, including study of the National Incident Command Systems (ICS-100), Human Dimensions in the Wildland Fire Service (L-180) Introduction to Wildland Fire Behavior (S-190), Firefighting Safety and Training (S-130). Weekly reading seminar, lectures and problem sessions. Last 4 weeks of semester will be prescribed fire planning and field implementation of methodologies learned in course.

Typically offered in Fall only

FOR 534/FOR 434 Forest Operations and Analysis (3 credit hours)
Management science and operational techniques in forestry. Logging road layout and construction, and machine systems: harvesting machine optimization and selection. Harvesting, production and forest planning. Decision and inventory theory, and other techniques for solving problems typically encountered in forest operations management. Required overnight weekend field trip.

Junior standing or above
Typically offered in Spring only
FOR 540 Advanced Dendrology (3 credit hours)
Identification and life histories of native and naturalized woody plants. Use of taxonomic manuals and literature. Identification of problematic groups. Concentration on North America, with discussion of other continents. Overnight field trips to natural forest communities.
Prerequisite: BO 403 or FOR 339
Typically offered in Spring only

FOR 561 Forest Communities of the Southeastern Coastal Plain (1 credit hours)
Species composition, distribution, site requirements, and succession of principal forest communities of southeastern Coastal Plain. Identification of important member plant species. Overnight field trips to typical examples.
Prerequisite: FOR 212, FOR 501
Typically offered in Summer only

FOR 562 Forest Communities of the Southern Appalachians (1 credit hours)
Species composition, distribution, site requirements, and succession of principal forest communities of southern Appalachians. Identification of important member plant species. Overnight field trips to typical examples.
Prerequisite: FOR 212, FOR 501
Typically offered in Summer only

FOR 565 Plant Community Ecology (4 credit hours)
Consideration of structure and function of terrestrial vascular plant communities, with emphasis on both classical and recent research. Measurement and description of community properties, classification, ordination, vegetation pattern in relation to environment, ecological succession and a survey of vegetation of North America.
Prerequisite: Undergraduate Ecology Course
Typically offered in Spring only

FOR 574 Forest Mensuration and Modeling (3 credit hours)
Study of mathematical functions required for quantifying the yield of timber and non-timber products. Procedures for planning, conducting, and analyzing forest inventories, use of mathematical models to estimate growth and yield of forest stands and non-timber products for management decisions.
Prerequisite: ST 511 or equivalent; College Calculus preferred
Typically offered in Fall only

FOR 575 Advanced Terrestrial Ecosystem Ecology (3 credit hours)
Views organisms and physical environment as integrated system. Outlines processes governing assimilation and cycling of energy, carbons, nutrients, and water. Evaluates ecosystem responses to intensive management, global climate change, air pollution, biofuels production, fragmentation, large-scale land use change. Illustrates application of ecosystem science approach to important regional and global questions through scaling of empirical, ecosystem-level data, ongoing research. Provides experience in hypothesis testing and experimental design, data analysis and interpretation, proposal development, and publication for research professionals. Graduate Standing.
Typically offered in Spring only

FOR 583 Tropical Forestry (3 credit hours)
Principles of tropical ecology, dendrology and agroforestry. Primary emphasis on establishment and management of tropical plantations with lesser emphasis on natural stands. Operation and management of tropical nurseries.
Prerequisite: Senior standing
Typically offered in Fall only

FOR 595 Special Topics (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems or research not related to thesis. Also used to develop and test new 500-level courses.
Typically offered in Fall, Spring, and Summer

FOR 601 Graduate Seminar (1 credit hours)
Weekly seminar in which students registered for course present the results of research and special projects. Invitation to all graduate students and faculty in department to attend and join discussion.
Typically offered in Fall and Spring

FOR 603 Research Methods in Forestry and Environmental Resources (1 credit hours)
Philosophy and objectives of scientific research and steps in the research process. Basic and applied research, inductive and deductive reasoning and need for hypothesis development and testing as a basis for scientific research. Special emphasis on preparation of study plans, graduate theses, published articles and technical presentations.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

FOR 610 Special Topics In Forestry (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems or research not related to thesis. Also used to develop and test new 500-level courses. Credits Arranged.
Typically offered in Fall, Spring, and Summer

FOR 630 Independent Study in Forestry (1 credit hours)
Independent study in Forestry under the supervision of a Forestry and Environmental Resources faculty member. Restricted to graduate students in the Department of Forestry and Environmental Resources with consent of the supervising faculty. May not be
Typically offered in Fall, Spring, and Summer

FOR 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer
FOR 688  Non-Thesis Masters Continuous Registration - Half Time Registration  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Spring only

FOR 689  Non-Thesis Master Continuous Registration - Full Time Registration  (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall and Spring

FOR 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

FOR 695  Master's Thesis Research  (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

FOR 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

FOR 713  Advanced Topics In Silviculture  (3 credit hours)
Critical examination of selected silvicultural topics, with special emphasis on concepts and phenomena distinguishing forests from other biotic communities and silviculture from other fields of applied biology. Emphasis on intensive silviculture in United States and selected international locations. A required written research proposal.

Prerequisite: FOR 304
Typically offered in Fall only

FOR 725/GN 725  Forest Genetics  (3 credit hours)
Application of genetic principles to silviculture, management and wood utilization. Emphasis on variation in wild populations, the bases for selection of desirable qualities and fundamentals of controlled breeding.

Typically offered in Spring only

FOR 726/CS 726/ANS 726  Advanced Topics In Quantitative Genetics and Breeding  (3 credit hours)
Advanced topics in quantitative genetics pertinent to population improvement for quantitative and categorical traits with special applications to plant and animal breeding. DNA markers - phenotype associations. The theory and application of linear mixed models, BLUP and genomic selection using maximum likelihood and Bayesian approaches. Pedigree and construction of genomic relationships matrices from DNA markers and application in breeding.

Prerequisite: ST 511, Corequisite: ST 512
Typically offered in Spring only

FOR 727  Tree Improvement Research Techniques  (3 credit hours)
Research methods involved in forest tree breeding and genetics programs. Emphasis on laboratory, greenhouse and field research techniques. Stress also on summary and presentation of research results.

Prerequisite: FOR 411 or GN 411
Typically offered in Spring only

FOR 728  Quantitative Forest Genetics Methods  (3 credit hours)
Applications of basic quantitative genetic methods in forest tree breeding and genetic research. Principles and procedures for partitioning experimental variance, estimating genetic parameters from different mating and test designs. Predicting breeding value and gain and developing breeding strategies.

Prerequisite: GN 703, ST 701
Typically offered in Fall only

FOR 734  Advanced Forest Management Planning  (3 credit hours)
History, principles, structures and use of modern forest management planning and decision-making techniques. Emphasis on optimization procedures and public forest management.

Prerequisite: FOR 405 or FOR 434 or OR 501, Corequisite: FOR 772
Typically offered in Spring only

FOR 750  Ecological Restoration  (3 credit hours)

Prerequisite: BO 360, SSC 200, Corequisite: BO 565
Typically offered in Spring only

FOR 753  Environmental Remote Sensing  (3 credit hours)
Principles and applications of remote sensing technology to earth resources and environmental studies. Electromagnetic energy, data acquisition platforms, sensors and scanners, processing of digital remotely sensed data, error analysis and accuracy assessments, and integration of remotely sensed data with other data types used in natural resource management.

Prerequisite: FOR 353
Typically offered in Fall only
FOR 784  The Practice Of Environmental Impact Assessment  (4 credit hours)
Impact assessment principles, practices and their evolution. Lectures and field practicums concerning problems addressed by environmental assessment practitioners. Practical implications of current regulatory requirements, especially concerning endangered species and wetlands, as they affect environmental practitioners' performance. Required reports combine varied technical tasks and documentation for regulatory process review.

Typically offered in Fall only

FOR 795  Advanced Special Topics in Forestry  (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems or research not related to thesis. Also used to develop and test new 700-level courses.

Typically offered in Fall and Spring

FOR 801  Seminar  (1 credit hours)
Weekly seminar in which students registered for course present the results of research and special projects. Invitation to all graduate students and faculty in department to attend and join discussion.

Typically offered in Fall and Spring

FOR 803  Research Methods in Forestry and Environmental Resources  (1 credit hours)
Philosophy and objectives of scientific research and steps in the research process. Basic and applied research, inductive and deductive reasoning and need for hypothesis development and testing as a basis for scientific research. Special emphasis on preparation of study plans, graduate theses, published articles and technical presentations.

Prerequisite: Grad. standing
Typically offered in Fall and Spring

FOR 810  Special Topics In Forestry  (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems or research not related to thesis. Also used to develop and test new 800-level courses.

Typically offered in Fall, Spring, and Summer

FOR 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

FOR 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

FOR 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

FOR 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

Genetic Engineering and Society (GES)

GES 506/ENT 506  Principles of Genetic Pest Management  (3 credit hours)
Introduction to the biological aspects of genetic pest management (GPM). Genetic techniques for GPM, including historical uses (such as the sterile insect technique) and approaches that are currently in development. Practical issues relating to the deployment of GPM, including ecological and economic considerations.

Typically offered in Fall only

GES 508/COM 508  Emerging Technologies and Society  (3 credit hours)
Provides frameworks for understanding emerging technologies and their social, political, and cultural contexts. Presents historical case studies, ethnographic accounts, and theoretical perspectives that introduce students to ways of thinking about science and technology, nature and culture, and democracy and expertise. Graduate standing is required.

Typically offered in Spring only

GES 591  Special Topics in Genetic Engineering and Society  (1-6 credit hours)
Special topics and experimental course offerings in Genetic Engineering and Society.

Typically offered in Fall, Spring, and Summer

Genetics (GN)

GN 301  Genetics in Human Affairs  (3 credit hours)
Appreciation and understanding of genetics in everyday life. Topics include basic principles of transmission genetics, molecular genetics, population genetics, and the effects of the environment on gene expression and phenotype. Applications of genetics in human development and disorders, genetic testing for medical and forensic purposes, and genetic engineering will be covered. Basic principles as well as ethical, legal, social, and public health issues will be covered.

GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall, Spring, and Summer
**GN 311  Principles of Genetics**  (4 credit hours)
Basic concepts and principles of prokaryotic and eukaryotic genetics. Mendelian inheritance, polygenic inheritance, linkage and mapping, chromosome aberrations, population genetics, evolution, DNA structure and replication, gene expression, mutation, gene regulation, extranuclear inheritance, bacterial and viral genetics, and recombinant DNA technology.
Prerequisite: BIO 183 or ZO 160
Typically offered in Fall, Spring, and Summer

**GN 312 Elementary Genetics Laboratory**  (1 credit hours)
Genetic experiments and demonstrations using a variety of bacterial, plant and animal organisms. Mendelian inheritance, linkage analysis, population genetics, cytogenetics, biochemical genetics, DNA isolation, electrophoresis, and Southern blotting.
Corequisite: GN 311
Typically offered in Fall and Spring

**GN 421/GN 521 Molecular Genetics**  (3 credit hours)
Biological macromolecules and their interactions, DNA topology, eukaryotic genome structure, chromatin and chromosome structure, transcription and transcription regulation, epigenetics, RNAi and RNA processing, recombinant DNA technology, genetic transformation and cloning of plants and animals. Bacteria, viruses, plants, animals and fungi as genetic systems. Students cannot receive credit for both GN 421 and GN 521.
Prerequisite: C- or better in GN 311
Typically offered in Fall and Spring

**GN 423 Population, Quantitative and Evolutionary Genetics**  (3 credit hours)
This course is an introduction to population, quantitative and evolutionary genetics. This course will acquaint students with basic population genetics models. The course will cover genetic variation; measures of genetic variation; basic and advanced topics of selection; ecological genetics; inbreeding; genetic drift and effective population size; mutation; neutral theory and coalescence; gene flow and population structure; linkage disequilibrium and recombination; quantitative genetics; heritability; quantitative trait loci; molecular population genetics and evolution.
Prerequisite: GN 311 and (MA 131 or MA 141)
Typically offered in Spring only

**GN 425 Advanced Genetics Laboratory**  (2 credit hours)
This is a challenging advanced genetics laboratory designed to provide research and communication training and in-depth understanding of modern genetics through hands-on activities. Students will participate in a semester-long supervised research project in contemporary genetics using a model genetic organism and state-of-the-art techniques. The project will be directly related to research in the coordinating faculty member's laboratory. The project will require literature review, hypothesis development, experimental design and execution, data analysis and presentation of results in written and oral form.
Prerequisite: GN 312; Corequisite: GN 421
Typically offered in Fall and Spring

**GN 427 Introductory Bioinformatics**  (3 credit hours)
This course is an introduction to bioinformatics for genetic and biological sciences. The course will provide a foundation in biological computing that includes command line interfaces, reformatting data, creating and editing graphics, automating analyses and database access, and scripting in biological programming languages used for bioinformatics such as Python, Perl, and R. Laptop required.
Prerequisite: GN 311 and (MA 131 or MA 141) with grades of C- or better
Typically offered in Fall only

**GN 428 Introduction to Machine Learning in Biology**  (3 credit hours)
New techniques in genomics have revolutionized biology, but generate large quantities of data that present challenges in extracting signal from noise. This course will provide students the basic skills to manipulate and integrate different types of biological datasets and to learn how to mine them using data analysis tools ranging from basic to state of the art. Machine learning methods provide a framework to analyze vast amounts of biological information and extract meaningful signals. By the end of the semester, students will have had exposure to a variety of modern machine learning tools for classification and prediction. We will focus on exploration of DNA data (with millions of variants), expression data (>20,000 genes), and microbiome data (thousands of features), combined with various disease/experimental measurements. The course will cover the basics of loading and exploring datasets using visualization, followed by basic machine learning basic methods including classification and regression algorithms.
Prerequisite: C- or better in GN 311 and C- or better in MA 131 or MA 141 and C- or better in ST 311
Typically offered in Spring only

**GN 434 Genes and Development**  (3 credit hours)
Overview of pivotal experiments in embryology and developmental genetics; genes and genetic pathways that control development in animal model systems and humans; focus on the application of molecular genetic approaches to the study of genes and development.
Prerequisite: C- or better in GN 311
Typically offered in Fall, Spring, and Summer

**GN 441/GN 541 Human and Biomedical Genetics**  (3 credit hours)
This course is an in depth study of human and biomedical genetics and the role of genetics in human health and disease. The course will acquaint students with contemporary knowledge of genetics in disease causation and susceptibility, the use of model organisms to inform human biology and contemporary topics in human genetics research like epigenetics, therapeutic cloning, gene therapy, role of genetics in response to drugs and predictive medicine. Credit cannot be given for both 441 and 541.
Prerequisite: C- or better in GN 421
Typically offered in Fall only
GN 450/GN 550 Conservation Genetics (3 credit hours)
The main objective of this course is to expose upper division undergraduate students and graduate students to conservation genetic tools and applications. Students will learn the genetic and genomic theory and methods commonly used in conservation and management of species. In addition, the course will provide hands-on experience working on current conservation projects here at North Carolina State University. Working in groups, the students will collect, run, and analyze those data for a scientific paper. The final project for all students will be a conservation genetic grant proposal.
Prerequisite: GN 311
Typically offered in Spring only

GN 451 Genome Science (3 credit hours)
Genomic approaches with a foundation in classical and molecular genetics, including both historical strategies used in early major genome projects, and cutting edge contemporary methods for genomics and systems biology; the sequencing, assembly, and annotation of genomes and transcriptomes; use of genomic methods to tackle problems in epigenetics, metagenomics, and proteomics; application to a wide variety of species and biological questions, including evolution and human health; reading, discussion, and presentation of current scientific literature.
Prerequisite: C- or better in GN 311
Typically offered in Spring only

GN 453 Personal Genomics (3 credit hours)
This course will teach students the principles and practices of data analysis associated with human genetic research. Students will gain an understanding of how DNA variation explains human ancestry and how DNA variation is used to identify genes affecting
Prerequisite: C- or better in GN 311 and C- or better in ST 311
Typically offered in Spring only

GN 456 Epigenetics, Development, and Disease (3 credit hours)
Scientists are just beginning to fully appreciate how our genes and the environment interact to influence human development and disease. The emerging field of epigenetics offers new insights into these complex connections. Epigenetics is the study of heritable changes in gene expression and phenotypes caused by mechanisms other than changes in the underlying DNA sequence. Topics may include imprinting, mechanisms driving epigenetic modifications, how environmental exposures may influence your grandchildren's health, why identical twins exhibit differences in behavior or disease susceptibility, and genetic and environmental bases of diverse diseases. We will also discuss experimental strategies for studying epigenetics. JR standing.
Prerequisite: B or better in GN 311
Typically offered in Spring only

GN 461 Advanced Bioinformatics (3 credit hours)
This course provides in-depth experience in applying bioinformatic computing techniques to experimental data with a focus on the genetic and biological sciences. The course will provide experience in genome sequence analysis and assembly, extracting, manipulating and visualizing genetic and molecular data, analysis of macromolecular sequences, and generating and visualizing phylogenetic date. Laptop required.
Prerequisite:GN 427 and ST 311 with grades of C- or better
Typically offered in Spring only

GN 490 Genetics Colloquium (1 credit hours)
This course will involve critical study of research in genetics. Students will evaluate primary research publication on prepared topics assigned by instructor, with emphasis on review of recent and current research.
Prerequisite: GN 421
Typically offered in Spring only

GN 496 Genetics Research Experience (3 credit hours)
GN 496 provides an opportunity for students to gain real-world experience by conducting independent research in a genetics research program. A minimum of 135 hours must be completed for the three credit hours. The experience must be arranged by the student and approved by the Director of the Undergraduate Genetics Program in advance of beginning the work. To gain approval, students must submit the completed GN 496 Contract, signed by their GN 496 supervisor (Research Mentor) and by their academic advisor. The student is required to write a research paper evaluating the results of their project. In addition to the work described in the contract, students will complete a series of reflective written assignments during and at the end of their GN 496 experience.
Minimum of sophomore standing. Limited to Genetics Majors and Genetics Minors. Students must submit required signed course contract prior to registration.
Typically offered in Fall, Spring, and Summer

GN 497 Genetics Teaching Experience (3 credit hours)
GN 497 provides an opportunity for students to gain experience in an aspect of genetics education research and/or developing, implementing, and evaluating the effectiveness of materials for use in the genetics classroom. A minimum of 135 hours must be completed for the three credit hours. The experience must be arranged by the student and approved by the Director of the Undergraduate Genetics Program in advance of beginning the work. To gain approval, students must submit the completed GN 497 Contract, signed by their GN 497 Teaching Mentor and by their academic advisor. The student is required to write a scientific paper evaluating the results of their project. In addition to the work described in the contract, students will complete a series of reflective written assignments during and at the end of their GN 497 experience.
Minimum of sophomore standing. Limited to Genetics Majors and Genetics Minors. Students must submit required signed course contract prior to registration.
Typically offered in Fall, Spring, and Summer

GN 521/GN 421 Molecular Genetics (3 credit hours)
Biological macromolecules and their interactions, DNA topology, eukaryotic genome structure, chromatin and chromosome structure, transcription and transcription regulation, epigenetics, RNAi and RNA processing, recombinant DNA technology, genetic transformation and cloning of plants and animals. Bacteria, viruses, plants, animals and fungi as genetic systems. Students cannot receive credit for both GN 421 and GN 521.
Prerequisite: C- or better in GN 311
Typically offered in Fall and Spring
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>GN 541/GN 441</td>
<td>Human and Biomedical Genetics</td>
<td>3</td>
<td>This course is an in depth study of human and biomedical genetics and the role of genetics in human health and disease. The course will acquaint students with contemporary knowledge of genetics in disease causation and susceptibility, the use of model organisms to inform human biology and contemporary topics in human genetics research like epigenetics, therapeutic cloning, gene therapy, role of genetics in response to drugs and predictive medicine. Credit cannot be given for both 441 and 541. Prerequisite: C- or better in GN 421 Typically offered in Fall only</td>
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<tr>
<td>GN 550/GN 450</td>
<td>Conservation Genetics</td>
<td>3</td>
<td>The main objective of this course is to expose upper division undergraduate students and graduate students to conservation genetic tools and applications. Students will learn the genetic and genomic theory and methods commonly used in conservation and management of species. In addition, the course will provide hands-on experience working on current conservation projects here at North Carolina State University. Working in groups, the students will collect, run, and analyze those data for a scientific paper. The final project for all students will be a conservation genetic grant proposal. Prerequisite: GN 311 Typically offered in Spring only</td>
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<tr>
<td>GN 685</td>
<td>Master's Supervised Teaching</td>
<td>1-3</td>
<td>Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment. Prerequisite: Master's student Typically offered in Fall and Spring</td>
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<tr>
<td>GN 690</td>
<td>Master's Examination</td>
<td>1-9</td>
<td>For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Prerequisite: Master's Student Typically offered in Fall only</td>
</tr>
<tr>
<td>GN 699</td>
<td>Master's Thesis Preparation</td>
<td>1-9</td>
<td>For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Prerequisite: Master's Student Typically offered in Fall only</td>
</tr>
<tr>
<td>GN 701</td>
<td>Molecular Genetics</td>
<td>3</td>
<td>A discussion of the structure and function of genetic material at a molecular level. Consideration of both prokaryotic and eukaryotic systems. The aim to describe genetics in terms of chemical principles. Prerequisite: GN 311 Typically offered in Fall only</td>
</tr>
<tr>
<td>GN 702</td>
<td>Cellular and Developmental Genetics</td>
<td>3</td>
<td>Regulation of genes involved in cellular function, differentiation and development in eukaryotes. Presentation of biological systems and model organisms used to study genetic control of cellular and developmental processes. Prerequisite: GN 701 Typically offered in Fall only</td>
</tr>
<tr>
<td>GN 707/GN 708</td>
<td>Genetics of Animal Improvement</td>
<td>3</td>
<td>Emphasis on the utilization of basic principles of population and quantitative genetics in animal improvement. Factors affecting genic and genotypic frequencies and methods of estimating genetic and nongenetic variance, heritabilities and breeding values. The roles of mating systems and selection procedures in producing superior genetic populations. Prerequisite: GN 311 and ST 512 Typically offered in Spring only</td>
</tr>
<tr>
<td>GN 713/GN 713</td>
<td>Quantitative Genetics and Breeding</td>
<td>3</td>
<td>Quantitative and population genetic theory of breeding problems; partitioning of genetic variance, maternal effects, genotype by environment interaction and genetic correlation; selection indexes; design and analysis of selection experiments; marker-assisted selection. Prerequisite: GN 509, ST 512 Typically offered in Fall only</td>
</tr>
<tr>
<td>GN 720/HS 720/CS 720</td>
<td>Molecular Biology in Plant Breeding</td>
<td>3</td>
<td>Theory and principles of molecular biology applied to plant breeding. Experimental approaches to induce genetic change, cytoplasmic recombination, haploid utilization and potentials of molecular techniques for solving breeding problems. Prerequisite: CS(GN,HS) 741, GN 701, GN 702, GN 703 Typically offered in Spring only</td>
</tr>
</tbody>
</table>
GN 721/ST 721 Genetic Data Analysis (3 credit hours)
Analysis of discrete data, illustrated with genetic data on morphological characters allozymes, restriction fragment length polymorphisms and DNA sequences. Maximum likelihood estimation. Methods for characterizing population structure and genetic diversity. Measures of selection of desirable qualities and fundamentals of controlled breeding. Emphasis on variation in wild populations, the bases for Prerequisite: ST 430 and GN 311
Typically offered in Spring only

GN 725/FOR 725 Forest Genetics (3 credit hours)
Application of genetic principles to silviculture, management and wood utilization. Emphasis on inbreeding, concepts of inbreeding, estimations of genetic variability, and relationships between type and source of genetic credit hours. Prerequisite: BCH 451 or GN 311
Typically offered in Fall only

GN 730/MB 730/PP 730/PB 730 Fungal Genetics and Physiology (3 credit hours)
Basic concepts of genetics and physiology of fungi, with emphasis on saprophytic and plant pathogenic mycelial fungi. Current literature on sexual and asexual reproduction and incompatibility systems. Laboratory exercises on mutant isolation, sexual and parasexual analysis, genetic transformation, and RFLP and isozyme analysis. Prerequisite: BCP 451, BO 775, GN 311 or PP 501
Typically offered in Spring only

GN 735 Functional Genomics (3 credit hours)
Methodology of experimental genomics; genome sequencing, gene expression arrays, genomic screens, proteomics. Aims and achievements of microbial, plant, animal, human genome projects. Applications of genomics including parasitology, breeding, functional genomics, evolutionary genetics. Interface with bioinformatics, data technology. Prerequisite: GN 701
Typically offered in Spring only

GN 740 Evolutionary Genetics (3 credit hours)
Genetic basis of evolution. Molecular evolution, molecular population genetics, evolutionary genetics of quantitative characters and the genetics of speciation. Critical reading of original research publications and student seminars. Prerequisite: GN 703
Typically offered in Fall only

GN 745/HS 745/CS 745 Quantitative Genetics In Plant Breeding (1 credit hours)
Theory and principles of plant quantitative genetics. Experimental approaches of relationships between type and source of genetic variability, concepts of inbreeding, estimations of genetic variance and selection theory. Prerequisite: CS(GN, HS) 541, ST 712, course in quantitative genetics recommended
Typically offered in Spring only

GN 746/HS 746/CS 746 Cytogenetics in Plant Breeding (2 credit hours)
Theory and principles of plant breeding methodology including population improvement, selection procedures, genotypic evaluation, cultivar development and breeding strategies. Prerequisite: BCH 451 or GN 311
Typically offered in Spring only

GN 750 Developmental Genetics (3 credit hours)
Action and regulation of genes and gene-products in development and differentiation. Examples from microorganisms, plants and animals. Emphasis on molecular and biochemical aspects of mechanisms controlling gene expression in eukaryotic cell differentiation. Prerequisite: GN 701, GN 702
Typically offered in Spring only

GN 755 Population Genetics (3 credit hours)
Theoretical population genetics and its relationship to natural and experimental populations. Single locus and multilocus systems, history of a gene in a population, diffusion approximations, suitability of models to natural and experimental populations. Prerequisite: GN 703
Typically offered in Spring only

GN 756/ST 756 Computational Molecular Evolution (3 credit hours)
Computational molecular evolution is the focus of this course. We discuss how to use genomic data to study and interpret general biological problems, such as adaptation and heterosis. The course is targeted for advanced graduate students interested in using genomic information to study a variety of problems in quantitative genetics. Prerequisite: GN 311 and ST 511
Typically offered in Fall only

GN 757/ST 757/HS 757 Quantitative Genetics Theory and Methods (3 credit hours)
The essence of quantitative genetics is to study multiple genes and their relationship to phenotypes. How to study and interpret the relationship between phenotypes and whole genome genotypes in a cohesive framework is the focus of this course. We discuss how to use genomic tools to map quantitative trait loci, how to study epistasis, how to study genetic correlations and genotype-by-environment interactions. We put special emphasis in using genomic data to study and interpret general biological problems, such as adaptation and heterosis. The course is targeted for advanced graduate students interested in using genomic information to study a variety of problems in quantitative genetics. Prerequisite: ST 511
Typically offered in Fall only

GN 758/MB 758 Microbial Genetics & Genomics (3 credit hours)
Structure and function in microbial genetics, with emphasis on microbial genome organization, stable maintenance and evolution. DNA mutation and repair pathways, transcriptional and translational regulation, DNA replication and recombination and characterization of recombinant DNA molecules. Applications of genetic and genomic analysis methods to microbial processes, including strain construction, genome manipulation, and enhancement of gene expression. Prerequisite: BCH 451 or GN 311
Typically offered in Spring only
GN 761/PB 761/BCH 761  Advanced Molecular Biology Of the Cell  (3 credit hours)
An advanced graduate class involving integrated approaches to complex biological questions at the molecular level, encompassing biochemistry, cell biology and molecular genetics. The course will focus on an important, current area of research in eukaryotic biology using the primary scientific literature, and will involve class discussions, oral presentations, and a written research proposal.
Typically offered in Spring only

GN 768/BCH 768  Nucleic Acids: Structure and Function  (3 credit hours)
An advanced treatment involving integrated approaches to biological problems at the molecular level, encompassing biochemistry, cell biology and molecular genetics. Broad, multidisciplinary approaches to solving research problems in biology and theoretical study of primary scientific literature, the development of a research proposal, oral presentations and class discussions.
Prerequisite: BCH 701 and 703
Typically offered in Spring only

GN 801  Seminar  (1 credit hours)
Informal group discussion of prepared topics assigned by instructor.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

GN 810  Special Topics in Genetics  (1-6 credit hours)
Critical study of selected areas and special topics of current interest in genetics and related fields.
Typically offered in Fall and Spring

GN 820  Special Problems  (1-6 credit hours)
Special topics designed for additional experience and research training.
Prerequisite: Advanced Graduate standing
Typically offered in Fall and Spring

GN 850  Professionalism and Ethics  (1 credit hours)
The course is designed to give students background in professionalism, scientific ethics and responsible conduct of science. Topics include the role of the scientist in society, ethical theory, data acquisition and ownership, scientific misconduct, authorship, peer review, conflicts of interest and commitment, intellectual property, ethics of teaching and mentoring, ethical treatment of animal and human subjects, ethics of genetics research, job hunting and interviewing.
Prerequisite: Graduate standing
Typically offered in Fall only

GN 860/HS 860/CS 860  Plant Breeding Laboratory  (1 credit hours)
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.
Prerequisite: CS(GN,HS)741
Typically offered in Spring only

GN 861/HS 861/CS 861  Plant Breeding Laboratory  (1 credit hours)
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.
Prerequisite: CS(GN,HS)741
Typically offered in Fall only

GN 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

GN 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

GN 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

GN 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

GN 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

GN 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall and Spring
Geographic Information Systems (GIS)

GIS 205 Spatial Thinking with GIS (3 credit hours)
Spatial thinking and how it relates to the basic foundations of geospatial science and geographic information systems (GIS) are introduced. Students will learn to tell stories through maps using geographic information and geospatial data and analysis by applying spatial reasoning through a series of interactive assignments and discussions. Students will learn to define spatial problems and design solutions across a variety of disciplines, setting the stage for additional technical coursework in GIS and Geospatial Science.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

GIS 280 Introduction to GIS (3 credit hours)
This course provides an overview of the operations and functions of geographic information systems [GIS]. Students develop a fundamental understanding of geographic information management and analysis methods. Emphasis is placed on the nature of geographic information, working with spatial data, and elementary geospatial analysis and modeling techniques. Students learn effective operation of GIS software and gain exposure to GIS tools that support these emphasis areas. Extensive independent learning and computer experiences include online laboratory sessions, alongside optional online or in-person weekly help sessions.

Typically offered in Fall and Spring

GIS 295 Special Topics in Geospatial Information Science (1-4 credit hours)
Special Topics in Geospatial Information Science at the 200 level for offering courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

GIS 501 Geospatial Professionalism (2 credit hours)
Students will examine a variety of topics critical to successful navigation of the geospatial profession, with an emphasis on map communication and presentation, interpreting geospatial research, the ethical, legal, and social implications (ELSI) of using spatial data, metadata concepts, and linking results to policy actions. Students will engage in several writing, presentation, and interpretation exercises.

Typically offered in Fall and Spring

GIS 510 Fundamentals of Geospatial Information Science and Technology (3 credit hours)
This course provides an advanced overview of how geographic information systems [GIS] facilitate data analysis and communication to address common geographic problems. Students improve spatial reasoning and problem definition expertise while emphasizing geographic data models and structures, data manipulation and storage, customization through programming, and the integration of geospatial analysis and modeling into project-based problem solving applicable to a variety of disciplines. Skilled application of both desktop and cloud-based GIS software supports these areas. Extensive independent learning and computer experiences include virtual laboratory sessions, alongside optional online or in-person weekly help sessions to facilitate student learning.

Prerequisite: Graduate Standing or PBS or Permission of Instructor
Typically offered in Fall and Spring

GIS 512 Introduction to Environmental Remote Sensing (3 credit hours)
Principles and hands-on techniques for processing and analyzing remotely sensed data for natural resource applications. Topics include review of the electromagnetic spectrum, pre-processing (georectification, enhancements and transformations), processing (visual interpretation, indices, supervised and unsupervised classification) and post-processing (masking, change analysis and accuracy assessment) of digital image data. This course will provide students with fundamental concepts and skills needed to pursue further studies in digital processing of remotely sensed data.

Typically offered in Fall and Spring

GIS 515 Cartographic Design (2 credit hours)
Principles of cartographic design and how to apply them to produce high-quality geographic information system (GIS) based maps. Successful students will acquire an understanding of map design and experience applying it with GIS software. Students produc

Prerequisite: GIS 510
Typically offered in Fall and Spring

GIS 517/LAR 517 GIS Applications in Landscape Architecture and Environmental Planning (3 credit hours)
Introduction to the methods and applications of geographic spatial modeling technology in landscape architecture and environmental planning.

Typically offered in Fall only

GIS 520 Spatial Problem Solving (3 credit hours)
Focus on spatial problem solving from a geographic information perspective. Students learn to solve spatial problems through advanced analysis using geospatial technologies, learn to integrate and analyze spatial data in various formats, and explore methods for displaying geographic data analysis results to guide decision making. All course materials are delivered through the Internet, with optional weekly on-campus and synchronous online help sessions.

Prerequisite: GIS 510 or PA 541 or SSC 440
Typically offered in Fall, Spring, and Summer

GIS 521 Surface Water Hydrology with GIS (3 credit hours)
The application of geographic information systems (GIS) to surface water modeling including stream and watershed delineations, regulatory wetlands jurisdiction determinations, and flood mapping. In addition students will develop spatial computation methods to support hydrological analysis in land use planning, landscape management, and engineering assessments.

Prerequisite: GIS 510 or PA 541 or SSC 440
Typically offered in Fall and Spring
GIS 530 Spatial Data Foundations (3 credit hours)
This course focuses on geospatial information systems from a mathematical and information science perspective. We discuss theoretical frameworks for conceptualizing geographic data, including levels of measurement, data control, and the vector data and raster data paradigms. Then we discuss the geometric underpinnings of geospatial systems: representing data with geographic elements, spatial referencing systems, and projection. Next, we explore map-related topology and computational geometry concepts. Finally, we survey the algorithms for core spatial manipulations, such as interpolation and polygon operations.
Prerequisite: GIS 510 or PA 541 or SSC 440
Typically offered in Fall and Spring

GIS 535 Web and Mobile GIS Protocols (3 credit hours)
This course examines the design, development and deployment of web and mobile geospatial applications using internet and web-based protocols. Throughout the course, students will develop and deploy web and mobile GIS maps and applications relevant to their career using on- premises hosted infrastructure. Course participants will be required to complete assignments with data relevant to their interests. Additionally, students will search for and examine scientific and popular literature to understand how the course concepts are being employed and to foster ideas and discussion.
Prerequisite: GIS 510
Typically offered in Fall only

GIS 540 Geospatial Programming Fundamentals (3 credit hours)
This course provides fundamental skills for geospatial programming. Topics include calling geographic processing tools, batch processing, performing file i/o in an external computing language and building, graphical user interfaces and displays. To support these tasks, students learn basic programming concepts, such as pseudocode, flow-control, code re-use, and debugging. In the final project, students streamline GIS work-flow and customize GIS user interfaces. Familiarity with GIS software is required, but no prior programming experience is expected.
Prerequisite: GIS 510 or PA 541 or SSC 440
Typically offered in Fall and Spring

GIS 550 Geospatial Data Structures and Web Services (3 credit hours)
This course examines the spatial database models and structures used in geospatial information science and technology as well as the design and implementation of web and related mobile computing geospatial tools and systems. Students develop, evaluate, and deploy multiple spatial data models and web services that include connections to external data sources and systems.
Prerequisite: GIS 540
Typically offered in Fall and Spring

GIS 582/MEA 582 Geospatial Modeling (3 credit hours)
The course provides foundations in methods for GIS-based surface analysis and modeling. The topics include proximity analysis with cost surfaces and least cost paths, multivariate spatial interpolation and 3D surface visualization. Special focus is on terrain modeling, geomorphometry, solar irradiation, visibility, and watershed analysis. Students are also introduced to the basic concepts of landscape process modeling with GIS and to the principles of open source GIS. Introductory level knowledge of GIS or surveying/ geomatics principles is required.
Typically offered in Fall and Spring

GIS 584/MEA 584 Mapping and Analysis Using UAS (3 credit hours)
The course provides an overview of UAS mapping technology and its rules and regulations. The principles of UAS data collection are explained along with optional hands-on practice with in flight planning and execution. The main focus is on processing imagery collected from UAS using structure from motion techniques and deriving orthophoto mosaics and ultra-high resolution digital elevation models of land surface, vegetation and structures. More advanced topics include multi-temporal 3D data analysis, fusion with lidar data and 3D visualization.
Prerequisite: GIS 510 or GIS/MEA 582 or Permission of Instructor
Typically offered in Summer only

GIS 590 Geospatial Information Science Master's Project (3 credit hours)
This is the culmination course for The Master of Geospatial Information Science and Technology degree. This course provides students with the opportunity to demonstrate their accumulated degree skills and expertise by developing and communicating the solution to a complex geospatial problem through a Master's Capstone project. The project will include interoperable spatial and non-spatial data, web services, customized user interfaces and workflows completed in collaboration with a community partner. The student will design and manage a major project and professionally communicate their analysis and results to a public audience.
Prerequisite: GIS 510 or GIS/MEA 582 or Permission of Instructor
Typically offered in Fall and Spring

GIS 595 Special Topics in Geospatial Information Science (1-6 credit hours)
Special Topics in Geospatial Information Science
Typically offered in Fall and Spring

GIS 601 Seminar in Geospatial Information Science (1 credit hours)
Seminar in Geospatial Information Science
Typically offered in Fall and Spring

GIS 609 Geospatial Forum (1 credit hours)
The Geospatial Forum brings together researchers, educators, practitioners, and students of the geospatial sciences in an exciting, weekly series of lively presentations and facilitated discussions centered upon frontiers in geospatial analytics and geospatial solutions to complex challenges. Live discussions are recorded and made available online for students.
Typically offered in Fall and Spring

GIS 610 Special Topics in Geospatial Information Science (1-6 credit hours)
Special Topics in Geospatial Information Science
Typically offered in Fall and Spring

GIS 630 Independent Study (1-3 credit hours)
Advanced topics not otherwise included in curriculum for advanced graduate students on a tutorial basis. Determination of credits and content by participating faculty in consultation with Director of Graduate Programs. Departmental consent required
Typically offered in Fall and Spring
GIS 660  MGIST Professional Portfolio  (1 credit hours)
This course will focus on creating an effective digital portfolio, including content selection, description and reflection, and web site organization and design. The digital portfolio will present personal MGIST program accomplishments to demonstrate individual competences through knowledge, skills, and abilities of a geospatial science professional. Intended for students in their last semester in the MGIST Program.

Restriction: Graduate Student in the MGIST Program  Typically offered in Fall and Spring

GIS 710 Geospatial Analytics for Grand Challenges  (3 credit hours)
Examination of sustainable solutions to grand societal challenges using geospatial analytics. Emphasis is placed on the roles that location, spatial interaction, and multi-scale processes play in scientific discovery and communication. Discussion of seminal and leading-edge approaches to problem-solving is motivated by grand challenges such as controlling the spread of emerging infectious disease, providing access to clean water, and creating smart and connected cities. Students also engage in several written and oral presentation activities focused on data science communication skills and professionalization.

Typically offered in Fall only

GIS 711/CSC 711 Geospatial Data Management  (3 credit hours)
Data management principles and technologies for efficient implementation of geospatial applications. This course introduces students to: spatial and temporal data types, data models, geometry models, spatial predicates, spatial access methods, and spatial query processing. In addition, students will be exposed to modern data management systems for geospatial application development and data integration principles. Prior GIS programming knowledge and knowledge of database management systems and SQL is preferred.

Typically offered in Fall only

GIS 712 Environmental Earth Observation and Remote Sensing  (3 credit hours)
Focus is on passive electro-optical (microwaves, infrared and visible) remote sensing and will cover the physics of remote sensing, light interactions with Earth surface materials, limitations, advantages and disadvantages of passive remote sensing techniques, estimation of bio/geo-physical parameters from remote sensing data, and sensor performance and mission design for applications including hydrology, cryosphere, atmosphere-ocean dynamics, ecosystems and carbon cycle, and land use land cover change. Students should have introductory knowledge of GIS and remote sensing.

Typically offered in Fall only

GIS 713 Geospatial Data Mining  (3 credit hours)
This course equips students with the theoretical background and practical computational skills required to use data mining methodologies, including clustering, PCA, spatial autocorrelation, neural networks, classification and regression trees, and high performance, open source geocomputation. The course is designed around, and pays particular attention to, approaches for data with spatial components. Students are expected to have a working knowledge of basic geographic principles, statistical principles, GIS, and remote sensing. Some experience with R programming would also be beneficial.

Typically offered in Fall and Spring

GIS 714 Geospatial Computation and Simulation  (3 credit hours)
This course focuses on theoretical concepts and computational methods that describe, represent and simulate the functioning of real-world geospatial processes. We define the general properties of geospatial computing and explain the role of simulations in analysis and understanding of observed spatial phenomena, testing of hypotheses and theories, and prediction of spatio-temporal systems behavior. We discuss the current methods and techniques for simulations using deterministic, stochastic and rule-based models as well as agent-based simulation of complex systems. Hands-on component of the course will cover implementation of simulations in GIS and advanced applications driven by the student's research. Some prior programming experience is expected along with exposure to geospatial modeling, such as in GIS/MEA 582 or equivalent.

Restriction: 15GAPHD or Permission of Instructor  Typically offered in Spring only

GIS 715 Geovisualization  (3 credit hours)
This course focuses on visualization and interface design for geospatial analytics. With readings from textbooks and visualization literature, we'll discuss the applied science visualization, the human visual system, properties of light and color, visual salience, motion and space perception, human-computer interaction, and visual thinking processes at it relates to geospatial data. The course will also include hands-on exploration of free and open source geospatial data manipulation and geovisualization tools and interaction with current technologies within the Center for Geospatial Analytics Geovisualization Laboratory. Some prior programming experience is preferred (GIS540 or equivalent).

Restriction: Graduate standing in Geospatial Analytics or Permission of Instructor  Typically offered in Spring only

GIS 790 Special Topics in Geospatial Analytics  (1-6 credit hours)
Special Topics in Geospatial Analytics  Typically offered in Fall, Spring, and Summer

GIS 810 Special topics in Geospatial Analytics  (1-6 credit hours)
Special topics in Geospatial Analytics  Typically offered in Fall, Spring, and Summer

GIS 885 Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.  Typically offered in Fall and Spring

GIS 895 Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research  Typically offered in Fall, Spring, and Summer
Geography (GEO)

GEO 200 Principles of Geography (3 credit hours)
Basic ideas in the field of geography. The scope of geography as an academic field explored. Emphasis placed on mastery of geographic tools, e.g., maps, globes, and media materials and sources. Regional study of contemporary world.

GEP Social Sciences
Typically offered in Spring only

GEO 220/SOC 220 Cultural Geography (3 credit hours)
Investigates the world's past and present cultural diversity by studying spatial patterns of population, language, religion, material and non-material culture, technology and livelihoods, communities and settlements and political organization and interaction.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

Global Knowledge (GK)

GK 295 Global Knowledge Special Topics (1-3 credit hours)
Special topics course offering for the general education Global Knowledge category.

Global Public Health (GPH)

GPH 201 Fundamentals of Global Public Health (3 credit hours)
Introduction to Public Health, providing a population-based perspective on disease and injury causation and prevention. Environmental, social, behavioral, and biological determinants of health and disease. Access to health services from a global perspective. Selected tools of disease control and health promotion and problems related to health-care delivery to society as a whole and to vulnerable populations.

Typically offered in Fall only

GPH 404/ST 404 Epidemiology and Statistics in Global Public Health (3 credit hours)
This course will provide a general introduction to the quantitative methods used in global health, combining elements of epidemiology and biostatistics. The course will focus on linear and logistic regression, survival analysis, traditional study designs, and modern study designs. Students will learn fundamental principles in epidemiology, including statistical approaches, and apply them to topics in global public health. The course prerequisite is a B- or better in one of these courses: ST 305, ST 311, ST 350, ST 370, or ST 371. In addition, a B- or better in GPH 201 is strongly recommended.

Pre-requisite: B- or better in one of these courses: ST 305, ST 311, ST 350, ST 370, or 371
typically offered in Fall only

GPH 425 Global Health and Physiology (6 credit hours)
This Study Abroad course is designed to immerse students in current physiology and disease research, tropical medicine, and global health issues while providing students with an opportunity to gain hands-on experience in the field of global health. Students spend three weeks on campus exploring scientific, policy, cultural, and governmental influences on global health before traveling to a developing country to participate in medical service outreach for 2 weeks. Application to and acceptance into this Study Abroad course and payment for travel is required for course participation.

Prerequisite: C- or better in BIO 212 or BIO 250 of BIO 240 or BIO 245
Typically offered in Summer only

Graduate Economics (ECG)

ECG 505 Applied Microeconomic Analysis (3 credit hours)

Prerequisite: EC 301 and MA 121
Typically offered in Fall only

ECG 506 Applied Macroeconomic Analysis (3 credit hours)
Applied course in aggregate economics. Analysis of aggregate economic fluctuations and stabilization policy; inflation and disinflation; the Federal budget and international balance of trade; and economic growth. Capital markets, monetary and fiscal policy, banking system, foreign exchange markets and their effects on business conditions. Development of standard macroeconomic model in context of specific applications.

Prerequisite: EC 302 and MA 121
Typically offered in Spring only

ECG 512 Law and Economics (3 credit hours)
Economic analysis of sources and effects of law, including common law, statutory law and regulation. Property rights and contracts, liability rules, criminal and punishment, statutory enactment, bureaucratic behavior and institutional reform.

Prerequisite: EC(ARE) 301 or EC(ARE) 401
Typically offered in Spring only

ECG 515 Environmental and Resource Policy (3 credit hours)
Application of price theory and benefit-cost analysis to public decisions related to resources and environment. Emphasis on evaluation of water supply and recreation investments, water quality management alternatives, public-sector pricing, common property resources and optimum management of forest and energy resources.

Prerequisite: EC(ARE) 301 or 401
Typically offered in Spring only
ECG 528/MBA 528/FIM 528/MA 528 Options and Derivatives

**Pricing** (3 credit hours)
The course covers (i) structure and operation of derivative markets, (ii) valuation of derivatives, (iii) hedging of derivatives, and (iv) applications of derivatives in areas of risk management and financial engineering. Models and pricing techniques include Black-Scholes model, binomial trees, Monte-Carlo simulation. Specific topics include simple no-arbitrage pricing relations for futures/forward contracts; put-call parity relationship; delta, gamma, and vega hedging; implied volatility and statistical properties; dynamic hedging strategies; interest-rate risk, pricing of fixed-income product; credit risk, pricing of defaultable securities.

Prerequisites: MA 341 and MA 405 and MA 421
Typically offered in Fall only

**ECG 530 Topics in Labor Economics** (3 credit hours)
This course covers topics in labor economics including labor supply, labor demand, human capital, household production, discrimination, and immigration. The course textbook will be supplemented with readings from academic research papers. Students will learn how empirical research evaluates the predictions of economic theory and the impact of public policy. Students will gain an understanding of how to read and critique empirical research by applying the theory and measurement techniques developed by economists.

Prerequisites: ECG 505 and ECG 561
Typically offered in Spring only

**ECG 537 Health Economics** (3 credit hours)
Microeconomic analysis of public and private policy issues concerning health care financing and delivery in United States including: choice under conditions of asymmetric information; health insurance; performance of physician, hospital, long-term care and pharmaceutical markets.

Prerequisite: EC(ARE) 401 or ECG 700
Typically offered in Fall only

**ECG 540 Economic Development** (3 credit hours)
Examination of problems encountered in promoting regional and national economic development. Consideration given to structural changes required for raising standards of living. Some basic principles of economics applied to suggest ways of achieving development goals. Planning strategies, policies and external assistance.

Prerequisite: EC(ARE) 301 or 401
Typically offered in Spring only

**ECG 548 International Economics** (3 credit hours)
This course covers the determinants of international trade, migration, and investment and their connection with economic growth. It also covers macro/monetary issues, including exchange rates, financial markets and monetary-fiscal policy in open economies.

Prerequisite: EC 301
Typically offered in Spring only

**ECG 561/ST 561 Applied Econometrics I** (3 credit hours)
Introduction and application of econometrics methods for analyzing cross-sectional data in economics, and other social science disciplines, such as OLS, IV regressions, and simultaneous equations models. Students should have had a statistical methods course at the 300 level or above as well as Calculus I and II.

Typically offered in Fall only

**ECG 562 Applied Econometrics II** (3 credit hours)
This course is a continuation of Applied Econometrics I (ECG 561). After a review of probability and statistics, and simple and multiple regression models, we explore the following topics: regression using panel (longitudinal) data, instrumental variables regression, regression with a binary dependent variable, prediction with many regressors and “Big Data” methods, and time series regression. The emphasis is on recognizing the conditions in which it is appropriate to apply the various techniques, formulating a relevant model, estimating the model and interpreting the results. This course will also provide the students practical experience in applied econometrics using STATA.

P: ECG 561
Typically offered in Spring only

**ECG 563 Applied Microeconometrics** (3 credit hours)
This course will survey econometric methods for the analysis of panel and limited dependent variable data. Both the theoretical foundation and empirical application of methods will be covered. Topics include fixed and random effects, program evaluation, censored, truncated, discrete choice and count data models. Although not required, ECG 561, ST 511 or ST 512 is encouraged prior to taking this class.

Typically offered in Fall only

**ECG 580 Writing in Economics** (3 credit hours)
Developing, writing and presenting economic analyses of empirical issues chosen by each student.

Corequisite: ECG 700 and ECG 703 and ECG 561
Typically offered in Fall only

**ECG 590 Special Economics Topics** (1-6 credit hours)
Examination of current problems on a lecture-discussion basis. Course content varies as changing conditions require new approaches to deal with emerging problems.

Typically offered in Fall, Spring, and Summer

**ECG 630 Independent Study** (1-3 credit hours)
Typically offered in Fall, Spring, and Summer

**ECG 685 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall and Spring

**ECG 690 Master's Examination** (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

**ECG 695 Master's Thesis Research** (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
ECG 700 Fundamentals of Microeconomics (3 credit hours)
Prerequisite: MA 131 and EC(ARE)301
Typically offered in Fall only

ECG 701 Microeconomics I (3 credit hours)
Prerequisite: ECG 700, MA 231
Typically offered in Fall only

ECG 702 Microeconomics II (3 credit hours)
Prerequisite: ECG 701
Typically offered in Spring only

ECG 703 Fundamentals of Macroeconomics (3 credit hours)
Fundamental topics in macroeconomics, including consumption, investment, government purchases, taxation, government debt, output supply, money and inflation, unemployment, elementary economic growth. Emphasis is on the microeconomic foundations of macroeconomics. Economic intuition is stressed.
Prerequisite: EC(ARE) 301, EC 302, BUS(ST)350, MA 131
Typically offered in Spring only

ECG 704 Macroeconomics I (3 credit hours)
Rigorous examination of basic macroeconomic theory, including household choice of consumption demand and labor supply, capital accumulation and economic growth, government purchases, taxation, government debt, investment, consumption and investment under uncertainty, real business cycle models. Throughout the course, the connection between economic intuition and formal mathematical analysis is emphasized. The level of mathematical rigor is high.
Prerequisite: ECG 561, ECG 703, MA 242
Typically offered in Fall only

ECG 705 Macroeconomics II (3 credit hours)
Continuation of ECG 704. Topics include, but are not limited to, money demand and supply; money and growth; inflation; term structure of interest rates; money and fluctuations, including real and New Keynesian models; theories of unemployment; conduct of policy and problems of time consistency; asset pricing; introduction to open economy models.
Prerequisite: ECG 704
Typically offered in Spring only

ECG 706 Industrial Organization (3 credit hours)
Survey of microeconomic literature on industrial organization: internal structure of the firm, number and sizes of firms in an industry, pricing and output behavior of firms. Public policy, including antitrust laws, patent and copyright laws, and government regulation of industry.
Prerequisite: ECG 700
Typically offered in Fall only

ECG 707 Topics In Industrial Organization (3 credit hours)
Advanced study of selected topics such as oligopoly theory, empirical models of industry, principal-agent contracts, economic theories of firm organization, antitrust issues, economic theories of regulation and economics of property rights.
Prerequisite: ECG 700
Typically offered in Spring only

ECG 708 Advanced Microeconomic Theory (3 credit hours)
Survey of literature on game theory focusing on applications to numerous areas of economics. Course will cover the classic literature on auctions, matching theory and non-cooperative game theory. Special focus on applying these theoretical results to practical problems of market design.
Prerequisite: ECG 702
Typically offered in Fall only

ECG 709 Behavioral and Experimental Economics (3 credit hours)
Survey of literature on behavioral and experimental economics from a broad perspective, with coverage of numerous fields of economics, including both laboratory and field experiments. Methodology of experimental economics and design of laboratory and field experiments will be covered.
Prerequisite: ECG 702
Typically offered in Spring only

ECG 710 Topics In Industrial Organization (3 credit hours)
Survey of literature on game theory focusing on applications to numerous areas of economics. Course will cover the classic literature on auctions, matching theory and non-cooperative game theory. Special focus on applying these theoretical results to practical problems of market design.
Prerequisite: ECG 702
Typically offered in Fall only

ECG 715 Environmental and Resource Economics (3 credit hours)
Theoretical tools and empirical techniques necessary for understanding of resource and environmental economics, developed in both static and dynamic framework. Discussions of causes of environmental problems, possible policies and approaches to nonmarket valuation. Analysis of resource use over time using control theory for both renewable and exhaustible resources.
Prerequisite: ECG 700
Typically offered in Fall only

ECG 716 Topics In Environmental and Resource Economics (3 credit hours)
Advanced study of selected topics in environmental and resource economics. Topics vary with interests of instructor and students.
Prerequisite: ECG 715
Typically offered in Spring only

ECG 730 Labor Economics (3 credit hours)
Application of microeconomic theory and econometric methods to labor market behavior in both static and dynamic contexts. Labor demand analysis, labor force participation, hours of work, household production, human capital, distribution of earnings, information and search, and mobility.
Prerequisite: ECG 700 and one of the following: ECG(ST) 561, ST 422, ST 512, ST 708
Typically offered in Fall only
ECG 739 Empirical Methods for Development Economics and Applied Microeconomics (3 credit hours)
This course will provide an in-depth study of the application of the core tools of causal inference and microeconometrics to answer questions in development microeconomics. The class will largely consist of two activities: (1) close reading and guided discussion of seminal and recent papers and (2) the analysis of real data to estimate causal relationships. While the particular applications we study will come largely from development economics, the course is intended to be useful to students in diverse areas of applied micro.

Prerequisite: ECG 751 and ECG 753
Typically offered in Fall only

ECG 740 Economic Growth and Development (3 credit hours)
Microeconomic issues of growth. Technology adoption and the distributional effects of technical change; the role of agriculture in economic development; land tenure and tenancy arrangements; the role of agrarian institutions in the development process; and poverty, inequality and economic growth in developing countries. Approximately equal time devoted to theory and evidence.

Typically offered in Fall only

ECG 741 Agricultural Production and Supply (3 credit hours)
Advanced study in logic of, and empirical inquiry into, producer behavior and choice among combinations of factors and kinds and qualities of output; aggregative consequences of individuals' and firms' decisions in terms of product supply and factor demand; factor markets and income distribution; and general interdependency among economic variables.

Prerequisite: ECG 700
Typically offered in Fall only

ECG 742 Consumption, Demand and Market Interdependency (3 credit hours)
Analysis of behavior of individual households and of consumers in aggregate with respect to consumption of agricultural products; impact of these decisions on demand for agricultural resources, competition among agricultural regions and for markets; and interdependence between agriculture and other sectors of the economy.

Prerequisite: ECG 700
Typically offered in Spring only

ECG 743 Theory Of International Trade (3 credit hours)
Consideration of specialized body of economic theory dealing with international movement of goods, services, capital and payments. A theoretically oriented consideration of policy.

Prerequisite: ECG 700, 703
Typically offered in Spring only

ECG 744 Monetary Aspects Of International Trade (3 credit hours)
Macroeconomic problems of an open economy including balance of payments adjustment mechanism, alternative exchange rate systems, external effects of monetary and fiscal policy, optimum currency areas and international monetary reform.

Prerequisite: ECG 703
Typically offered in Fall only

ECG 750/ST 750 Introduction to Econometric Methods (3 credit hours)
Introduction to principles of estimation of linear regression models, such as ordinary least squares and generalized least squares. Extensions to time series and panel data. Consideration of endogeneity and instrumental variables estimation. Limited dependent variable and sample selection models. Attention to implementation of econometric methods using a statistical package and microeconomic and macroeconomic data sets.

Prerequisite: ST 421; Corequisite: ST 422
Typically offered in Spring only

ECG 751/ST 751 Econometric Methods (3 credit hours)
Introduction to important econometric methods of estimation such as Least Squares, Instrumental Variables, Maximum Likelihood, and Generalized Method of Moments and their application to the estimation of linear models for cross-sectional economic data. Discussion of important concepts in the asymptotic statistical analysis of vector process with application to the inference procedures based on the aforementioned estimation methods.

Prerequisite: ST 421, ST 422
Typically offered in Fall only

ECG 752/ST 752 Time Series Econometrics (3 credit hours)
The characteristics of macroeconomic and financial time series data. Discussion of stationarity and non-stationarity as they relate to economic time series. Linear models for stationary economic time series: autoregressive moving average (ARMA) models;

Prerequisite: ECG(ST) 751
Typically offered in Spring only

ECG 753/ST 753 Microeconometrics (3 credit hours)
The characteristics of microeconomic data. Limited dependent variable models for cross-sectional microeconomic data: logit/probit models; tobit models; methods for accounting for sample selection; count data models; duration analysis; non-parametric methods.

Prerequisite: ECG 751
Typically offered in Spring only

ECG 756 Mathematical Methods For Economics (3 credit hours)
Linear algebra and matrices, optimization with equality and inequality constraints, comparative statistics, differential and difference equations, intertemporal optimization. Economic applications to utility and profit maximization, national income determination, economic growth, business cycles.

Prerequisite: MA 231, introductory course in linear algebra
Typically offered in Fall only
ECG 766 Computational Methods in Economics and Finance (3 credit hours)
Fundamental methods for formulating and solving economic models numerically will be developed. Emphasis on defining the mathematical structure of problems and practical computer methods for obtaining model solutions. Major topics include solution of systems of equations, complementarity relationships and optimization. Finite and infinite dimensional problems will be addressed, the latter through the use of finite dimensional approximation techniques. Particular emphasis placed on solving dynamic asset pricing, optimization and equilibrium problems.

Prerequisite: (MA 305 or MA 405) and MA 341 and EC 301 and EC 302 and (CSC 112 or 114) or equivalents.

Typically offered in Fall only

ECG 784 Advanced Macroeconomics (3 credit hours)
Advanced study of macro-economics. Emphasis on business cycles and behavior of real variables. Real, incomplete information and disequilibrium theories of the business cycle; rational expectations; contract theory and indexation; investment; and effects of government expenditure, taxes and debt.

Prerequisite: ECG 704

Typically offered in Spring only

ECG 785 Monetary Economics (3 credit hours)
Field course for students desiring a specialization in monetary economics or macroeconomics. Survey of current topics in monetary theory and policy.

Prerequisite: ECG 705

Typically offered in Spring only

ECG 790 Advanced Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

ECG 830 Independent Study (1-3 credit hours)
Typically offered in Fall and Summer

ECG 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

ECG 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Fall and Spring

ECG 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

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Graphic Communications (GC)

GC 120 Foundations of Graphics (3 credit hours)
Introductory course providing orientation to language of graphics for students majoring in any field. Designed to help develop ability to use CAD within the context of a concurrent design process to understand how everyday objects are designed, analyzed and created. Emphasis placed on decision-making processes involved with creating geometry and development of modeling strategies that incorporate intentions of designer.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

GC 250 Architectural Graphic Communications (3 credit hours)
Architectural Graphic Communications is an advanced graphic course designed to expand on the concepts covered in the introductory courses (GC 120, GC 210, GC 211). The emphasis is on strengthening architectural sketching and CAD drawing skills and showing how specific construction processes and materials selected for an architectural design affect commercial and residential production architectural drawings. Topics include perspective drawing, shadow projection, texturization, rendered plans, elevations and other related topics.

Prerequisite: GC 120 or TDE 220

Typically offered in Fall and Spring

GC 320 3D Spatial Relations (3 credit hours)
Analysis and solution of three-dimensional space problems utilizing graphic principles of orthogonal projection techniques. Application of studies of lines; surfaces; solids; surface intersections; surface development; vectors; and civil, mechanical, and geographical structures.

Prerequisite: GC 120

GEP Mathematical Sciences
Typically offered in Fall and Spring

GC 330 Basic Technical Animation (3 credit hours)
Create technical animations to communicate scientific and technical information to a variety of audiences and environments. Includes performing basic skills in image processing including cropping, transformations, color manipulation and color enhancement. Students will apply basic concepts of constructing 3-D objects, spaces, and environments. Create technical animations which apply environmental attributes including surface study, texture, color, lighting models, photorealism, and raytracing.

Prerequisite: GC 120 or TDE 220

Typically offered in Fall only

GC 340 Concepts of Website Development (3 credit hours)
An introduction to the essential elements of web site development for students in Technology Education and Graphic Communications. Content focuses on planning and executing web site for educational effectiveness, user interfaces, site testing, and maintenance. Course provides instruction in software appropriate for creating a website.

Typically offered in Summer only
GC 350 Applied CAD/D and Geometric Controls (3 credit hours)
Techniques for producing mid-level computer models of individual parts and assemblies of parts. Application of conventional tolerancing and geometric tolerancing and dimensioning. Investigation of design for manufacture and CAD/CAM (Computer-Aided Design and Manufacturing) databases developed with 3-D modeling tools. Development and management of 3-D geometry using modeling software.

Prerequisite: GC 120
Typically offered in Fall and Spring

GC 420 Visual Thinking (3 credit hours)
Develop visual thinking skills through a series of exercises using various visual media. Integrates and stresses drawing and construction activities essential to visual thinking. Emphasis on direct observation (seeing), mental imagery and sketching that is based upon three-dimensional space. Develops students' visual and drawing skills and provides for their application toward solving open-ended spatial problems. Intended for the scientific and technically oriented student.

Typically offered in Fall and Spring

GC 450 Advanced Graphics Usage with CAD (3 credit hours)
Advanced applications of 3-dimensional solid modeling tools in technical and engineering environments. Theory and application of manufacturing databases developed with 3-D modeling tools. Development and management of 3-D geometry using modeling software.

Prerequisite: GC 350 -- Applied CAD/D and Geometric Controls
Typically offered in Fall and Spring

GC 496 Special Topics in Graphic Communications (1-4 credit hours)
Topical study in areas of current interest and need to students and/or needs of curricula served by Graphic Communications.

Typically offered in Fall, Spring, and Summer

GC 498 Independent Study in Graphic Communications (1-4 credit hours)
Independent study in areas of current interests and needs of students in the field of Graphic Communications and the visual sciences. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standart Study".

Prerequisite: GC 120 or TDE 220
Typically offered in Fall, Spring, and Summer

Graphic Design (GD)

GD 201 Design, Context, and Experience (6 credit hours)
Introduction to analysis and form-making in graphic design through investigations of design artifacts as components of larger and physical, social, cultural, and technological systems. Appropriate student-owned technology and software required. Graphic Design Majors Only, except with Department Head permission.

Prerequisite: GD 210 Co-requisite: GD 217
Typically offered in Fall only

GD 202 Designing for Settings, People, and Use (6 credit hours)
Relationships among audience/user interpretive behavior, attributes of physical and cultural settings, and objects with attention to different perspectives on the role of the designer. Graphic Design Majors Only, except with Department Head permission.

Prerequisite: GD 201, GD 217; Corequisite: GD 317
Typically offered in Spring only

GD 203 History of Graphic Design (3 credit hours)
Events, ideas, movements, designs and individuals that have historical significance and influence on contemporary graphic design and the graphic design profession. Concentration on graphic design of the last 100 years.

GEP Visual and Performing Arts
Typically offered in Spring only

GD 210 Image and Tech Tinkering (6 credit hours)
GD 210 is an introduction to exploration with imagery and technology. It introduces basic critical and interpretative ideas about images in context and with users in mind. This includes fundamentals of both the reproduction and experience of imagery that are particularly relevant to the Graphic Design curriculum. GD 210 also introduces students to technologies relevant to current and future design practice, and nurtures rapid ideation through prototyping techniques. Graphic Design majors only, except with Department Head permission.

Prerequisite: D 104
Typically offered in Spring only

GD 217 Typography and Technology (3 credit hours)
Introduction to typography with respect to four primary systems: reading, form, language, and technology. Appropriate student-owned technology and software required. Graphic Design majors only, except with Department Head permission.

Prerequisite: GD 210
Typically offered in Fall only

GD 301 Branding, Interaction, and Service Design (6 credit hours)
Investigations of branding, interaction, and service design in response to problems of complex systems and contexts. Graphic Design majors only, except with Department Head permission.

Prerequisite: GD 202. Corequisite: GD 417
Typically offered in Fall only

GD 303 Graphic Design Theory and Practice (3 credit hours)
An examination of theories and critical perspectives shaping graphic practice. The course includes a discussion of contemporary design strategy in business and the role of visual communication in the information age.

GEP Visual and Performing Arts
Typically offered in Fall only

GD 310 Visualization, Representation, and Display (3 credit hours)
Surveying, documenting, and interpreting sites and subjects; representing relationships among settings, people, and objects through image-making strategies, such as activity maps, interviews, panoramas, and visual essays. Graphic Design majors only, except with Department Head permission for other college of design majors.

Prerequisite: GD 210
Typically offered in Spring only

GEP Visual and Performing Arts
Typically offered in Spring only
GD 317 Typographic Language, Writing, and Reading (3 credit hours)
Continuation of typography and technology with greater emphasis on the individual reading experience, including page sequencing, grids, and the relationship between historical conventions and new interpretive demands on readers. Graphic Design majors only, except with Department Head permission.
Prerequisite: GD 217
Typically offered in Spring only

GD 400 Advanced Graphic Design Studio (6 credit hours)
Topical and interdisciplinary studios addressing advanced visual communication problems. Graphic Design Majors only, except with Department Head permission.
Prerequisites: GD 301 and GD 203 and GD 303
Typically offered in Fall and Spring

GD 401 Graphic Design Practicum (3 credit hours)
Capstone experience focused on the transition from school to career. Individual capstone project and discussions of professional practice, guidelines, and ethics. Graphic Design majors only, seniors.
Prerequisite: GD 301 and GD 410 and GD 417
Typically offered in Fall only

GD 410 Online and Mobile Interaction Design Systems (3 credit hours)
Exploration of dynamic communication systems, including methods for visualizing user interaction, setting conditions for user experience, and managing collaborative work. Graphic Design majors only, except with Department Head permission for other College of Design majors.
Prerequisite: GD 310
Typically offered in Fall only

GD 417 Information and Publishing Design Systems (3 credit hours)
Continuation of typographic language, writing, and reading with attention to advanced grid, form, and font systems in the design of multi-page documents, as well as issues of production and printing. Graphic Design majors only, except with Department Head permission.
Prerequisite: GD 317
Typically offered in Fall only

GD 490 Graphic Design International Studio (6 credit hours)
Define visual communication design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary visual communication. Directed studies in history and culture, and in artifact making. Additional travel and trip costs are required beyond registration fees, as well as appropriate immunizations. Graphic Design majors and departmental approved Elective ("swing") Studio for all other College of Design Majors with Junior or Graduate Standing in Major.
Prerequisite: Junior standing in the major and Study Abroad Office approval
Typically offered in Summer only

GD 492 Special Topics in Graphic Design (3 credit hours)
Topics of current interest in Graphic Design. Normally used to develop new courses. Graphic Design Majors, and department approved elective for all other college of Design Majors with Junior or Graduate standing in major.
Prerequisite: Jr standing in Graphic Design major
Typically offered in Fall, Spring, and Summer

GD 494 Internship in Graphic Design (3 credit hours)
Supervised field experience in graphic design offices and organizations. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior.
Prerequisite: Junior standing in Graphic Design and 3.0 GPA or better
Typically offered in Fall, Spring, and Summer

GD 495 Independent Study in Graphic Design (1-3 credit hours)
Special projects in graphic design developed under the direction of a faculty member on a tutorial basis. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by
Prerequisite: Junior standing in Graphic Design and 3.0 GPA or better
Typically offered in Fall, Spring, and Summer

GD 501 Graduate Graphic Design Studio (9 credit hours)
Student-defined graphic design projects in response to critical content framework presentation by GD 571 faculty. Center of framework on role of design objects as cognitive artifacts and extension, transformation or diminishment of human thought by their form and content. Interaction of potential audiences with designer-created artifacts. Graphic design majors only.
Corequisite: GD 571
Typically offered in Fall only

GD 502 Graduate Graphic Design Studio II (9 credit hours)
Student-defined graphic design projects in response to critical content framework presentation by GD 572 faculty. Center of framework on role of design objects as cultural artifacts and their reflection on social diversity of both designers and audiences. Creation, reproduction, distribution and reception of messages in both designer-created artifacts and audience's response. Graphic design majors only.
Prerequisite: GD 501, Corequisite: GD 572
Typically offered in Fall only

GD 503 Graduate Graphic Design Studio III (9 credit hours)
Student-defined graphic design projects in response to critical content framework presentation by GD 671 faculty. Center of framework on nature of new information environments. Shape and response of technologies to new cognitive and cultural relationships
Prerequisite: GD 573, Corequisite: GD 671
Typically offered in Spring only

GD 510 Imaging for Graphic Design IV (3 credit hours)
Advanced problems in the visual design and structuring of information in interactive multimedia presentations. Topics include the design of interfaces, navigation, motion graphics, and websites as well as exploration of narrative and hypermedia approaches to the organization of content.
Prerequisite: GD 410, Design Majors
Typically offered in Spring only
GD 517 Type IV (3 credit hours)
Advanced problems of typographic expression/communication in which
typographic variables are used to alter, enhance, or reinforce verbal
meaning. Historic precedent and experimentation with the conventions for
typographic form are explored. The impact of the computer on changes in
typographic aesthetics, including motion graphics, typeface design, and
website design.
Prerequisite: GD 417, Design Majors
Typically offered in Spring only

GD 571 Design As Cognitive Artifact (3 credit hours)
Relationship between theories of human cognition and graphic design.
Analysis and critique of design objects as cognitive artifacts and
extension, transformation or diminishment of human thought by their
form and content. A critical examination of cognitive, linguistic and social
science theories shaping graphic design. Non-majors by permission only.
Typically offered in Fall and Spring

GD 572 Design as Cultural Artifact (3 credit hours)
Introduction to recent theories in various disciplines concerning a cultural
understanding of graphic design. Theories of mass and popular culture,
critiques of creativity and authorial intentionality, influences of interpretive
criticism, theories of consumption and issues of cultural representation.
Emphasis on adaptation of these theories to an understanding of the
cultural significance of graphic design. Non-majors by permission only.
Typically offered in Fall and Spring

GD 573 New Information Environments (3 credit hours)
Changing role of graphic design in new information environments.
Implications of new technology on social construction of meaning, impact
of electronic media on culture and cognition, and differences in designing
artifacts and designing experiences. Non-majors by permission only.
Prerequisite: GD 503
Typically offered in Spring only

GD 580 Special Topics In Graphic Design History (1-6 credit hours)
Topics of current interest in interpretation, criticism, methodology and
research, relating to graphic design history. Further specialized study
in history of printing, typography, communication, image-making and
information systems. Investigation of how we study artifacts, production
and producers.
Prerequisite: GD 242
Typically offered in Spring only

GD 581 Graphic Design Final Project Research (3 credit hours)
A seminar course to assist students in preparing foundation for final
project to be conducted in GD 688 Final Project Studio.
Prerequisite: GD 502
Typically offered in Fall only

GD 588 Final Project Studio In Graphic Design (6 credit hours)
Final project for graduate students supervised by members of their
graduate advisory committees.
Prerequisite: GD 581
Typically offered in Spring only

GD 592 Special Topics In Graphic Design (1-6 credit hours)
Topics of current interest to program/option offered by faculty in School.
Subjects offered under this number normally used to test and develop
new courses.
Prerequisite: Graduate standing
Typically offered in Fall only

GD 610 Special Topics In Graphic Design (1-credit hours)
An investigation of special topics in graphic design of a particular interest
to advanced students under direction of chair of graduate committee on a
tutorial basis; credit and content vary with each student.
Prerequisite: Permission of grad. advisor
Typically offered in Fall and Spring

GD 630 Independent Study In Graphic Design (1-3 credit hours)
Special problems in various aspects of graphic design developed under
the direction of a faculty member on a tutorial basis.
Typically offered in Fall, Spring, and Summer

GD 676 Special Project In Graphic Design (1-3 credit hours)
Seminar on subjects of current interest in graphic design, presented by
persons not part of regular faculty.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

GD 685 Master’s Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the
student in planning for the teaching assignment, observe and provide
feedback to the student during the teaching assignment, and evaluate the
student upon completion of the assignment.
Prerequisite: Master’s student
Typically offered in Fall and Spring

GD 688 Non-Thesis Masters Continuous Registration - Half Time
Registration (1 credit hours)
For students in non-thesis master’s programs who have completed all
credit hour requirements for their degree but need to maintain half-time
continuous registration to complete incomplete grades, projects, final
master’s exam, etc.
Prerequisite: Master’s student
Typically offered in Fall and Spring

GD 689 Non-Thesis Master Continuous Registration - Full Time
Registration (3 credit hours)
For students in non-thesis master’s programs who have completed all
credit hour requirements for their degree but need to maintain full-time
continuous registration to complete incomplete grades, projects, final
master’s exam, etc. Students may register for this course a maximum of
one semester.
Prerequisite: Master’s student
Typically offered in Spring only

GD 690 Master’s Examination (1-9 credit hours)
For students in non-thesis master’s programs who have completed all
other requirements of the degree except preparing for and taking the final
master’s exam.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer
Health and Exercise Studies Minor (HESM)

HESM 201 Coaching Baseball/Softball (2 credit hours)  
Theories, techniques, and strategies of coaching baseball/softball.

Typically offered in Fall, Spring, and Summer

HESM 202 Coaching Basketball (2 credit hours)  
Theories, techniques, and strategies of coaching basketball.

Typically offered in Fall, Spring, and Summer

HESM 203 Coaching Football (2 credit hours)  
Theories, techniques, and strategies of coaching football.

Typically offered in Fall and Spring

HESM 204 Coaching Golf (2 credit hours)  
Theories, techniques, and strategies of coaching golf.

Typically offered in Fall, Spring, and Summer

HESM 205 Coaching Soccer (2 credit hours)  
Theories, techniques, and strategies of coaching soccer.

HESM 207 Coaching Tennis (2 credit hours)  
Theories, techniques, and strategies of coaching tennis.

HESM 209 Coaching Volleyball (2 credit hours)  
Theories, techniques, and strategies of coaching volleyball.

HESM 211 Strength Training and Conditioning (2 credit hours)  
Knowledge and skills necessary for designing and implementing strength and conditioning programs. This course does not constitute credit toward meeting the minimum university Physical Education requirements.

Typically offered in Fall, Spring, and Summer

HESM 212 Alcohol, Drugs and Tobacco (2 credit hours)  
Theories of drug use, pharmacology, tolerance, dependence, nicotine, alcohol usage, alcoholism, sedative-hypnotics, narcotics, amphetamines, cocaine, marijuana, hallucinogens, steroids and treatment. This course does not constitute credit toward meeting the Physical Education requirement.

Typically offered in Fall, Spring, and Summer

HESM 213 Human Sexuality (2 credit hours)  
Physiological and psychosocial aspects of human sexuality. Emphasis placed on health-related topics of birth control, pregnancy, childbirth, abortion and sexually-transmitted diseases. Concepts of gender acquisition, sexual values, and sexual morality discussed as related to the promotion of healthy lifestyles within contemporary American culture.

Typically offered in Fall, Spring, and Summer

HESM 214/PRT 214 Introduction to Adventure Education (3 credit hours)  
History and philosophy, social psychology of adventure, theories of adventure, benefits, risk-taking behavior, current trends and issues, research and evaluation, and model programs. Field trip required. Students are responsible for their own transportation for field trip.

Typically offered in Fall only

HESM 215/PRT 215 Principles and Practices of Outdoor Leadership (3 credit hours)  
Principles and practices of leadership in adventure education and recreation programs: group management, trip planning, staffing, group dynamics, health and safety issues, risk management and other relevant topics.

Typically offered in Spring only

HESM 216 Backcountry Instruction Methodology (2 credit hours)  
Techniques for teaching outdoor skills and activities are covered. Emphasis is placed on trip planning, presentations, and skills instruction for outdoor educators. Students will make numerous outdoor activity skills presentations. Students will also evaluate and provide feedback for classmates. Additional charge assessed for the field trips. Refer to the online schedule of classes for the current charge and dates.

Typically offered in Fall only

HESM 218 Personal Health (2 credit hours)  
Behavior change, wellness, stress management, cardiovascular diseases, alcohol and tobacco use, cancer, infectious diseases, arthritis, human sexual response, sexual assault, contraception, and sexually transmitted diseases. This course does not constitute credit toward meeting the Physical Education requirement.

Typically offered in Fall, Spring, and Summer

HESM 219 Nutrition, Exercise and Weight Control (2 credit hours)  
A nutrition, exercise and weight management program emphasizing the basics of proper nutrition and exercise. Emphasis on lifestyle changes and their relationship to appropriate weight management. Medical request.

Typically offered in Fall, Spring, and Summer
HESM 287 Stress Management (2 credit hours)
Impact of stress upon the psychological and physiological function of the body. Exploration and interaction with stress management techniques. This course does not constitute credit toward meeting the Physical Education GER requirement

Typically offered in Spring only

HESM 300 Practicum in Health (1 credit hours)
This course focuses on applying program development, management, evaluation, and educational strategies and techniques within a health-related setting. Students are required to purchase internship liability insurance to participate in the practicum; the fee is automatically charged upon registration. Contact University Insurance & Risk Management for more details.

Prerequisite: HESM 285, HESM 375, HESM 377, and 6 hours of electives from the Health Minor

Typically offered in Fall, Spring, and Summer

HESM 301 Coaching Practicum (1 credit hours)
A 30-hour practical coaching experience in a middle school or high school setting. Specific placement will depend upon the various playing sessions for the sports involved. Students are required to purchase internship liability insurance to participate

Prerequisite: Requires departmental consent, First Aid, and CPR Certification or Equivalent

Typically offered in Fall, Spring, and Summer

HESM 302 Practicum Experience in Outdoor Programs (1 credit hours)
The practicum experience provides a short-term, supervised opportunity for students to participate in leading an outdoor activity course or program. The practicum is the integration of academic preparation with its application in a field setting. The student may be assigned to a Department of Health and Exercise Studies outdoor activity course, program or to an approved non-University program in order to meet this requirement. The practicum student must be directly involved in the program for a minimum of 30 hours. Students are required to purchase internship liability insurance to participate in the practicum; the fee is automatically charged upon registration. Contact University Insurance & Risk Management for more details.

Prerequisite: HESM 214, HESM 215, HESM 216, HESM 280 or equivalent

Typically offered in Fall, Spring, and Summer

HESM 303 Sports Science Practicum (1 credit hours)
A 30-hour practical sports science specialist experience in a fitness specific setting within the triangle area. Course does not constitute credit toward meeting the physical education requirement. Students are required to purchase internship liability

Prerequisite: Completed coursework in Sports Science Minor

Typically offered in Fall, Spring, and Summer

HESM 304 Dance Practicum (1 credit hours)
A 30-hour practical experience in the dance field. Assigned internships could include dance teaching, performing, choreographing, research, or other dance-related work dependent upon the student's experiences and interests. Specific placement will be determined by the student and the instructor. Students are required to purchase internship liability insurance to participate in the practicum; the fee is automatically charged upon registration. Contact University Insurance & Risk Management for more details.

Typically offered in Fall and Spring

HESM 320 Movement Improvisation (1 credit hours)
Conceptually guided, spontaneous movement generation and invention reached through individual and group experiences.

Typically offered in Fall and Spring

HESM 322 Dance and Society (3 credit hours)
Dance and Society examines dance as an artistic, religious, cultural, and social form, including historic and aesthetic influences, basic dance elements, and relationship to other arts. This course incorporates multiple modalities of dance knowledge - lectures, films, demonstrations, and practical dance experience. A small fee may be required for concert attendance.

GEP Global Knowledge, GEP Visual and Performing Arts

Typically offered in Fall only

HESM 324 Concert Dance History (3 credit hours)
An overview of the development of Western theatrical dance. This course introduces the major figures and movement theories of the 19th & 20th Centuries with particular emphasis on major stylistic trends and cultural influences. Readings, discussions, lectures, and films/videotapes will introduce selected choreographers and the concerns that inform their work. Additional readings in dance philosophy and aesthetics will address ideas such as form, expression, audience expectations, and performance conventions. A small fee may be required for concert attendance.

GEP U.S. Diversity, GEP Visual and Performing Arts

Typically offered in Fall only

HESM 326 Current Trends in Dance (3 credit hours)
Critical and contextual examination of current trends in dance. While specific readings and video resources will vary by semester as the field of dance continues to change, major course topics will include at least three of the following: the role of dance supporters and presenters, media influences, non-concert and site-specific dance, current movement trends, political significance, and international concerns.

GEP Visual and Performing Arts

Typically offered in Fall only

HESM 328 Dance Composition - Group Forms (2 credit hours)
This course builds on skills and concepts learned in Movement Improvisation. Various approaches to group choreography will be discussed and explored. A student-choreographed group work will be created and performed.

Prerequisite: HESM 320
GEP Visual and Performing Arts

Typically offered in Spring only
HESM 330  Introduction to Laban Movement Analysis and Bartenieff Fundamentals  (2 credit hours)
An introduction to Laban Movement Analysis (LMA) and Bartenieff Fundamentals (BF) through movement integration, observation, notation, analysis, and application. LMA is a method and language for describing, visualizing, interpreting, and documenting all varieties of human movement. It consists of the study of four major components: Body, Effort, Shape and Space, the relationships between them, and ways of notating them. BF consists of a set of concepts, principles and exercises developed by Irmgard Bartenieff in applying Laban's movement theory to the physical/kinesiological functioning of the human body. LMA/BF is used by dancers, actors, musicians, and dance therapists, among others.
Typically offered in Spring only

HESM 332  Dance and Technology  (2 credit hours)
The exploration of dance creation, performance, documentation, practice, and analysis through existing and emerging practices in film, digital video production, and interactive media.
Typically offered in Spring only

HESM 370  Foundations of Sport Coaching and Instruction  (2 credit hours)
This course will introduce methods of skill instruction, basic teaching strategies, and pedagogy in the area of sport coaching. Students will learn how to properly organize drills, plan safe and effective practices, present age-appropriate sport skills to athletes at the youth, middle and high school levels, and evaluate motor-skill development of athletes. This course will also explore psychomotor, cognitive, and affective development and performance of athletes in school and community settings. Students in this course will have the opportunity to teach cooperatively with peers and will also be presented with opportunities to teach micro-lessons in their area of sport interest.
Typically offered in Spring only

HESM 375  Health Planning and Programming  (2 credit hours)
This course is designed to assist students in developing a foundation in health programming. Students will learn the necessary skills to develop, implement, and evaluate health education programs.

Prerequisite: HESM 285 Personal Health
Typically offered in Fall only

HESM 377  Methods of Health Promotion  (2 credit hours)
This course focuses on methods and techniques for delivering health-related content to diverse populations. Cooperative learning, critical thinking, peer educator training, and decision-making will be applied to various health dimensions.

Typically offered in Spring only

HESM 381  Athletic Training  (3 credit hours)

Prerequisite: HESM 280 or HESM 281 or CPR/First aid Certification
Typically offered in Fall, Spring, and Summer

HESM 395  Special Topics in Health and Exercise Studies  (1-3 credit hours)
Examination of selected topics in health, outdoor leadership, sports science, coaching, and dance. This course does not fulfill the GEP requirement for Health and Exercise Studies.

Typically offered in Fall, Spring, and Summer

HESM 476  Motor Learning and Sport Performance  (3 credit hours)
This course will introduce the concepts, principles, and theories dealing with the performance of motor skills as applied in the areas of sport performance and physical activity. Topics will discuss how skilled movements are learned, maintained, and enhanced as well as explore some of the basic physiological, bio-mechanical, and cognitive influences which affect the quality of skilled performance. This course is primarily designed to benefit sport coaches, physical educators, and fitness instructors.

Typically offered in Fall only

HESM 477  Coaching Concepts  (3 credit hours)
Practical and theoretical concepts essential to the preparation of coaches. This course does not constitute credit toward meeting Physical Education requirements.

Typically offered in Fall, Spring, and Summer

HESM 478  Exercise Physiology and Sports Science  (3 credit hours)
Basic principles of human anatomy, physiology, and biomechanics and their relationship to athletic coaching.

Typically offered in Fall, Spring, and Summer

HESM 479  Sport Management  (3 credit hours)
Planning, organizing, leading, and evaluating within a sport context; fundamentals of accounting, budgeting, economics, marketing, strategic planning, ethics, and their use in sport settings; techniques of personnel, facility, and sporting event management.

HESM 480  Principles of Exercise Programming  (3 credit hours)
Fundamentals and scientific principles necessary to plan, design, implement, and evaluate individual exercise programs.

Prerequisite: HESM 478
Typically offered in Fall and Spring

Health Exercise Studies Dance (HESD)

HESM 227  African Dance I  (1 credit hours)
Development of beginning level skill of East and West African dances, including history, culture, and context, emphasizing the central role that dance plays in African cultures.
GEP Global Knowledge, GEP Health and Exercise Studies
Typically offered in Fall only

HESM 228  African Dance II  (1 credit hours)
Development of intermediate level skills in traditional and contemporary African dances with clear distinction between different African regions. Emphasis will be placed on culture, history, community and theoretical aspects of each dance.

Corequisite: HESM 227 (African Dance I)
GEP Global Knowledge, GEP Health and Exercise Studies
Typically offered in Fall only
HESD 230    Horton Dance Technique  (1 credit hours)
Development of beginning and intermediate-level skills in Horton dance technique, including alignment, vocabulary, performance, and history, with emphasis on strengthening the body for dance. Class format will include warm-up exercises, fortifications, studies, and traveling combinations. Course also includes the study of Lester Horton’s influence on American modern dance, particularly in relation to integration in concert dance and the formation of Alvin Ailey American Dance Theater.

GEP Health and Exercise Studies, GEP U.S. Diversity
Typically offered in Fall only

HESD 234    Country Dance  (1 credit hours)
This course is the development of beginning-level skills in country dance including vocabulary, technique, history, and performance. A variety of fundamentals for leading and following, combinations, figures, and calls will be emphasized in American Heritage Dance, Texas Two-step, and Western Square Dance.

GEP Health and Exercise Studies
Typically offered in Spring only

HESD 240    Social Dance  (1 credit hours)
Development of beginning-level skills in social dance, including vocabulary, technique, history, performance, with emphasis on leading and following in the : Cha-Cha, Foxtrot, Waltz, Rumba, and Shag.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

HESD 241    Social Dance II  (1 credit hours)
This course will focus on training students to understand and perform more complex dances in an improvisational environment. Emphasis will be on learning advanced level dance steps and combinations that are more challenging or complex social dances not

Prerequisite: HESD 240 or equivalent skills
GEP Health and Exercise Studies
Typically offered in Fall only

HESD 263    Tap Dance  (1 credit hours)
This beginning-level technique class covers basic tap dance skills in warm-up exercises, combinations, and compositions. Emphasis is placed on correct alignment in tap dance steps and the exploration of a variety of rhythms and patterns.

GEP Health and Exercise Studies
Typically offered in Spring only

HESD 264    Ballet I  (1 credit hours)
Development of beginning-level technical skills in ballet, including vocabulary, technique, history, performance, alignment, function and access of turnout, with emphasis on safe and efficient body use.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESD 265    Ballet II  (1 credit hours)
Further development of Ballet technique building on fundamental concepts and vocabulary introduced in Ballet I. Will include increased movement capabilities, rhythmic accuracy, alignment, performance, and access of turnout. A small fee may be required for dance concert attendance.

Prerequisite: HESD 264 or Instructor Permission
GEP Health and Exercise Studies, GEP Visual and Performing Arts
Typically offered in Fall only

HESD 273    Jazz Dance I  (1 credit hours)
This beginning-level technique class covers basic jazz dance skills in warm-up exercises, combinations, and compositions. A variety of jazz styles are covered including one or more of the following: classical (Luigi/Giordano), Broadway, contemporary, Afro-jazz, and others.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESD 274    Modern Dance I  (1 credit hours)
Development of beginning-level technical skills and movement concepts in modern dance, including vocabulary, technique, history, performance, and alignment, with emphasis on safe and efficient body use. Class format will include structured exercises and improvisations. A small fee may be required for dance concert attendance.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESD 275    Modern Dance II  (1 credit hours)
Further development of modern dance technique, building on fundamental movement concepts and vocabulary introduced in Modern Dance I. Will include increased movement capabilities, rhythmic accuracy, and spatial relationships. A small fee may be required for dance concert attendance.

Prerequisite: HESD/DAN 274 (or permission of instructor)
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESD 280    Jazz Dance II  (1 credit hours)
Further development of jazz dance technique building on fundamental concepts and vocabulary introduced in Jazz Dance I. Will include increased movement capabilities, rhythmic accuracy, alignment, and performance. A small fee may be required for dance concert attendance.

Prerequisite: HESD 273 or Instructor Permission
GEP Health and Exercise Studies, GEP Visual and Performing Arts
Typically offered in Spring only

Health Exercise Studies Fitness (HESF)

HESF 100    Cross Training  (2 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced aerobic activities as well as strength and endurance conditioning exercises.

GEP Health and Exercise Studies
Typically offered in Fall and Spring
HESF 101 Fitness and Wellness (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced running activities as well as strength and endurance conditioning exercises.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

HESF 102 Fitness Walking (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced fitness walking techniques and strength conditioning exercises.

HESF 103 Water Aerobics (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues are also addressed. The components of fitness will be met through structured individually paced water aerobics classes that will take place in chest deep water. Muscular strength activities could take place in or out of water.

HESF 104 Swim Conditioning (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. This course covers the mechanics of a variety of strokes, training methods, training principles, safety, with swim techniques that maximize fitness gains and minimize injuries.

Prerequisite: PE 215 or equivalent skill

HESF 105 Aerobics and Body Conditioning (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced aerobics classes. Muscular strength activities could take place in or out of the aerobics room.

HESF 106 Triathlon (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced swim, cycle and run training techniques. The student must provide bicycles and ANSI approved helmets.

Prerequisite: PE 221 or equivalent skill

HESF 107 Run Conditioning (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced running activities on an indoor or outdoor track, and/or a cross-country route. Muscular strength activities will occur in a weight room or incorporated during running activities.

HESF 108 Water Step Aerobics (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced water step aerobics classes that will take place in chest deep water on an aquatic exercise step. Muscular strength activities could take place in or out of the water.

HESF 109 Step Aerobics (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced step aerobics classes. Muscular strength activities could take place in or out of the aerobics room.

HESF 110 Adapted Physical Education (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced aerobic, muscular strength and muscular endurance activities that meet the need of students with medical/physical limitations. For students with medical problems who are unable to take regular Physical Education classes. Repeatable up to two semesters.
HESF 111  Indoor Group Cycling  (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through individually paced indoor group cycling classes. Muscular strength activities could take place in or out of the main classroom.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

HESF 112  Fitness Kickboxing  (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. Fitness kickboxing includes strikes against a heavy bag, focus mitt punching, medicine ball core exercises, running, and jumping rope. The components of fitness will be met through structured fitness kickboxing activities as well as strength and endurance conditioning exercises.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

HESF 113  High Intensity Conditioning  (1 credit hours)
This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of fitness: cardio-respiratory endurance, muscular strength, muscular endurance, flexibility and body composition. A variety of health and wellness issues will be addressed. The components of fitness will be met through structured individually paced high intensity aerobic and strength activities. High Intensity Conditioning includes plyometrics, agility drills, and running, as well as strength exercises using body weight and a variety of equipment such as dumbbells, barbells, and medicine balls. Exercises are set to various interval lengths ranging from 20-120 seconds. Use of heart rate training will be emphasized in order to differentiate between high intensity and steady state aerobic exercise.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

Health Exercise Studies Outdoor (HESO)

HESO 253  Orienteering  (1 credit hours)
Navigating on foot from defined point to defined point, with use of map and compass in the shortest possible time.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 255  Basic Canoeing  (1 credit hours)
Instruction and experience in flatwater canoe skills; emphasizing paddling skills, safety, flat and moving water travel techniques and proper equipment selection. Plan and participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

Prerequisite: Basic swimming ability required
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 257  Backpacking  (1 credit hours)
Designed for students with little or no backpacking experience. Safe and environmentally-sound camping practices. Equipment/clothing, first aid and safety management agencies, land navigation, and trip planning. Plan and participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to online schedule of classes for the current charge.

Prerequisite: Must pass basic fitness test
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 258  Basic Rock Climbing  (1 credit hours)
Instruction and direct experience for the beginning rock climber. Emphasis on safe rope systems for belaying and basic movement on rock.

GEP Health and Exercise Studies
Typically offered in Fall, Spring, and Summer

HESO 259  Intermediate Rock Climbing  (1 credit hours)
Development of intermediate rock climbing skills and practices including: climbing safety, belaying techniques, anchor systems, partner and self-rescue, rappelling and ascending techniques, minimal impact climbing, and climbing hazards. Participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

Prerequisite: HESO 258
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 262  Introduction to Whitewater Canoeing  (1 credit hours)
Instruction and direct experience in fundamental whitewater canoeing skills. Basic paddling strokes and maneuvers for use on whitewater, river safety, basic river rescue, equipment selection and care, and environmental ethics. Participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to the online schedule of classes for the current charge.

Prerequisite: HESO 255, Intermediate swimming ability required
GEP Health and Exercise Studies
Typically offered in Fall only

HESO 263  Whitewater Kayaking  (1 credit hours)
This class is designed for students with little or no whitewater kayaking experience to develop basic kayaking skills and help them become proficient paddlers. Topics will include whitewater safety, equipment use and care, paddle strokes and river running techniques, basic rescue techniques, kayak navigation, basic hydrology, and trip planning. Participate in one required weekend field trip. Additional charge assessed for the field trip. Refer to the online schedule of classes for the current charge. Students must pass swim test to participate in course.

Prerequisite: Intermediate swimming ability
GEP Health and Exercise Studies
Typically offered in Fall and Spring
HESO 276 Whitewater Rafting (1 credit hours)
Whitewater rafting skills and practices emphasizing safe river travel, minimal impact river camping techniques, and trip planning. Participate in one required weekend field trip. Additional charge assessed for the field trip. Refer to PackTracks for the current charge.

Prerequisite: Intermediate swimming ability required
GEP Health and Exercise Studies
Typically offered in Spring only

HESO 277 Mountain Biking (1 credit hours)
Bike handling, minimal impact trail riding skills, safety, fitness, basic maintenance and repair, and equipment selection. Students must provide their own bike, helmet, protective equipment, and clothing.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 278 Fly-Fishing (1 credit hours)
Instruction and experience in basic fly-fishing skills. Emphasis on casting techniques, tackle selection, habitat evaluation, minimal impact travel, safety, fitness, equipment selection and trip planning. Basic swimming ability and field trip required. Transportation provided by the Physical Education Department. Charge required with a non-refundable deposit.

Prerequisite: Basic swimming ability
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESO 281 Challenge Course and Team Building Facilitation (1 credit hours)
Participants are introduced to ropes and group initiative courses including a variety of adventure games, initiatives, love and high ropes course events. Safety, risk management issues and facilitation techniques are presented and discussed. Transportation is provided to and from the challenge course by the department. An additional charge is assessed for the course. Refer to the online schedule of classes for the current charge and field trip date(s).

Prerequisite: HESO 258 or equivalent skills
GEP Health and Exercise Studies
Typically offered in Spring only

HESO 283 Mountaineering (1 credit hours)
Instruction and experience in alpine climbing skills emphasizing snow and ice travel, safety, land navigation, winter hazard evaluation, minimal impact camping skills, and equipment selection. Three full-day classroom sessions before the trip required. Plan and participate in a ten-day field trip over winter break. Additional charge assessed for the field trip with a non-refundable deposit. Refer to the online schedule of classes for the current charge. Final grades will not post until the second week of January. In the interim, a grade of LA will be given. December-graduating seniors should be aware this will delay graduation clearance and posting of degrees.

Prerequisite: HESO 258, HESO 257
GEP Health and Exercise Studies
Typically offered in Spring only

HESO 284 Sea Kayaking (1 credit hours)
Instruction and experience in basic sea kayaking skills. Emphasis on paddling techniques, open water travel, navigation, minimal impact camping, safety, fitness, equipment selection and trip planning. Plan and participate in one required field trip. Additional charge assessed for the field trip with a non-refundable deposit. Refer to the online schedule of classes for the current charge.

Prerequisite: Intermediate swimming ability
GEP Health and Exercise Studies
Typically offered in Fall and Spring

Health Exercise Studies Racquet (HESR)

HESR 242 Badminton (1 credit hours)
This is a beginning badminton course in which students will develop the basic skills necessary to play the game of badminton. Technical skills include the overhead and underhand clears, the short and long serves, drop shots and the smash. Instruction will include an emphasis on the fundamental strategies and rules used in both singles and doubles play. Basic fitness and training principles will be discussed as applicable to the sport of badminton.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESR 249 Tennis I (1 credit hours)
This is a beginning tennis course in which students will develop the basic skills necessary to play the game of tennis. Technical skills include the overhead and backhand ground strokes, serves, lobs, overheads, drop shots, and proper footwork. Students will also learn the fundamental rules, basic strategies, and court positioning for singles and doubles play. Basic fitness and training principles will be discussed as applicable to the sport of tennis.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESR 250 Tennis II (1 credit hours)
This course will review some of the basic tennis skills introduced in the PE 249 Tennis course. Additionally, this course will introduce more advanced techniques in stroke production and skill development such as the topspin and slice serves, approach shots, half-volleys, and drop shots. Students will analyze some of the various styles of play used in the game of tennis and perform drills as well as match play situations that will improve performance based on offensive and defensive tactics in both singles and doubles.

Prerequisite: HESR 249
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESR 255 Pickleball (1 credit hours)
This is a beginning pickleball course in which students will develop the basic skills to play the game of pickleball. Technical skills include the overhead and backhand groundstrokes, serves, lobs, overheads, dink shots, and proper footwork. Students will also learn the fundamental rules, basic strategies, and court positioning for singles and doubles play. Basic fitness and training principles will be discussed as applicable to the sport of pickleball.

GEP Health and Exercise Studies
Typically offered in Fall and Spring
HESS 256  *Racquetball*  (1 credit hours)
This is a beginning racquetball course in which the students will develop the basic skills to play the game of racquetball. Technical skills include forehand and backhand groundstrokes, ceiling balls, serves and proper footwork. Students will also learn the fundamental rules, basic strategies, and court positioning for singles, cutthroat and doubles play. Basic fitness and training principles will be discussed as applicable to the sport of racquetball. Approved protective eyewear must be provided by the student.

**GEP Health and Exercise Studies**
Typically offered in Fall and Spring

### Health Exercise Studies Specialty (HESS)

HESS 219  *Gymnastics*  (1 credit hours)
Develop basic gymnastics skills on vault, bars, beam, floor, and trampoline. 1) To assist the students in safely learning progressions on each of these events for skill development. 2) To acquire the fitness requirements associated with learning these skills. 3) To identify the hazards and risks associated with gymnastics and 4) To identify basic skills and terminology associated with the sport.

**GEP Health and Exercise Studies**
Typically offered in Fall and Spring

HESS 230  *Pilates/Core Training*  (1 credit hours)
This course will teach the fundamentals of Pilates which are to improve body awareness, increase breathing capacity and improve postural alignment through simultaneous stretching and strengthening movements. The goal of Pilates exercises is to achieve optimal functional fitness. The knowledge and training gained from Pilates will not only benefit an individual in their daily activities, but also improve their performance in any physical activity they choose to participate in.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 235  *Beginning Karate*  (1 credit hours)
Introduction to traditional Japanese karate: kihon (basic punching, striking, blocking, and kicking techniques); kata (formal drills); yakusoku kumite (pre-arranged sparring); and demonstration of ji-yu-kumite (controlled free sparring). Karate uniform required.

**GEP Health and Exercise Studies**
Typically offered in Fall and Spring

HESS 237  *Weight Training*  (1 credit hours)
This is an introductory weight training course in which students will learn the principles of muscular development, as well as development of overall fitness. Free weights, machines, exercise equipment, and body weight exercises will be used to apply these principles. Various training systems and protocols will be introduced along with content of muscular physiological adaptations.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 239  *Self Defense*  (1 credit hours)
Basic self defense and techniques. Skills covered include strikes, blocks, and escapes; plus psychology of general and sexual assault. Physical contact will occur between students and with the instructor as well.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 243  *Bowling*  (1 credit hours)
This is a beginning bowling course in which the students will develop the basic skills necessary to play and enjoy the game of bowling. Technical skills include ball rotation and delivery along with proper foot work. Students will also learn the fundamental rules, basic strategies for throwing a strike ball, general theory for converting spares, and scoring along with bowling etiquette, terminology, rules, and safety precautions. Basic fitness and training principles will be discussed as applicable to the sport of bowling. Additional fee assessed.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 245  *Golf*  (1 credit hours)
This course will provide golf instruction at an introductory level. Coursework will introduce full swing fundamentals, chipping, pitching, and putting fundamentals, rules and etiquette on the golf course, and history of the game. Students will develop an appreciation for the game of golf through practice, play, and time on the golf course. There is a required charge for class meetings held at local golf courses. Refer to the online schedule of classes for the current charge. Students must provide their own transportation to the golf course.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 251  *Target Archery*  (1 credit hours)
Shooting fundamentals, safety, selection, and care of equipment.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 252  *Skiing/Snowboarding*  (1 credit hours)
Instruction and experience in the fundamentals of skiing or snowboarding. Emphasis on safety, controlled turns and stops, equipment selections, and pre-season preparation. Slope instruction held at a selected site during winter break. Additional charge assessed for trip with a non-refundable deposit. Refer to the online schedule of classes for program format options, current charges and trip dates. Students are responsible for providing their own transportation. Final grades will not post until the second week of January. In the interim, a grade of LA will be given. December graduating seniors should be aware this will delay graduation clearance and posting of degrees.

**GEP Health and Exercise Studies**
Typically offered in Fall, Spring, and Summer

HESS 279  *Yoga I*  (1 credit hours)
This course will emphasize the physical practice of yoga at an introductory level. Coursework will introduce breathing exercises, relaxation techniques and a variety of yoga poses: standing, twisting, balancing, backward bending, and inversions. Students will develop the fitness skills required to perform these poses and maintain a safe yoga practice.

**GEP Health and Exercise Studies**
Typically offered in Fall only

**NOTES:**
Graduation clearance and posting of degrees.

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**NC State University**
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HESS 280 Yoga II (1 credit hours)
This course will build upon material introduced in Yoga I by emphasizing the practice of yoga at an intermediate level. Coursework will require a deeper level of understanding of a variety of yoga postures, breathing techniques, and meditation practices. Yoga philosophy will also be addressed through the study of historical yogic texts such as The Yoga Sutras of Patanjali.

Prerequisite: HESS 279

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESS 296 Independent Study in Physical Education (1-3 credit hours)
Independent study in Physical Education will vary according to the specialized topic of interest. Credit and content determined by instructor. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in N

Typically offered in Fall, Spring, and Summer

Health Exercise Studies Team (HEST)

HEST 216 Soccer (1 credit hours)
Soccer with emphasis on skills development, playing strategies, and rules of the game.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 261 Basketball (1 credit hours)
Offensive and defensive skills development and systems of team work.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 265 Slow Pitch Softball (1 credit hours)
Develop basic skills, rules and strategies for playing slow pitch softball.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 266 Ultimate Frisbee (1 credit hours)
Emphasis on skill development, aerobic fitness and spirit of competition.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 267 Flag Football (1 credit hours)
An introduction to the skills, history, rules and strategy of flag football.

GEP Health and Exercise Studies
Typically offered in Fall only

HEST 269 Volleyball I (1 credit hours)
This course is designed to teach and apply the basic volleyball fundamentals of setting, passing, spiking, court movement, and game strategy.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 270 Volleyball II (1 credit hours)
This course is designed to go beyond the basic volleyball skills. Emphasis will be placed on floaters, top spin, and jump serves, forearm passing, setting, back setting, strong side and weak side attacking, blocking and advance serve reception techniques.

Prerequisite: HEST 269

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESA - Health Exercise Aquatics (HESA)

HEST 214 Beginning Swimming (1 credit hours)
Swimming strokes and deep water skills for the non-swimmer to survive in the water.

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 215 Advanced Beginning Swimming (1 credit hours)
Continuation of Basic Strokes acquired in Beginning Swimming, additional new strokes, and survival skills.

Prerequisite: HEST 214 or equivalent skill

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 217 Survival Swimming (1 credit hours)
This course will provide NCSU students with the opportunity to learn water survival skills and techniques that will enhance their chances of survival if stranded in the water. Skills include drownproofing, underwater swimming, survival swim strokes, jumping from a height, clothing inflation techniques, and swimming through a simulated oil/debris field. These survival skills and techniques will help promote physical fitness and a healthy lifestyle.

Prerequisite: HEST 214 or equivalent skill

GEP Health and Exercise Studies
Typically offered in Fall and Spring

HEST 221 Intermediate Swimming (1 credit hours)
This course is designed to provide instruction in five basic swim strokes - front crawl (freestyle), back crawl (backstroke), breaststroke, elementary backstroke and sidestroke. Additional emphasis will be placed on increased cardiovascular fitness along with skill development in treading water, underwater swims, turns and dives.

Prerequisite: HEST 214 or equivalent skill

GEP Health and Exercise Studies
Typically offered in Fall and Spring
HESA 223 Lifeguard Training (2 credit hours)
This course is designed to provide entry-level lifeguard participants with the knowledge and skills prevent, recognize and respond to emergencies and to provide care for injuries and sudden illnesses until Emergency Medical Services (EMS) personnel arrive and take over. Optional fee assessed for certification.
Prerequisite: PE 221 or equivalent skill
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESA 226 Skin and Scuba Diving I (2 credit hours)
This course is designed for students with little or no experience, emphasizing safety and responsible skin and scuba diving techniques. Topics include the use and care of scuba equipment, diving skills, problem solving, emergency procedures, basic rescue techniques, direct and indirect effects of pressure, medical contradictions, oxygen enriched are diving, and gas management. Optional fee assessed for open-water training field trip and certification. Students must provide their own transportation for fieldtrip(s).
Prerequisite: PE 221 or equivalent skill
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESA 227 Skin & Scuba Diving II (2 credit hours)
This course will build on the knowledge and skills learned in Skin & Scuba Diving I with emphasis on dive rescue techniques. Coursework will require a deeper understanding of dive planning, dive physiology, gas management, and diving first aid. Coursework will also require a higher skill level relating to propulsion techniques, navigation, equipment handling, buoyancy control, search & recovery techniques, and diving first aid than is required in Skin and Scuba Diving I. Optional fee assessed for open water training fieldtrip and certification. Students must provide their own transportation for fieldtrip(s).
Prerequisite: HESA 226 or equivalent skills
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESA 229 Scuba Leadership (2 credit hours)
This course will provide NCSU students with the opportunity to build upon the skills learned in PE 227 and progress towards proficiency as a scuba diving leader. This course will help promote physical fitness and skill development in scuba diving, as well as an understanding of the knowledge and skills of scuba diving leadership. Participation in scuba leadership provides interested students with the opportunity to seek clarification as a scuba diving leader. Fee is assessed for required fieldtrip(s). Students must provide their own transportation for fieldtrip(s).
Prerequisite: HESA 227 or equivalent skill
GEP Health and Exercise Studies
Typically offered in Fall and Spring

HESA 231 Scientific Diving (3 credit hours)
This course covers the knowledge, skills, and diving experience necessary to plan and safely conduct scientific dives with regards to site selection, safety procedures, gas mix considerations, equipment requirements, data collection techniques, and dive team selection. These skills and techniques will help promote physical fitness and a healthy lifestyle. Successful completion of all phases of the course will qualify students for certification as a "scientific diver." This course meets American Academy of Underwater Sciences (AAUS) guidelines. Fee is assessed for required fieldtrip(s). Students must provide their own transportation for fieldtrip(s).
Prerequisite: HESA 227 or equivalent skill
GEP Health and Exercise Studies
Typically offered in Fall and Spring

History (HI)

HI 205 Western Civilization Since 1400 (3 credit hours)
A survey of Western Civilization from the Renaissance to the present.
Typically offered in Fall and Spring

HI 207 Ancient Mediterranean World (3 credit hours)
The ancient cultures of the Middle East, Greece and Rome, including Mesopotamian, Egyptian, Hebrew, Phoenician, Greek and Roman societies and cultures.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

HI 208 The Middle Ages (3 credit hours)
Medieval civilization as it emerged from the declining Roman Empire through its apogee in the 13th century. The transition from the classical to the medieval world, the impact of the Germanic influx, the Islamic influence, the Crusades, and the political, economic, and social institutions of the High Middle Ages.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

HI 209 From Renaissance to Revolution: The Origins of Modern Europe (3 credit hours)
Exploration of the political, economic, social, and cultural history of Western Europe during an intense and exciting period of transition from a medieval to a modern world. Topics to be discussed include Renaissance art and philosophy; the printing revolution and the French Revolution; climate change and economic dislocation; witchcraft; religious reforms and religious wars; commercialization; navigation; empire; slavery; the new science; and new ideas about democracy, equality, and modernity.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 210 Modern Europe 1815-Present (3 credit hours)
Survey of the history of European societies and political systems from 1815 to the present.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring
HI 214 History and Archaeology of Ancient Latin America (3 credit hours)
Exploration of ancient Latin American civilizations and early Europeans in the region through archaeological and historical analysis. Major themes include migrations of people into the Western hemisphere, the rise and decline of states and empires such as the Maya, Aztecs, Moche, and Incas, inter-regional trade, development of writing and communication systems, religious ideology, social and political infrastructure and mechanisms of control. Unique cultural forms discussed include mummies, pyramids, military techniques, political propaganda, and agricultural innovation. Contemporary issues addressed include media representations of the past, indigenous rights, and looting and destruction of cultural property.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 215 Latin America to 1826 (3 credit hours)
Exploration of the pre-Hispanic indigenous roots and the colonial period in Latin America. Major themes include the origins and development of social, political, economic and religious institutions from pre-conquest times to the achievement of independence. Topics include ancient American cultures, conquest and settlement by Spain and Portugal, colonial rule in theory and practice, religious life and structures, the colonial economy and labor, and independence movements.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 216 Latin America Since 1826 (3 credit hours)
Analysis of the last two centuries of social, political, economic, and intellectual life in Latin America and the Caribbean. Course readings include primary sources, declassified CIA documents, and Latin American literature. Course themes include social and political conflicts, changing gender relations, human rights abuses, the effect of the US and global economic forces, and the impact of the growing Latino population in the U.S.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 217 Caribbean History (3 credit hours)
Exploration of the social, economic, political, intellectual, and cultural histories of the Caribbean. Major course topics include pre-Columbian indigeneity, colonization & imperialism, plantation slavery, abolition & emancipation, the Haitian and Cuban Revolutions, gender & migration, and decolonization & independence. The course emphasizes the diversity of the region and places the islands of the Caribbean within the wider context of a modern globalizing world.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 218 British History to 1688 (3 credit hours)
History of the British peoples from earliest times to the Glorious Revolution. Social, political, constitutional developments; relationship between history and literature; synthesis of British cultures.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

HI 222 History of British Cultures and Societies From 1688 (3 credit hours)
British people from Glorious Revolution to the present. Social, political, constitutional development; history and literature; growth and decline of British empire; spread of British culture.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 232 The World from 1200 to 1750 (3 credit hours)
The making of the modern world through interregional conquest and commerce from 1200 to 1750. Focus on the growing global circulation of peoples, pathogens, goods, and ideas.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 240/HA 240 Introduction to Visual Culture (3 credit hours)
Introduction to the role of visual cultural production in the nineteenth and twentieth centuries in expressing and shaping both individual and collective identities. Case studies of imperialism, gender, and war draw from different regional histories and utilize a variety of visual genres - such as photography, popular posters, painting, advertising, and film stills - to study how visual culture can be used as evidence to understand the past, using the approaches of the disciplines of History and Art History.

Prerequisite: Sophomore standing
GEP Global Knowledge, GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

HI 251 American History I (3 credit hours)
Themes in early American history: colonial clash and mix of cultures; generation of an American consciousness; federalism and democracy in national politics; expansion and immigration; racial and sectional division. Credit is not allowed for both HI 251

GEP Humanities
Typically offered in Fall, Spring, and Summer

HI 252 American History II (3 credit hours)
Themes in post-Civil War American history: impact of war on American foreign and domestic policy; the repercussions of industrialization and economic modernization; continuity and change in American institutions and values; problem solving in pluralist

GEP Humanities
Typically offered in Fall, Spring, and Summer
HI 253  Early American History  (3 credit hours)
Themes in early American history with an emphasis on diversity in the U.S.; focus on colonial clash and mix of cultures, generation of an American consciousness, federalism and democracy in national politics, expansion and immigration, and racial and sectional division. Credit is not allowed for both HI 253 and HI 251.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

HI 254  Modern American History  (3 credit hours)
Major themes in modern American history with an emphasis on diversity in the United States; focuses on aspects of race/ethnicity, gender, class, sexual orientation, disability, religious and/or age identities as it considers the impacts of industrialization and economic modernization; impact of war on American domestic and foreign policy; continuity and change in American institutions and values; problem solving in a pluralistic society. Credit is not allowed for both HI 254 and HI 252.

X: Credit not allowed for both HI 254 and HI 252.
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

HI 263  Asian Civilizations to 1800  (3 credit hours)
The history of China, India, Japan, and Southeast Asia from 500 to 1800. The making of the Asian region through the rise and fall of five great empires: the Tang, the Mongol, the Mughal, the Qing, and the British empires.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 264  Modern Asia: 1800 to Present  (3 credit hours)
Introductory survey of 19th and 20th century Asia, with attention to Japan, Southeast Asia, India and China. Emphasis on cultural and political crises of the 19th century and revolutionary transformations of the 20th century.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 270  Modern Middle East  (3 credit hours)
Social and political change in the Middle East in the nineteenth and twentieth centuries. Decline of the Ottoman empire, the rise of nationalism, the waxing and waning of European imperialism in the region, and the creation of modern states and societies and their ideological and economic underpinnings.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 275/AFS 275  Introduction to History of South and East Africa  (3 credit hours)
The African kingdoms (Lunda, Buganda, and Zulu); the European encroachment; the origins of colonialism and the character of colonial societies and economies, South African apartheid; African protest, nationalism and independence.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 276/AFS 276  Introduction to History of West Africa  (3 credit hours)
The history of Western Africa. Forest civilizations and the slave trade, trade and the expansion of Islam, colonialism in West Africa; African nationalism and the achievement of independence; and postcolonial West Africa.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

HI 298  Special Topics in History  (1-3 credit hours)
Presentation of material normally not available in regular history course offerings, or offering of new introductory courses on a trial basis. Students cannot receive credit for multiple sections of HI 298 unless the topics are different.

Typically offered in Fall, Spring, and Summer

HI 300  Sophomore Seminar in History  (3 credit hours)
Introduction to the process of researching and writing history. Techniques for locating and interpreting primary sources. The craft of historical writing. Analysis and criticism of the varieties of history. Basic computer literacy: basic computing terms, electronic mail, online searching of the NCSU Libraries, use of the Internet, and word processing.

Prerequisite: Sophomore standing. History Majors
Typically offered in Fall and Spring

HI 305  Frauds and Mysteries of the Past  (3 credit hours)
Myths, mysteries, misconceptions, and hoaxes in history and archaeology. Examination of popular fascinations with the past, fallacies invoked in historical myths, and misappropriation of the past. Students learn about and implement methods and evidence used by scholars to interpret past peoples and events, logic, skepticism, and critical thinking, interpretative, and analytical skills. Students apply these skills in discussions, in-class activities, and creative assignments to debunk and disprove inaccurate and problematic claims about the past. Case studies of topics such as: stereotypes about early humans, Atlantis, mythical beasts, pyramid alignment, conspiracy theories, art fakes and forgeries, and alien visitations.

GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

HI 307  Jewish History  (3 credit hours)
Survey of major topics in the history of the Jews, focusing on the development of Jewish life on the European continent but also covering the patterns of migration that created a global diaspora as well as the forces that formed modern Israel.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 317  Cuba Today: Historical and Sociopolitical Perspectives  (3 credit hours)
This course, offered in Havana, Cuba, through the Study Abroad Office, examines Cuban political, social and economic dynamics through historical and sociopolitical perspectives. It explores the process and legacy of colonization, the role of slavery in colonial society, Santeria, healthcare, education and international relations in revolutionary Cuba. In order to take this course, students must be degree seeking and it must count towards their degree.

GEP Global Knowledge, GEP Humanities
Typically offered in Summer only
Typically offered in Spring only

GEP Interdisciplinary Perspectives

HI 318 Environmental History of Cuba: Prehistory to the Present (3 credit hours)
This course, offered in Havana, Cuba, is designed to introduce students to the environmental history of the country, from the pre-history to present. Among the core topics examined are the social, economic and environmental impacts of sugar, tobacco and coffee cultivation, the relationships between animal husbandry and deforestation, and the history of foreign tourism and its environmental implications. The course closes with an examination of the "Special Period" in Cuba beginning in 1989, and the rise of organic and urban agriculture in Cuba. In order to take this course, students must be degree seeking and it must count towards their degree.

GEP Interdisciplinary Perspectives
Typically offered in Summer only

HI 320/REL 320 Religion in American History (3 credit hours)
Representative people, movements and thought in the major religions within the context of American society and culture.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 321 Scientific Revolution and European Society, 1500-1800 (3 credit hours)
Exploration of the changing role that the arts, technology, and sciences played in shaping early modern European culture, society, and global power, between 1500 and 1800. Examination of the historical context of developments such as machine-making, new scientific ideas, patronage of science and technology, the formation of distinct technical and scientific fields, nation-building projects, and global ventures.

GEP Global Knowledge, GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

HI 322 Rise of Modern Science (3 credit hours)
Analysis of how "modern" science developed in Europe since the 1500s, exploring the foundation of the ideas, scientific practices, institutions, and cultural meaning and power of science in modern society. Examples taken from the creation of the mechanistic worldview and Newtonian science, and the development of modern disciplines such as chemistry, geology, biology, and physics.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HI 323 Science, American Style (3 credit hours)
Exploration of the distinctive nature of American science and its place in American culture. Analysis of the historical context of developments, such as early contributions to science, natural history, and paleontology; the growth of professionalization of science; ideas about scientific management and social applications such as eugenics; and the creation of the atomic bomb and the rise of "Big Science" after WWII.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 324 History of Common Law and Constitution (3 credit hours)
Survey of the development of common law and constitution from the earliest Roman and Anglo-Saxon beginnings to the era of the French and American Revolutions. The focus will be on the European social, political and intellectual contexts within which Anglo-American law emerged, and the foundations of legal and constitutional principles. Topics include the origins of courts and the judiciary; the evolution of jury trial and the early history of the law of evidence; conflicts and compromised between secular and ecclesiastical law; rights and limits to property ownership at common law; and problems regarding the legal status of women, children, servants and slaves.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 325 Empire, War, and Revolution in Russia (3 credit hours)
Survey of Russian history since the advent of modern reform following the 1861 Serf Emancipation. The course treats the failure of an increasingly outdated monarchy to cope with the rise of an influential urban educated class, and industrial work force, and Populist and Marxist revolutionary movements. The course traces the degeneration of the 1917 socialist revolution into a hardened dictatorship which, forced by conditions outside its control, waged a destructive but victorious war, saving Europe from Nazism. It treats the 1991 Soviet collapse and the challenges and failures of the post-Stalin and post-Soviet periods.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 326 History of Modern Science (3 credit hours)
Typically offered in Fall and Spring

GEP Interdisciplinary Perspectives

Typically offered in Fall only

HI 338 Survey of Russian History (3 credit hours)
Representative people, movements and thought in the major revolutions, political movements, and social changes in Russian history from 1855 to the present. Among the core topics examined are the decline of the Russian empire, the Russian revolution of 1917, the impact of World War II, the rise of communism, and the fall of the Soviet Union. The course will be divided into two parts - the first part will focus on Russian history from the 1855-1917 Russian imperial period and the second part will focus on the period following the Russian revolution of 1917 and the rise of the Soviet Union.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 339 The World at War (3 credit hours)
Comparative history of the experience of war over time and place. Topics include the interactions between war and society; effects on combatants and non-combatants, especially women and children; and the role of technology.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

HI 340 Spy vs. Spy: Cold War Intelligence History (3 credit hours)
This course will examine the often deadly intelligence efforts that characterized the Cold War (USA vs. USSR) of 1945-1991. While the history of that era marks the major political, economic, and military events, much occurred in the shadows. This wide-ranging intelligence competition affected - and was affected by - both American and Russian societies and cultures. Drawing on selected readings, this course will seek to describe this struggle to know and to conceal, and offer useful context to explain how and why it influenced the course of the Cold War.

GEP Humanities
Typically offered in Fall only

HI 341 Empire, War, and Revolution in Russia (3 credit hours)
Survey of Russian history since the advent of modern reform following the 1861 Serf Emancipation. The course treats the failure of an increasingly outdated monarchy to cope with the rise of an influential urban educated class, and industrial work force, and Populist and Marxist revolutionary movements. The course traces the degeneration of the 1917 socialist revolution into a hardened dictatorship which, forced by conditions outside its control, waged a destructive but victorious war, saving Europe from Nazism. It treats the 1991 Soviet collapse and the challenges and failures of the post-Stalin and post-Soviet periods.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

Typically offered in Fall and Spring

GEP Interdisciplinary Perspectives
**HI 340 History of Agriculture** (3 credit hours)
An introduction to the history of agriculture from a global perspective. The course explores our evolving relationship with plants and animals, including the earliest experiments in domestication and husbandry, short- and long-term developmental trajectories, local- and global-scale patterns, and coverage of diverse places and times. Themes include agricultural practices, food systems, landscape transformations, technological innovations, social and political organization, inequality, exploitation, food security, and sustainability.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

**HI 341 Technology in History** (3 credit hours)
The role of technology in society from earliest times to the present. Major achievements in technology and an examination of the nature of invention, innovation and adaptation of technologies and their impact on Western Civilization.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

**HI 344 Dinomania: Dinosaurs in Culture and Science** (3 credit hours)
The cultural and scientific history of dinosaurs as simultaneously an object of scientific knowledge and of popular culture. Attention will be paid to early dinosaur discoveries and interpretations, the competitive exploration for dinosaurs in the US West and other exotic places, the origin and international spread of dinomania, dinosaurs as cultural icons, and the ways that dinosaurs have been represented in the media and in public museums. This course will include critical discussion of how natural science is done, how ideas about dinosaurs are culturally embedded, and how and why those ideas change over time.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

**HI 345 American Popular Culture** (3 credit hours)
Popular culture as reflection of as well as contributor to American historical trends. Changes in forms of entertainment (music, books, popular art, theater, film, television, etc.), from the artisanal culture of the late 18th century through the rise of 19th- and early 20th-century commercial culture to the evolution of mass media culture in the late 20th and early 21st centuries.

GEP Humanities
Typically offered in Spring only

**HI 346 The Civil War Era in Popular Culture** (3 credit hours)
Survey of the causes, trajectories, and consequences of the American Civil War and the social, political, and economic struggles of Reconstruction. Draws on history and literary studies to investigate how Americans represented and misrepresented the Civil War era, through an examination of popular culture. Emphasis on conflicts concerning regional identity, race, class, gender, and sexuality in the history and memory of the Civil War era.

GEP Humanities, GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Spring only

**HI 350 American Military History** (3 credit hours)
American military experience and its relationship to other historical developments. Use of military force in terms of strategy and tactics and as an element in the nation's diplomatic, political, social, economic and intellectual life.

GEP Humanities
Typically offered in Fall only

**HI 351 U.S. Naval History** (3 credit hours)
The role of the U.S. Navy in American history. Sea power, national defense and foreign policy. The impact of technology on naval warfare and the historical evolution of missions of the U.S. Navy.

GEP Humanities
Typically offered in Spring only

**HI 354 The Rise of the American Empire** (3 credit hours)
This course investigates the rise of the American Empire from the Spanish American War of 1898 through the 2001 attacks on the World Trade Center. The purpose of the course is not only to acquaint you with the crises and triumphs of US foreign policy from 1898 to 2001, but also to help you develop your own analysis of whether the acquisition of empire was accidental or deliberate, or a combination of both.

GEP Humanities
Typically offered in Spring only

**HI 360 U.S. Agricultural History** (3 credit hours)
U.S. Agricultural history from colonial era to present. Attention to the major economic, social, political, environmental and cultural forces that shaped American agriculture from the 16th century to 21st century. Discussion of the role of technological change and evolution of governmental policy in U.S. agriculture. Exposure to major episodes demonstrating fundamental changes and continuities in U.S. agriculture. Discussion of the diversity of American farmers and farmworkers and their struggles for equality and access.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

**HI 364 History of North Carolina** (3 credit hours)
History of North Carolina from early European exploration to the present. Features of North Carolina society which made this state similar to and different from other southern states and the nation as a whole.

GEP Humanities
Typically offered in Fall, Spring, and Summer

**HI 365 The American West** (3 credit hours)
A history of the American borderlands with emphasis on the trans-Mississippi West. Cycles of exploration, conquest, and exploitation of this region. Influence of the frontier in the development of the United States.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only
HI 366 Native American History (3 credit hours)
An introductory interpretation of the varied historical experiences of
many nations native to North America from the first migrations of peoples
into the continent until the present, including the variety and diversity
of Indian cultures and experiences; native resistance to colonialism,
expansion, and U.S. federal policies; and the survival and continuity of
native cultures and peoples through more than four centuries of contact,
conquest, and change.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 369 Sexuality in U.S. History (3 credit hours)
Exploration of the social construction of sexualities from the early
seventeenth century to the present day. This course will focus on the
United States, but we will begin with the history of sexuality in early
modern Europe to see where ideas of sexuality in colonial America had
their roots. We will proceed through the chronological development of
the history of sexuality in North America. Throughout the semester, we
will explore dominant and alternative constructions of sexuality; trace
the changing and contested meanings of sexuality; and explore the
implications of these understandings in sexuality for power relations in the
history of the United States. While issues of gender and race frequently
intersect with sexuality, we will be focused primarily on the latter.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 370 Modern Egypt (3 credit hours)
Exploration of the political, socio-economic, and cultural history of Egypt
from the end of the 18th century (the 1798 exploration led by Bonaparte)
to the present day; including the late Ottoman period (1798-1805), the
birth of the modern state (1805-1922), Egypt's liberal experiment (1922 -
1952), the Nasser era (1952-1970), the neo-liberal age (since 1970), and
concluding with the January 25th Revolution. The investigation follows
two main threads: the conflictual relationships that developed over the
past two centuries between the state and society in all its diversity, and
the continuous struggle over the definition of the Egyptian nation that
these conflicts have generated.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring and Summer

HI 371 Modern Japan, 1850 to Present (3 credit hours)
Survey of Japan's emergence as a modern nation and world power.
Topics include nation-state formation; modernization and its dislocations;
democratization and authoritarianism; imperialism, international politics,
and war; postwar reforms; changing gender relations; popular culture;
and social problems.

Prerequisite: 3 hours of History or Sophomore standing
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 372/AFS 372 African-American History Through the Civil War, 1619-1865 (3 credit hours)
African background and continuity of the particular role, experience and
influence of African Americans in the United States through the Civil War.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 373/AFS 373 African-American History Since 1865 (3 credit hours)
The history of African-Americans from the Reconstruction era through the
Civil Rights movement of the 1950s and 1960s to the present.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

HI 374 Visual Culture of Modern South Asia (3 credit hours)
History of visual-cultural production in expressing and shaping socio-
political configurations in the South Asian subcontinent. Treats visual
evidence over 300 years to understand the integrative relationship and
flow of cultural production across elite

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 375 Global History of Travel and Tourism (3 credit hours)
This course traces the development of travel and tourism from ancient
times to modern days, examining it as an agent that both produces and
reflects social-cultural activities. It draws on different travel-energized
materials-from topographic descriptions to sentimental narratives-to
examine how people traveled long distances for various reasons and to
analyze their impressions of foreign lands and reflections on their home
population. Topics include how the crossing of boundaries reflected and
reshaped the meanings of place, the formation of identity, the spread
of religion and aesthetics, the accumulation of knowledge and scientific
empiricism, as well as the consumption of visual and material culture.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

HI 380 History of Nonprofits, Philanthropy, and Social Change (3 credit hours)
This course explores the historical development of nonprofits and
philanthropy in the United States from the colonial period to the present:
the origins of charity and philanthropy as concepts for social change and
social justice, the rise of benevolent societies in the nineteenth century,
the creation of philanthropic foundations and advocacy organizations
in the twentieth century, and the construction of complex relationships
between modern nonprofits, the state, and the private sector.

GEP Humanities
Typically offered in Spring only

HI 381 NGO Nonprofits in a Global Context (3 credit hours)
Non-Governmental Organizations (NGOs) are a crucial component and
a revealing characteristic of the strength and effectiveness of a country's
civil society. Examining their histories outside of the U.S. gives us a
window into global culture, values, and modes of everyday life, and into
notions about "charity" and "public good" in a given society. We will use
India as a case study to develop a set of questions about how NGOs
function in different societies, examining how researchers and activists
partner with NGOs in different parts of the world to address pressing
environmental, economic, social, and cultural-production issues.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only
HI 382 History of Capitalism in America  (3 credit hours)
The phrase "capitalism in America" raises big questions, and this course will look at such questions as: What is capitalism anyway? What was the relation between slavery and capitalism? Is capitalism the story of heroic entrepreneurs who through vision and courage built new enterprises? Has the government played any positive role in American capitalism or has it just stood in the way? Is fraud an aberration or an essential part of capitalism? Why has America had all these financial crises and how have Americans responded to them? Is capitalism in the twenty-first century something new or is it just a continuation of longer trends? Is it even reasonable to talk about capitalism in the United States alone?

GEP Humanities, GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Spring only

HI 385 Introduction to Public History  (3 credit hours)
History is about people: their societies, economies, cultures, and politics and how these changed over time. In Public History, history is also for people, in that careful and exacting historical research can facilitate dialogue and be applied to contemporary problems. Just as important, Public History is history saved, researched, and analyzed with people, for public historians work with individuals and groups to collaboratively understand history and preserve historical resources for future generations. This class treats the major concepts, scholarship, and research methods shaping the Public History field; it is also an opportunity to test the fields theories in projects that will create new resources for historical learning in our community. Required field trip fee of $10.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Summer

HI 390 Internship in History  (3 credit hours)
Directed work experience for history students with internship-site mentoring and evaluation. Engagement in the community as a practitioner. Course requires 140 contact hours with the sponsoring organization. The course includes an on-campus class meeting and presentation at the end of the semester. Students must have at least a 3.0 overall GPA and at least a 3.0 GPA in the major, be a junior or senior, and must complete the application process with the Department of History. Students must provide their own transportation to the internship site. Modest liability insurance fee required.

Prerequisite: Juniors & Seniors with Cumulative GPA of 3.0 or above and 3.0 GPA or above in History courses, HI 300 and 12 hours of History courses and consent of the department
Typically offered in Fall, Spring, and Summer

HI 395 History: Study Abroad  (1-3 credit hours)
Topical History courses taught in NCSU Study Abroad programs. (Current listings available in Study Abroad Office, CHASS Dean's Office and History Department).

Prerequisite: 3 hours of History or Sophomore standing

HI 400/HI 500 Civilization of the Ancient Near East  (3 credit hours)
The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C. Credit for both HI 400 and HI 500 is not allowed

Prerequisite: 3 hours of History
Typically offered in Fall only

HI 402/REL 402 Early Christianity to the Time of Eusebius  (3 credit hours)
Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox C

Prerequisite, one of: REL 312, REL 317, or HI 207.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

HI 403/HI 503 Ancient Greek Civilization  (3 credit hours)
The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides. Credit will not be given for both HI 403 and HI 503.

Typically offered in Spring only

HI 404/HI 504 Rome to 337 A.D.  (3 credit hours)
The development of ancient Rome from its origins in Italy, through the rise as an Empire embracing the entire Mediterranean World and Western Europe, to Constantine, Christianity and the foundation of Constantinople. Examines critically the political achievement of a people who rose from an obscure Italian city to a world empire, with emphasis on the analysis of primary sources. Credit will not be given for both HI 404 and HI 504

P: 3 hrs. of History

HI 405/HI 505 History and Archaeology of the Roman Empire  (3 credit hours)
Analysis of Rome's rule over the Mediterranean World in the first four centuries A.D. through the use of literary and archaeologic sources. Special emphasis on imperial army and frontier security. Credit will not be given for both HI 405 and HI 505

P: 3 hrs. of History

HI 406/HI 506 From Roman Empire to Middle Ages  (3 credit hours)
Late Antiquity and the early Middle Ages. The transition from classical civilization to the basis of modern civilizations; the fall of Rome, the Germanic kingdoms, Byzantium, the establishment of Christianity, the birth and growth of Islam. Credit will not be given for both HI 406 and HI 506

P: 3 hrs. of History

HI 407/REL 407 Islamic History to 1798  (3 credit hours)
The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art and architecture, Islam in Spain, India, Asia and Africa, the Crusades, the Ottomans, Islam and Europe. Credit will not be given for both REL/HI 407 and REL/HI 507.

Prerequisite: 3 hrs HI or REL 300 or above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only
HI 408/REL 408  Islam in the Modern World  (3 credit hours)
Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world. Students cannot receive credit for both REL/HI 408 and REL/HI 508.

Prerequisite: 3 hours of history or religious studies
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

HI 409/HI 509  The High Middle Ages  (3 credit hours)
Medieval culture from 10th through 13th centuries: revival of the Roman Empire, monastic and papal reform, rise of universities, evolution of representative bodies, the Gothic style, troubadour and goliardic poetry, scholasticism, and revival of Roman law. Credit will not be given for both HI 409 and HI 509

P: 3 hrs. of History

HI 410  Italian Renaissance  (3 credit hours)
The historical, literary, and cultural developments defining the "Renaissance" period of Italian history from the late fourteenth century to the end of the sixteenth century. Topics include critical analysis of the concept of a "renaissance" and its usefulness for historical interpretation; the intersection of politics, religion, society, art, and literature in relation to defining a "Renaissance" culture; and the development of a global money economy and the cultural output it inspired in Europe.

P: 3 hrs. of History
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Summer

HI 411/HI 511  Trials of Faith: Religious Reformation in Early-Modern Europe  (3 credit hours)
Examination of the great disruption in European civilization associated with the Protestant and Catholic Reformations. The course considers the new religious ideas and practices associated with the Reformations and transformation they produced in European political and economic life; the violence they provoked; the new thinking about families and gender roles they encouraged, the spread of European religions around the globe with European voyages of discovery and conquest, and the beginning of ideas about religious toleration. Credit will not be given for both HI 411 and HI 511.

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 412/HI 512  The Sexes and Society in Early-Modern Europe  (3 credit hours)
Examination of changes in gender relations; ideas about the sexes, femininity, and masculinity; the roles of women and men in political, religious, economic, scientific, and family life in Europe between the late Middle Ages and the French Revolution. Credit for HI 412 and HI 512 is not allowed.

P: 3 hrs. of History
GEP Global Knowledge

HI 414/HI 514  From Kings to Revolution: The History of Early-Modern France  (3 credit hours)
Examination of the most politically powerful and culturally dominant kingdom in early-modern Europe, which dissolved into a revolution that destroyed its monarchy while establishing ideas about democracy and equality. From the glories of the Versailles palace to the misery of peasant villages, topics include the beginnings of the French state and nation in the warfare and religious conflicts of 1500s, political and economic developments, the growth of an internationally influential French culture, religious change, controversies over gender roles, and the origins of the French Revolution. Credit will not be given for both HI 414 and HI 514.

P: 3 hrs. of History
GEP Global Knowledge

HI 415/HI 515  The French Revolution  (3 credit hours)
Broadly based analysis of France's first revolutionary era; the enlightenment and its impact, the causes and character of the Revolution in France; impact of these events in France and Europe. Credit will not be given for both HI 415 and HI 515

P: 3 hrs. of History
GEP Global Knowledge

HI 418/HI 518  Fascist Italy and Nazi Germany  (3 credit hours)
Fascism as a theoretical concept, rise of fascism in Italy and Germany, seizure of power by Mussolini and Hitler, organization of the economy, churches, military, women, youth, and culture under the dictatorships. Students will not receive credit for both HI 418 and HI 518

P: 3 hrs. of History
GEP Global Knowledge

HI 419/HI 519  Modern European Imperialism  (3 credit hours)
Historical background of European overseas expansion; its impact on the economics, politics and culture of both Europe and the colonized world; the significance of imperialism and anti-colonial nationalism in shaping the modern world. Credit will not be given for both HI 419 and HI 519

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 421/HI 521  European Intellectual History: The Eighteenth Century  (3 credit hours)
Historical examination of some of the major figures of the European Enlightenment, beginning with Locke and ending with Kant. Credit will not be given for both HI 421 and HI 521

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 422/HI 522  European Intellectual History: The 19th Century  (3 credit hours)
Historical examination of some of the major figures of European thought during the 19th century, beginning with the enthusiasm of the period of the French Revolution and ending with the disillusionment of the fin de siecle. Credit will not be given for both HI 422 and HI 522

P: 3 hrs. of History
GEP Global Knowledge
HI 423/HI 523 Women in European Enlightenment  (3 credit hours)
Historical analysis of feminist thought and action during the Enlightenment of the 1700s. Topics include women's role in the development of Western knowledge and science, historical construction of the gendered "nature" of women, education and political resources available to women, and their strategies for emancipation. Credit will not be given for both HI 423 and HI 523.

P: 3 hrs. of History  
GEP Global Knowledge  
Typically offered in Spring only

HI 425/HI 525 Tudor and Stuart England  (3 credit hours)
British history from the Reformation through the Civil War. Emphasis on key developments in social, political and economic life: The development of a new concept of kingship, the growing independence of Parliament, the search for religious uniformity and the changing status of the aristocracy and gentry. Credit will not be given for both HI 425 and HI 525.

Prerequisite: 3 hours of History  
GEP Global Knowledge  
Typically offered in Summer only

HI 429 20th Century Britain  (3 credit hours)
British political, social and economic history since 1914, with reference to the effects of two world wars, the growth of the Welfare State, Britain's decline as a power, and its search for a new role in the world. Credit will not be given for both HI 429 and HI 529.

Prerequisite: 3 hours of History  
GEP Global Knowledge  
Typically offered in Summer only

HI 430/HI 530 Modern France  (3 credit hours)
French history from the downfall of Napoleon I to the present, with a short introductory survey of the Old Regime and the French Revolution. Cultural, social and economic developments and political trends. Credit will not be given for both HI 430 and HI 530.

P: 3 hrs. of History  
GEP Global Knowledge  
Typically offered in Fall only

HI 434/HI 534 Theory and Practice of Digital History  (3 credit hours)
Introduces students to the theory and practice of digital history. Students will examine theoretical scholarship on digital practices in history, learning how to acquire, edit, process, analyze, and present humanistic data. Students will critique examples of digital history including digital archives, exhibits, scholarship, and teaching resources, and then apply conceptual knowledge in the creation of their own digital history projects. The course is geared to students without prior knowledge of coding. Credit will not be given for both HI 434 and HI 534.

R: Graduate Standing or PBS  
Typically offered in Fall only

HI 437 Topics in Central and East European History  (3 credit hours)
Topical focus on specific problems and events occurring in the region in and between Germany and Russia in modern history. The course is designed to expose advanced undergraduates, principally history majors, to intensive reading, writing, and discussion of focused topics in the subject area. Previous modern European history credit is advised. This course is repeatable once for credit when offered with a different topic.

P: 3 hrs. of History  
Typically offered in Spring only

HI 440/HI 540 American Environmental History  (3 credit hours)
Interactions between humans and their environments in America; environmental focus on themes in American history such as colonial settlement, industrialization, progressivism, the New Deal, the 1960s. Credit will not be given for both HI 440 and HI 540.

Prerequisite: 3 hours of History  
GEP Interdisciplinary Perspectives  
Typically offered in Fall and Summer

HI 441/HI 541 Colonial and Revolutionary U.S.  (3 credit hours)
Origins of the English colonies in America to the American Revolution. European background to colonization, merging of different cultures, effects of mercantile doctrine, causes of revolution. Credit will not be given for both HI 441 and HI 541.

P: 3 Hours of History

HI 443/HI 543 U.S. Constitutional History to 1883  (3 credit hours)
This course examines the origins and development of the U.S. Constitution from the Articles of Confederation to 1883. The course specifically looks at the federal Convention of 1787, the national bank debate and early constitutional interpretation; the constitution and its interaction with politics, economics, and society; the powers of Congress; taxation, contracts, commerce and war. The course also examines sovereignty, slavery and civil rights. It ends with an analysis of the Civil War Amendments and the transformation in American constitutionalism. Credit for both HI 443 and HI 543 is not allowed.

P: 3 hrs. of History  
Typically offered in Fall only

HI 444 U.S. Constitutional History Since 1870  (3 credit hours)
Examines the transformation of American Constitutional thought after the Civil War; the triumph of nationalism and the evolution of a new federal theory; the rise and fall of federal protections of civil rights in the late 19th-century and the Civil Rights Revolution in the 20th century. Explores key concepts as civil liberties, judicial activism and judicial restraint; procedural and substantive due process, liberty of contracts and entrepreneurial liberty, Japanese internment, privacy, women and gender issues; explores free speech, religious freedom, civil liberties. Credit for both HI 444 and HI 544 is not allowed.

P: 3 hrs. of History  
Typically offered in Spring only

HI 445/HI 545 Early American Borderlands  (3 credit hours)
Examines the social, political, and cultural development of the eastern American frontiers between the early seventeenth and mid-nineteenth centuries. Addresses the relationships between settlers and environments, settlers and Native Americans. Explores the structure and life of pioneer families, the development of new institutions, the role of governments in regulating settlements, and the evolution of the “frontier myth.” Credit cannot be given for both HI 445 and HI 545.

P: 3 hrs. of History  
GEP Humanities, GEP U.S. Diversity  
Typically offered in Spring only
HI 446/HI 546 Topics in Civil War and Reconstruction (3 credit hours)
Examination of the historiography of the American Civil War and Reconstruction. Topics include the origins of the war, military strategy, the northern and southern homefront, nationalism and citizenship, slavery and freed labor, changing gender roles and ideologies, struggles over racial inequality, and conservatism and radicalism during Reconstruction. Credit will not be given for both HI 446 and HI 546.

Prerequisite: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

HI 447/WGS 447/HI 547/WGS 547 Women in America: From Contact to the Civil War (3 credit hours)
The historical experience of women in America from Native American and European contact through the colonial period to the immediate post-Civil-War years (to 1890). Topics include the history of women’s work, education, legal and political status, religious experience, and sex roles, with consideration of age, class, race, sexual preference, and region as significant variables in women’s experience in America. Credit will not be given for both HI (WGS) 447 and HI (WGS) 547.

P: 3 Hours of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 448/WGS 448/HI 548/WGS 548 American Women in the Twentieth Century (3 credit hours)
Women’s historical experience in America, 1890-1990. Changes in women’s work, education, legal and political status, and sex roles, age, class, race, sexual preference and region as significant variables in women’s experience. Credit will not be given for both HI (WGS) 448 and HI (WGS) 548.

P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

HI 449/HI 549 U.S. Labor to 1900 (3 credit hours)
This course explores the history of work, workers, and working-class life and labor in the United States from the founding of the first European colonies to the beginning of the twentieth century: bound and free labor in colonial America, the transformation of urban worklife in the decades preceding the Civil War, slavery and class formation in the antebellum South, the effects of immigration on American workers, and the impact of race and gender on workers’ solidarity. Credit will not be given for both HI 449 and HI 549.

P: 3 hrs. of History
GEP U.S. Diversity

HI 450 U.S. Labor Since 1900 (3 credit hours)
This course explores the history of work, workers, and working-class organizations in the twentieth century United States; with particular attention to three core issues in twentieth-century American labor history: whether the US South has a particular form of labor history; the historical struggle for workers’ rights to collectively act and protest; and the intersections between race, ethnicity, immigration and labor in the twentieth-century US. Credit will not be given for both HI 450 and HI 550.

P: 3 hrs. of History
GEP U.S. Diversity

HI 451/HI 551 The Vietnam War (3 credit hours)
The Vietnam War in Vietnamese historical context. A study of major works on the legacy of French colonialism; the growth of Vietnamese radicalism and communism; World War II and the Vietnamese Revolution; the French Indochina War and political division
Prerequisite: 3 hours of History
Typically offered in Spring only

HI 452/HI 552 Recent America (3 credit hours)
Examination of contemporary opinions and historical interpretations of major problems in American life since 1939, including World War II, its social and economic consequences; Korea and the Cold War, big business and labor; civil rights and feminist movements; countercultures, Vietnam and Watergate. Credit will not be given both for HI 452 and HI 552
P: 3 Hours of History

HI 453/HI 553 United States-Latin American Relations Since 1823 (3 credit hours)
Critical analysis of the last two centuries of relations between the US and Latin America. Exploration of major policies using primary sources and declassified CIA documents. Major themes include US economic, political, and military influence, covert and overt US interventions, and response by Latin American governments. Historical perspectives on contemporary inter-American problems such as drugs, environment, debt crisis, human rights abuses, and the impact of the Latino population in the U.S. Credit will not be given both for HI 453 and HI 553.
Prerequisite: 3 hrs. of History

HI 454 History of U.S. Foreign Relations, 1900-Present (3 credit hours)
America’s emergence as a world power; American diplomatic history since 1900; the expansion of American economic and cultural relations; the evolution of the American foreign policy bureaucracy; and the historical forces and personalities that have shaped
P: 3 hrs. of History

HI 455/AFS 455/HI 555/AFS 555 History of the Civil Rights Movement (3 credit hours)
The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for AFS/HI 455 and AFS/HI 555.
P: 3 hrs. of History

HI 459/HI 559 The Early American Republic (3 credit hours)
Examines the social, political, and cultural development of the Early Republic, the period in American history roughly from the Revolutionary War through the Administration of John Quincy Adams. Employs the life of Thomas Jefferson—the quintessential American, as the foundation for delving into the historical problems, interpreting primary sources, and analyzing secondary sources. Encourages graduate students to analyze the ways in which historiographic debates complicate our understanding of the Early American Republic. Credit will not be given both for HI 459 and HI 559.
Prerequisite: 3 hrs. of History
HI 461/HI 561 Civilization of the Old South (3 credit hours)
The distinctive features of the Old South as part of the regional
development of United States history. Consideration of colonial factors
in the making of the South, development of the plantation system and
slavery, Southern social order, intellectual and cultural life, economic
development, and rise of Southern nationalism. Credit will not be given
for both HI 461 and HI 561.
Prerequisite: 3 hrs. of History

HI 462/HI 562 Southern History since the Civil War (3 credit hours)
Exploration of many American "Souths" from Reconstruction to the
present. How race/ethnicity, gender, class, geography, sexuality, and
culture inform "Southern" identity; major political and economic changes;
and the region's relationship to the nation and the world. Credit will not be
given for HI 462 and HI 562.
Prerequisite: 3 hours of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

HI 463/HI 563 Topics in History and Memory (3 credit hours)
Explores how "collective memory" develops. Examines how memory is
represented through public speeches, civic celebrations, monuments
and memorials, and other forms of popular and political culture. Analyzes
what is recalled, what is forgotten, and who decides. Asks why memory
is made public. May be repeated once for credit when offered with a
different topic. Credit will not be given for both HI 463 and HI 563.
Typically offered in Fall, Spring, and Summer

HI 465 Oil and Crisis in the Gulf (3 credit hours)
Historical roots and development of the Persian Gulf region from the
late nineteenth century until the present with an emphasis on the social,
economic, cultural and political transformations following the discovery
of oil, and subsequent events such as the Arab Oil embargo of 1973, the
Iranian Revolution, the Iran-Iraq war, and the two Gulf wars.
P: 3 hrs. of History
GEP Global Knowledge

HI 466 History of the Palestinian-Israeli Conflict (3 credit hours)
Historical roots and development of the Palestinian-Israeli conflict from the
late nineteenth century until the present through the study of the history and historiography of Zionism, Palestinian nationalism, creation of the state of Israel, establishment of settlements, conflicts and peace negotiations, as well as a study of the impact of this conflict on both Israeli and Palestinian societies, economies and cultures.
P: 3 hrs. of History
GEP Global Knowledge

HI 467 Modern Mexico (3 credit hours)
Major developments in Mexican national life since 1821. The 19th
century: the era of Santa Anna, the war with the United States, the
Reform, the French intervention, and the dictatorship of Profrío Díaz. The
1910 Revolution and the resulting transformation of Mexico's political,
social and economic institutions. Reading knowledge of Spanish helpful but not required.
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall only

HI 468/HI 568 Slavery in the Americas (3 credit hours)
Exploration of the development of chattel slavery throughout the Americas. Analysis of the emergence and development of New World slavery in ways that encourage students to think critically about the historical processes of abolition, emancipation, and freedom across the Atlantic world. The lectures and readings seek to dislodge the notion that the "history of slavery" only pertains to the United States. The course, instead, emphasizes commonalities and differences in ways that challenge assumptions that the institution was exceptional in any given region. Credit will not be given for both HI 468 and HI 568.
Prerequisite: 3 Hours of History and Junior Standing
GEP Global Knowledge
Typically offered in Spring only

HI 469/HI 569 Latin American Revolutions in the Twentieth Century (3 credit hours)
Comparative analysis of causes, participants, process, and outcome of revolutions in Mexico, Bolivia, Cuba, and Central America. Credit for both HI 469 and HI 569 will not be given
P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Spring only

HI 470/HI 570 Exploring World History (3 credit hours)
Introduction to the methods, themes, and narratives of world history. As
a distinct approach to historical study, world history focuses on dynamic
connections and relationships among regions of the world and the variety
of global processes - related to trade, religion, production, consumption,
migration, imperialism, disease, and technologies - that connected them.
The course is a suggested elective for future teachers who will teach
world history in high school, as well as an ideal course for History majors
and graduate students who want to explore the connections among all
the regionally specific upper division courses they have taken. Credit will
not be given for both HI 470 and HI 570.
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

HI 471/HI 571 Revolutionary China (3 credit hours)
China 1900 to present. Examination of political, cultural, and socio-
economic revolutionary phases of China's 20th-century transformation
from traditional empire to communism. Particular attention to post-1949
problems of nation-building. Credit will not be given for both HI 471 and
HI 571
P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 472 Fashion, Food, and Fun: Material Culture in Chinese History (3 credit hours)
Exploration of the history of everyday material culture in China, covering a wide range of physical objects such as clothes, tea, architecture, and woodblock printing. Examination of how the material culture of different time periods evolved in response to varying historical factors and contributed to the formation of cultural norms. Focus on both textual and visual historical records, as well as objects from the Gregg Museum.
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall only
HI 473/HI 573 Japan’s Empire in Asia, 1868-1945 (3 credit hours)
An advanced survey of Japanese relations with Asia in the nineteenth and twentieth centuries. Structures and ideologies of imperialism and colonialism; modernization, nationalism and social change; migration and mobility; resistance and collaboration; and legacies of empire. Credit will not be given for both HI 473 and HI 573.

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 474 Modern India (3 credit hours)
The history of the Indian sub-continent, from the 16th century to the present. Focus on political, economic and cultural change under the Mughal Empire and the British Raj; the problems of independent India, Pakistan and Bangladesh.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall only

HI 475/AFS 475/HI 575/AFS 575 History of the Republic of South Africa (3 credit hours)
Evolution of the Republic of South Africa’s society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI (AFS) 475 and HI 575.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall only

HI 476/AFS 476/HI 576/AFS 576 Leadership in Modern Africa (3 credit hours)
Recent sub-Saharan African political history (excluding South Africa). Overview of concepts, vocabulary, historical trends. Detailed examination of specific African countries as case studies, such as Ghana, Nigeria, Zimbabwe, Tanzania. Credit will not be given for both HI (AFS) 476 and HI 576.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall and Spring

HI 477 Women in the Middle East (3 credit hours)
The varied forces influencing lives of women in Middle East from beginning of Islam to present.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

HI 478 Islam and Christianity in Sub-Saharan Africa (3 credit hours)
Expansion and interaction of Islam and Christianity in sub-Saharan Africa in the nineteenth and twentieth centuries, and their influence and impact on the economy, politics, and society. Topics include missionary activity, resistance to imperial authority, the role of the churches, and the influence of religion on leadership, education, nationalism, and post-colonialism. Credit will not be given for both HI 478 and HI 578.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall only

HI 479/AFS 479/HI 579/AFS 579 Africa (sub-Saharan) in the Twentieth Century (3 credit hours)
Developments in sub-Saharan Africa during the colonial period, from the end of the nineteenth century to the advent of decolonization in the early 1960s. Interplay of political, social, economic and cultural factors in the experiences of African peoples during this period. Credit will not be given for both HI (AFS) 479 and HI 579.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

HI 481/HI 581 History of the Life Sciences (3 credit hours)
Historical context of the individuals, ideas, scientific practices, and social goals that created the core concepts of the modern biological sciences, from Renaissance medicine to molecular biology, with a focus on interconnections of the scientific knowledge and perspective of life sciences with other aspects of culture, including other sciences, views about nature and life, religious belief, medical practice, and agriculture. Topics include the development of biological experiments; theories of ecology and evolution; the chemical understanding of health, food, and drugs; and the modern molecular revolution. Credit will not be given for both HI 481 and HI 581.

P: 3 hrs. of History
GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 482/HI 582 Darwinism in Science and Society (3 credit hours)
Scientific development of Darwinism and its reception by the scientific community and the general public. Social impact of theories of evolution as reflected in Social Darwinism, eugenics, sociobiology, and relationship of sciences to ethics and religion. Credit will not be given both for HI 482 and HI 582.

P: 3 hrs. of History
GEP Interdisciplinary Perspectives
Typically offered in Fall only

HI 483/HI 583 Science and Religion in European History (3 credit hours)
Are science and religion inherently in conflict with each other? Historical analysis of the idea of the “warfare between religion and science,” treating their complex relationship and respective cultural authority before 1800, including the relationship of science and religion in Europe during periods of the Reformation, the creation of early modern states, and the Enlightenment of the 1700s. Topics include visions of nature and utopias, the creation of mechanistic science in the 1600s, and natural theology. Credit will not be given for both HI 483 and HI 583.

P: 3 hrs. of History
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 484/HI 584 Science in European Culture (3 credit hours)
The role of science in shaping early modern European identity, culture and polity in the 1600s and 1700s. Drawing on documents and material culture, topics include the meaning of natural wonders, explorations, travel literature, instruments and mapping, colonies and empire, and universal expos. Credit will not be given for both HI 484 and HI 584.

P: 3 hrs. of History
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall only
HI 485/HI 585 History of American Technology (3 credit hours)
Technology in American history: the ideological, social, economic, and institutional contexts of technological change from the 1760’s to the present. Impacts of new technological systems. Credit will not be given for both HI 485 and HI 585.

Prerequisite: 3 hours of History
GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 486/HI 586 Science and Empire (3 credit hours)
The development of European science in the context of world exploration, global commercial expansion, local knowledge, and visions of colonization and empire. Credit will not be given for both HI 486 and HI 586.

Typically offered in Fall only

HI 491 Seminar in History (3 credit hours)
Detailed investigation of selected topics in history. Consult Department of History for specific topics.

Prerequisite: HI 300 and 18 hours of History
Typically offered in Fall and Spring

HI 495 Honors Research in History I (2 credit hours)
Preparation of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be

Prerequisite: Senior in History Honors Program
Typically offered in Fall and Spring

HI 496 Honors Research in History II (4 credit hours)
Completion of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be

Prerequisite: HI 495, Senior in History Honors Program
Typically offered in Fall, Spring, and Summer

HI 498 Independent Study in History (1-6 credit hours)
Extensive readings on predetermined topics focused around a central theme. Permission of the department is required. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be

Prerequisite: 3 hours of History

HI 499 Special Topics in History (1-3 credit hours)
Timely topical courses or experimental course offerings in advanced historical study.

Prerequisite: 3 hours of History
Typically offered in Fall and Spring

HI 500/HI 400 Civilization of the Ancient Near East (3 credit hours)
The civilization of Mesopotamia and Egypt from earliest times to the fall of Babylon in 539 B.C. Credit for both HI 400 and HI 500 is not allowed

Prerequisite: 3 hours of History
Typically offered in Fall only

HI 502/REL 502 Early Christianity to the Time of Eusebius (3 credit hours)
Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox C

Prerequisite: Graduate standing
Typically offered in Fall only

HI 503/HI 403 Ancient Greek Civilization (3 credit hours)
The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides. Credit will not be given for both HI 403 and HI 503.

Typically offered in Spring only

HI 504/HI 404 Rome to 337 A.D. (3 credit hours)
The development of ancient Rome from its origins in Italy, through the rise as an Empire embracing the entire Mediterranean World and Western Europe, to Constantine, Christianity and the foundation of Constantinople. Examines critically the political achievement of a people who rose from an obscure Italian city to a world empire, with emphasis on the analysis of primary sources. Credit will not be given for both HI 404 and HI 504

P: 3 hrs. of History

HI 505/HI 405 History and Archaeology of the Roman Empire (3 credit hours)
Analysis of Rome's rule over the Mediterranean World in the first four centuries A.D. through the use of literary and archaeologic sources. Special emphasis on imperial army and frontier security. Credit will not be given for both HI 405 and H1 505

P: 3 hrs. of History

HI 506/HI 406 From Roman Empire to Middle Ages (3 credit hours)
Late Antiquity and the early Middle Ages. The transition from classical civilization to the basis of modern civilizations; the fall of Rome, the Germanic kingdoms, Byzantium, the establishment of Christianity, the birth and growth of Islam. Credit will not be given for both HI 406 and HI 506

P: 3 hrs. of History

HI 507/REL 507 Islamic History to 1798 (3 credit hours)
The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art and architecture, Islam in Spain, India, Asia and Africa, the Crusades, the Ottomans, Islam and Europe. Credit will not be given for both REL/HI 407 and REL/HI 507.

Prerequisite: Graduate Standing
Typically offered in Fall only
HI 508/REL 508 Islam in the Modern World (3 credit hours)
Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world. Students cannot receive credit for both REL/HI 408 and REL/HI 508.

Prerequisite: Graduate Standing
Typically offered in Fall only

HI 509/HI 409 The High Middle Ages (3 credit hours)
Medieval culture from 10th through 13th centuries: revival of the Roman Empire, monastic and papal reform, rise of universities, evolution of representative bodies, the Gothic style, troubadour and goliardic poetry, scholasticism, and revival of Roman law. Credit will not be given for both HI 409 and HI 509.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 511/HI 411 Trials of Faith: Religious Reformation in Early-Modern Europe (3 credit hours)
Examination of the great disruption in European civilization associated with the Protestant and Catholic Reformations. The course considers the new religious ideas and practices associated with the Reformations and transformation they produced in European political and economic life; the violence they provoked; the new thinking about families and gender roles they encouraged, the spread of European religions around the globe with European voyages of discovery and conquest, and the beginning of ideas about religious toleration. Credit will not be given for both HI 411 and HI 511.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 512/HI 412 The Sexes and Society in Early-Modern Europe (3 credit hours)
Examination of changes in gender relations; ideas about the sexes, femininity, and masculinity; the roles of women and men in political, religious, economic, scientific, and family life in Europe between the late Middle Ages and the French Revolution. Credit for HI 412 and HI 512 is not allowed.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 514/HI 414 From Kings to Revolution: The History of Early-Modern France (3 credit hours)
Examination of the most politically powerful and culturally dominant kingdom in early-modern Europe, which dissolved into a revolution that destroyed its monarchy while establishing ideas about democracy and equality. From the glories of the Versailles palace to the misery of peasant villages, topics include the beginnings of the French state and nation in the warfare and religious conflicts of 1500s, political and economic developments, the growth of an internationally influential French culture, religious change, controversies over gender roles, and the origins of the French Revolution. Credit will not be given for both HI 414 and HI 514.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 515/HI 415 The French Revolution (3 credit hours)
Broadly based analysis of France's first revolutionary era; the enlightenment and its impact, the causes and character of the Revolution in France; impact of these events in France and Europe. Credit will not be given for both HI 415 and HI 515.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 518/HI 418 Fascist Italy and Nazi Germany (3 credit hours)
Fascism as a theoretical concept, rise of fascism in Italy and Germany, seizure of power by Mussolini and Hitler, organization of the economy, churches, military, women, youth, and culture under the dictatorships. Students will not receive credit for both HI 418 and HI 518.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Spring only

HI 519/HI 419 Modern European Imperialism (3 credit hours)
Historical background of European overseas expansion; its impact on the economics, politics and culture of both Europe and the colonized world; the significance of imperialism and anti-colonial nationalism in shaping the modern world. Credit will not be given for both HI 419 and HI 519.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Spring only

HI 521/HI 421 European Intellectual History: The Eighteenth Century (3 credit hours)
Historical examination of some of the major figures of the European Enlightenment, beginning with Locke and ending with Kant. Credit will not be given for both HI 421 and HI 521.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 522/HI 422 European Intellectual History: The Nineteenth Century (3 credit hours)
Historical examination of some of the major figures of European thought during the 19th century, beginning with the enthusiasm of the period of the French Revolution and ending with the disillusionment of the fin de siecle. Credit will not be given for both HI 422 and HI 522.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Fall only

HI 523/HI 423 Women in European Enlightenment (3 credit hours)
Historical analysis of feminist thought and action during the Enlightenment of the 1700s. Topics include women's role in the development of Western knowledge and science, historical construction of the gendered "nature" of women, education and political resources available to women, and their strategies for emancipation. Credit will not be given for both HI 423 and HI 523.

P: 3 hrs. of History

GEP Global Knowledge

Typically offered in Spring only
History of the Soviet Union and After (3 credit hours)
History of the Soviet state and society from the 1917 Revolution, including post-Soviet situation. Political disarray and resistance to the Bolshevik regime, 1917-21; industrialization, urbanization and application of coercive techniques of rule; popular reconciliation with Party state and great power status during World War II and after; fate of non-Russian nationalities; de-Stalinization, stagnation and failed attempt at Party renewal after 1985. Credit for both HI 439 and HI 539 is not allowed.

Prerequisite: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

American Environmental History (3 credit hours)
Interactions between humans and their environments in America; environmental focus on themes in American history such as colonial settlement, industrialization, progressivism, the New Deal, the 1960s. Credit will not be given for both HI 440 and HI 540.

Prerequisite: 3 hours of History
GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 541/HI 441 Colonial and Revolutionary U.S. (3 credit hours)
Origins of the English colonies in America to the American Revolution. European background to colonization, merging of different cultures, effects of mercantile doctrine, causes of revolution. Credit will not be given for both HI 441 and HI 541.

Prerequisites: Graduate standing
Typically offered in Fall only

Modern France (3 credit hours)
French history from the downfall of Napoleon I to the present, with a short introductory survey of the Old Regime and the French Revolution. Cultural, social and economic developments and political trends. Credit will not be given for both HI 430 and HI 525.

Typically offered in Spring only

Tudor and Stuart England (3 credit hours)
British history from the Reformation through the Civil War. Emphasis on key developments in social, political and economic life: The development of a new concept of kingship, the growing independence of Parliament, the search for religious uniformity and the changing status of the aristocracy and gentry. Credit will not be given for both HI 425 and HI 525.

P: 3 hrs. of History
GEP Global Knowledge

Typically offered in Fall only
HI 446 | Topics in Civil War and Reconstruction (3 credit hours)
Examination of the historiography of the American Civil War and Reconstruction. Topics include the origins of the war, military strategy, the northern and southern homefront, nationalism and citizenship, slavery and freed labor, changing gender roles and ideologies, struggles over racial inequality, and conservatism and radicalism during Reconstruction. Credit will not be given for both HI 446 and HI 546.

Prerequisite: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

HI 447/WGS 547 | Women in America: From Contact to the Civil War (3 credit hours)
The historical experience of women in America from Native American and European contact through the colonial period to the immediate post-Civil-War years (to 1890). Topics include the history of women's work, education, legal and political status, religious experience, and sex roles, with consideration of age, class, race, sexual preference, and region as significant variables in women's experience in America. Credit will not be given for both HI (WGS) 447 and HI (WGS) 547.

P: 3 Hours of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

HI 448/WGS 548 | American Women in the Twentieth Century (3 credit hours)
Women's historical experience in America, 1890-1990. Changes in women's work, education, legal and political status, and sex roles, age, class, race, sexual preference and region as significant variables in women's experience. Credit will not be given for both HI (WGS) 448 and HI (WGS) 548.

P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

HI 449 | U.S. Labor to 1900 (3 credit hours)
This course explores the history of work, workers, and working-class life and labor in the United States from the founding of the first European colonies to the beginning of the twentieth century: bound and free labor in colonial America, the transformation of urban worklife in the decades preceding the Civil War, slavery and class formation in the antebellum South, the effects of immigration on American workers, and the impact of race and gender on workers' solidarity. Credit will not be given for both HI 449 and HI 549.

P: 3 hrs. of History
GEP U.S. Diversity

HI 540 | U.S. Labor Since 1900 (3 credit hours)
This course explores the history of work, workers, and working-class organizations in the twentieth century United States; with particular attention to three core issues in twentieth-century American labor history: whether the US South has a particular form of labor history; the historical struggle for workers' rights to collectively act and protest; and the intersections between race, ethnicity, immigration and labor in the twentieth-century US. Credit for both HI 450 and HI 550 is not allowed.

Prerequisite: Graduate standing

HI 545 | The Vietnam War (3 credit hours)
The Vietnam War in Vietnamese historical context. A study of major works on the legacy of French colonialism; the growth of Vietnamese radicalism and communism; World War II and the Vietnamese Revolution; the French Indochina War and political division

Prerequisite: 3 hours of History
Typically offered in Spring only

HI 549 | Recent America (3 credit hours)
Examination of contemporary opinions and historical interpretations of major problems in American life since 1939, including World War II, its social and economic consequences; Korea and the Cold War, big business and labor; civil rights and feminist movements; countercultures, Vietnam and Watergate. Credit will not be given both for HI 452 and HI 552.

P: 3 Hours of History

HI 555 | United States-Latin American Relations Since 1823 (3 credit hours)
Critical analysis of the last two centuries of relations between the US and Latin America. Exploration of major policies using primary sources and declassified CIA documents. Major themes include US economic, political, and military influence, covert and overt US interventions, and response by Latin American governments. Historical perspectives on contemporary inter-American problems such as drugs, environment, debt crisis, human rights abuses, and the impact of the Latino population in the US. Credit will not be given both for HI 453 and HI 555.

Prerequisite: 3 hrs. of History
Typically offered in Fall only

HI 556 | History Of U. S. Foreign Relations, 1900-Present (3 credit hours)
American diplomatic history since 1900; the expansion of American economic and cultural relations; the evolution of the American foreign policy bureaucracy; and the historical forces and personalities that shaped American relations with other nations. C

Typically offered in Fall only

HI 557 | History of the Civil Rights Movement (3 credit hours)
The black revolution; stages and leaders of the movement; successes and failures in the fight for desegregation, the vote, and economic opportunity; impact of Civil Rights movement on the United States. Credit will not be given both for AFS/HI 455 and AFS/HI 555.

P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity

HI 558 | The Early American Republic (3 credit hours)
Examines the social, political, and cultural development of the Early Republic, the period in American history roughly from the Revolutionary War through the Administration of John Quincy Adams. Employs the life of Thomas Jefferson-the quintessential American, as the foundation for delving into the historical problems, interpreting primary sources, and analyzing secondary sources. Encourages graduate students to analyze the ways in which historiographic debates complicate our understanding of the Early American Republic. Credit will not be given for both HI 459 and HI 559.

Prerequisite: 3 hrs. of History
HI 561/HI 461 Civilization of the Old South (3 credit hours)
The distinctive features of the Old South as part of the regional development of United States history. Consideration of colonial factors in the making of the South, development of the plantation system and slavery, Southern social order, intellectual and cultural life, economic development, and rise of Southern nationalism. Credit will not be given for both HI 461 and HI 561.

Prerequisite: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

HI 562/HI 462 Southern History since the Civil War (3 credit hours)
Exploration of many American "Souths" from Reconstruction to the present. How race/ethnicity, gender, class, geography, sexuality, and culture inform "Southern" identity; major political and economic changes; and the region's relationship to the nation and the world. Credit will not be given for HI 462 and HI 562.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall and Spring

HI 563/HI 463 Topics in History and Memory (3 credit hours)
Explores how "collective memory" develops. Examines how memory is represented through public speeches, civic celebrations, monuments and memorials, and other forms of popular and political culture. Analyzes what is recalled, what is forgotten, and who decides. Asks why memory is made public. May be repeated once for credit when offered with a different topic. Credit will not be given for both HI 463 and HI 563.

Typically offered in Fall, Spring, and Summer

HI 566 Readings in Native American History (3 credit hours)
Readings in the varied historical experiences of nations native to North America from the first migrations of peoples into the continent until the present, including the variety and diversity of native cultures and experiences; native resistance to colonialism, expansion, and U.S. federal policies; and the survival and continuity of native cultures and peoples through more than four centuries of contact, conquest, and change.

HI 568/HI 468 Slavery in the Americas (3 credit hours)
Exploration of the development of chattel slavery throughout the Americas. Analysis of the emergence and development of New World slavery in ways that encourage students to think critically about the historical processes of abolition, emancipation, and freedom across the Atlantic world. The lectures and readings seek to dislodge the notion that the "history of slavery" only pertains to the United States. The course, instead, emphasizes commonalities and differences in ways that challenge assumptions that the institution was exceptional in any given region. Credit will not be given for both HI 468 and HI 568.

Prerequisite: 3 Hours of History and Junior Standing
GEP Global Knowledge
Typically offered in Spring only

HI 569/HI 469 Latin American Revolutions in the Twentieth Century (3 credit hours)
Comparative analysis of causes, participants, process, and outcome of revolutions in Mexico, Bolivia, Cuba, and Central America. Credit for both HI 469 and HI 569 will not be given.

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Spring only

HI 570/HI 470 Exploring World History (3 credit hours)
Introduction to the methods, themes, and narratives of world history. As a distinct approach to historical study, world history focuses on dynamic connections and relationships among regions of the world and the variety of global processes - related to trade, religion, production, consumption, migration, imperialism, disease, and technologies - that connected them. The course is a suggested elective for future teachers who will teach world history in high school, as well as an ideal course for History majors and graduate students who want to explore the connections among all the regionally specific upper division courses they have taken. Credit will not be given for both HI 470 and HI 570.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

HI 571/HI 471 Revolutionary China (3 credit hours)
China 1900 to present. Examination of political, cultural, and socio-economic revolutionary phases of China's 20th-century transformation from traditional empire to communism. Particular attention to post-1949 problems of nation-building. Credit will not be given for both HI 471 and HI 571

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 572 The Rise of Modern Japan, 1850-Present (3 credit hours)
Japan's emergence as a modern nation and world power. Topics include nation-state formation; modernization and its dislocations; democratization and authoritarianism; imperialism, international politics, and war; postwar reforms; changing gender relations, popular culture, and social problems. Credit will not be given for both HI 472 and HI 572

Prerequisite: Graduate standing
GEP Global Knowledge
Typically offered in Spring only

HI 573/AFS 473 Japan's Empire in Asia, 1868-1945 (3 credit hours)
An advanced survey of Japanese relations with Asia in the nineteenth and twentieth centuries. Structures and ideologies of imperialism and colonialism; modernization, nationalism and social change; migration and mobility; resistance and collaboration; and legacies of empire. Credit will not be given for both HI 473 and HI 573

P: 3 hrs. of History
GEP Global Knowledge
Typically offered in Fall only

HI 575/AFS 575/HI 475/AFS 475 History of the Republic of South Africa (3 credit hours)
Evolution of the Republic of South Africa's society, with emphasis on the interaction of diverse peoples and cultures. Particular attention is given to the period since 1870. Credit will not be given for both HI (AFS) 475 and HI 575.

Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Fall and Spring
HI 576/AFS 576/HI 476/AFS 476  Leadership in Modern Africa  (3 credit hours)
Recent sub-Saharan African political history (excluding South Africa).
Overview of concepts, vocabulary, historical trends. Detailed examination of
specific African countries as case studies, such as Ghana, Nigeria,
Zimbabwe, Tanzania. Credit will not be given for both HI (AFS) 476 and
HI 576.
Prerequisite: 3 hours of history
GEP Global Knowledge

HI 578 Islam and Christianity in Sub-Saharan Africa since the 19th
Century  (3 credit hours)
Expansion and interaction of Islam and Christianity in sub-Saharan
Africa in the nineteenth and twentieth centuries, and their influence and
impact on the economy, politics, and society. Topics include missionary
activity, resistance to imperial authority, the role of the churches, and
the influence of religion on leadership, education, nationalism, and post-
colonialism. Credit will not be given for both HI 478 and HI 578; graduate
standing for HI 578.
Typically offered in Fall only

HI 579/AFS 579/HI 479/AFS 479  Africa (sub-Saharan) in the
Twentieth Century  (3 credit hours)
Developments in sub-Saharan Africa during the colonial period, from the
end of the nineteenth century to the advent of decolonization in the early
1960s. Interplay of political, social, economic and cultural factors in the
experiences of African peoples during this period. Credit will not be given
for both HI (AFS) 479 and HI 579.
Prerequisite: 3 hours of History
GEP Global Knowledge
Typically offered in Spring only

HI 581/HI 481  History of the Life Sciences  (3 credit hours)
Historical context of the individuals, ideas, scientific practices, and
social goals that created the core concepts of the modern biological
sciences, from Renaissance medicine to molecular biology, with a focus
on interconnections of the scientific knowledge and perspective of the life
sciences with other aspects of culture, including other sciences, views
about nature and life, religious belief, medical practice, and agriculture.
Topics include the development of biological experiments; theories of
ecology and evolution; the chemical understanding of health, food, and
drugs; and the modern molecular revolution. Credit will not be given
for both HI 481 and HI 581.
P: 3 hrs. of History
GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 582/HI 482  Darwinism in Science and Society  (3 credit hours)
Scientific development of Darwinism and its reception by the scientific
community and the general public. Social impact of theories of evolution
as reflected in Social Darwinism, eugenics, sociobiology, and relationship
of sciences to ethics and religion. Credit will not be given both for HI 482
and HI 582.
P: 3 hrs. of History
GEP Interdisciplinary Perspectives
Typically offered in Spring only

HI 583/HI 483  Science and Religion in European History  (3 credit hours)
Are science and religion inherently in conflict with each other? Historical
analysis of the idea of the “warfare between religion and science,”
treating their complex relationship and respective cultural authority before
1800, including the relationship of science and religion in Europe during
periods of the Reformation, the creation of early modern states, and the
Enlightenment of the 1700s. Topics include visions of nature and utopias,
the creation of mechanistic science in the 1600s, and natural theology.
Credit will not be given for both HI 483 and HI 583.
P: 3 hrs. of History
GEP Global Knowledge, GEP Interdisciplinary Perspectives

HI 584/HI 484  Science in European Culture  (3 credit hours)
The role of science in shaping early modern European identity, culture
and polity in the 1600s and 1700s. Drawing on documents and material
culture, topics include the meaning of natural wonders, explorations,
travel literature, instruments and mapping, colonies and empire, and
universal expos. Credit will not be given for both HI 484 and HI 584.
P: 3 hrs. of History
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall only

HI 585/HI 485  History of American Technology  (3 credit hours)
Technology in American history: the ideological, social, economic, and
institutional contexts of technological change from the 1760’s to the
present. Impacts of new technological systems. Credit will not be given
for both HI 485 and HI 585.
Prerequisite: 3 hours of History
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HI 586/HI 486  Science and Empire  (3 credit hours)
The development of European science in the context of world exploration,
global commercial expansion, local knowledge, and visions of
colonization and empire. Credit will not be given for both HI 486 and
HI 586.
Prerequisite: 3 hours of History
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

HI 587/ANT 587  Cultural Resource Management  (3 credit hours)
Theoretical and practical overview of U.S. federal and state laws,
institutions, and practices related to the inventory, evaluation,
reservation, protection, and overall management of cultural resources;
history and philosophical bases of Cultural Resource Management
(CRM); professional ethics; indigenous and other stakeholder interests
in CRM; and comparative national regulations outside the U.S. and the
international heritage management and organizations. Graduate standing
in history required.
Typically offered in Spring only

HI 588/HI 488  Family and Community History  (3 credit hours)
Theory and research in family history, local history, and community
studies, as well as application to public history presentation and
community development. Students cannot receive credit for both HI 488
and HI 588.
Typically offered in Fall only
HI 589 Interpretation in Historic Sites and Parks (3 credit hours) Methodologies of interpreting history at historic sites and parks; training in interpretive tools linking historiography and research methodology with real places for presentation to the public; considerations of practical application. Five day trips required.

Requisite: NCSU Graduate Students (MR or DR), NDS Students Only

Typically offered in Spring only

HI 591 Museum Studies (3 credit hours) Organization and operation of museums as historical agencies. Role of museums in historical research and education. Graduate standing or NDS.

Typically offered in Fall only

HI 593 Material Culture (3 credit hours) Current theories of material culture analysis and their application to history museums. Graduate standing or NDS.

Typically offered in Spring only

HI 594 Cultural Heritage (3 credit hours) Use of the past and its cultures in reinforcing identities. Global development of heritage preservation, cultural resource management, and heritage tourism. Role of heritage professionals in identification, study, assessment, preservation, interpretation, management, and promotion of historic and cultural resources. Law and regulations that protect and preserve cultural resources. Graduate standing or NDS.

Typically offered in Fall only

HI 595 Special Topics in History (1-6 credit hours) Topical courses or experimental course offerings in advanced historical study.

Prerequisite: Graduate standing

Typically offered in Fall, Spring, and Summer

HI 596 Introduction To Public History (3 credit hours) Historical origins of public history, applications of history to public life, historiography and major paradigms in the field, and debates about the public role of historians. Graduate standing in History.

Typically offered in Fall only

HI 597 Historiography and Historical Method (3 credit hours) Major steps in development of historical investigation; analysis of elements of historical research; discussion of methodology and archival materials used by contemporary scholar historian.

Typically offered in Fall only

HI 598 Historical Writing (3 credit hours) Critical studies in the methods and practice of contemporary historical writing.

Prerequisite: Graduate standing or PBS status

Typically offered in Spring only

HI 599 Independent Study (1-3 credit hours) Individualized study conducted under supervision of graduate faculty. Course of study, assigned readings, course projects or papers, and methods of evaluating work to be detailed in writing and approved by department head.

Prerequisite: Graduate standing or PBS status

Typically offered in Fall, Spring, and Summer

HI 642 Internship In Public History (3 credit hours) Supervised internship experience with a public or private historical agency or institution or local, regional, or national significance. Graduate standing in History.

Typically offered in Fall, Spring, and Summer

HI 685 Master's Supervised Teaching (1-3 credit hours) Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student

Typically offered in Spring only

HI 693 Master's Supervised Research (1-9 credit hours) Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

HI 695 Master's Thesis Research (1-9 credit hours) Thesis Research

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

HI 696 Summer Thesis Research (1 credit hours) For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student

Typically offered in Summer only

HI 699 Master's Thesis Preparation (1-9 credit hours) For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits Arranged

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

HI 787 African American Public History (3 credit hours) Issues in public history practice as they relate to the collection, preservation, and interpretation of African American cultural history. Graduate standing in history required.

Typically offered in Spring only

HI 788 Native American Public History (3 credit hours) Issues in public history practice as they relate to the collection, preservation, and interpretation of Native American history. Graduate standing in history required.

Typically offered in Fall only

HI 789 Internship In Public History (3 credit hours) Supervised internship experience with a public or private historical agency or institution or local, regional, or national significance. Graduate standing in History.

Typically offered in Fall, Spring, and Summer
History of Art (HA)

HA 201 History of Art from Caves to the Renaissance (3 credit hours)
Art from prehistory through Ancient Greece and Rome through Italian Renaissance. Major art forms of painting, sculpture, and architecture, and how they reflect their historical context.

GEP Visual and Performing Arts
Typically offered in Fall only

HA 202 History of Art From the Renaissance Through the 20th Century (3 credit hours)
Art from the Northern Renaissance in Europe through the 20th century in Europe and America: painting, sculpture and architecture recent mixed media techniques such as collage, and trottage.

GEP Visual and Performing Arts
Typically offered in Spring only

HA 203 History of American Art (3 credit hours)
A history of American Art (painting, sculpture and architecture) from the Colonial Period through the 20th century.

GEP Visual and Performing Arts
Typically offered in Fall and Spring

HA 240/HI 240 Introduction to Visual Culture (3 credit hours)
Introduction to the role of visual cultural production in the nineteenth and twentieth centuries in expressing and shaping both individual and collective identities. Case studies of imperialism, gender, and war draw from different regional histories and utilize a variety of visual genres - such as photography, popular posters, painting, advertising, and film stills - to study how visual culture can be used as evidence to understand the past, using the approaches of the disciplines of History and Art History.

Prerequisite: Sophomore standing
GEP Global Knowledge, GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

HA 298 Special Topics in Art History (3 credit hours)
Special topics in art history with emphasis on chronological periods such as 20th-century art of the Italian Renaissance or on fields of art such as paintings, sculpture, photography, or architecture.

Typically offered in Fall, Spring, and Summer

HA 395 History of Art: Study Abroad (3 credit hours)
Topical History of Art courses taught in NC State Study Abroad programs. (Current listings available in History Department, Study Abroad Office and CHASS Dean's Office.)

Typically offered in Fall, Spring, and Summer

HA 401 19th Century European Art from Revolution to Post-Impressionism (3 credit hours)
From the politically charged art of the French Revolution, through Neo-classicism, Romanticism, Realism, Impressionism and Post-Impressionism, this course examines styles, subject matter and cultural context of the many, rapid artistic changes in the long 19th century.

Prerequisite: HA 201 or HA 202
GEP Visual and Performing Arts

HA 404 Italian Renaissance Art and Material Culture (3 credit hours)
From villas to teaspoons, this course investigates daily life in Renaissance Italy, 1300-1550, through the architecture, painting, sculpture, and art objects that people commissioned and used. Works of art will be analyzed in terms of style, subject matter, and historical context.

Prerequisite: 3 hrs. of HA
GEP Visual and Performing Arts

HA 410 History of the Art of Photography (3 credit hours)
History of and the interaction between art and photography from the invention of photography to the present.

Prerequisite: 3 Hours of History of Art, Film, History, or Literature
GEP Visual and Performing Arts

HA 498 Independent Study in History of Art (1-6 credit hours)
Directed independent study of topics in the History of Art. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" to be completed by the student and faculty member prior to regis

Prerequisite: 3 hours History of Art
Typically offered in Fall and Spring
Honors (HON)

HON 202 Inquiry, Discovery, and Literature (3 credit hours)
A study of works of literature that treats the themes of inquiry and discovery--its risks, its creativeness, its ambiguities and complexities, and its moral dilemmas--through selected works from literature and other media, including theater, music, visual arts, and film. Analysis of each work in terms of its historical context and internal structure as well as its treatment of the nature of inquiry and discovery.

Prerequisite: HON student
GEP Humanities
Typically offered in Fall and Spring

HON 290 Honors Special Topics - Humanities/US Diversity (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GEP requirements in Humanities and US Diversity co-requisite. Interdisciplinary in character and often team-taught.

Restricted to students in the University Honors Program. Other students upon approval.
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

HON 291 Honors Special Topics - Mathematics (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in mathematics, interdisciplinary in character and often team-taught.

Prerequisite: HON student
GEP Mathematical Sciences
Typically offered in Fall and Spring

HON 292 Honors Special Topics - Natural Sciences (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the natural sciences, interdisciplinary in character and often team-taught.

Prerequisite: HON student
GEP Natural Sciences
Typically offered in Fall and Spring

HON 293 Honors Special Topics - Interdisciplinary Perspectives/Global Knowledge (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GEP requirements in Interdisciplinary Perspectives and Global Knowledge co-requisite. Interdisciplinary in character, and often team-taught.

Restricted to students in the University Honors Program. Other students upon approval.
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HON 294 Honors Special Topics - Humanities (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the Humanities, and interdisciplinary in character.

Prerequisite: HON student
GEP Humanities
Typically offered in Fall and Spring

HON 295 Honors Special Topics - Social Science (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the social sciences, interdisciplinary in character, and often team-taught.

Prerequisite: HON student
GEP Social Sciences
Typically offered in Fall and Spring

HON 296 Honors Special Topics - Interdisciplinary Perspectives (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Interdisciplinary Perspectives.

Prerequisite: HON student
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HON 297 Honors Special Topics - Interdisciplinary Perspectives/US Diversity (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GEP requirements in Interdisciplinary Perspectives and US Diversity co-requisite. Interdisciplinary in character and often team-taught.

Restricted to students in the University Honors Program. Other students upon approval.
GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall and Spring

HON 298 Honors Research/Independent Study (1-3 credit hours)
Research/Independent Study for University Honors Program students. Repeatable if content differs. Research or independent study under supervision of faculty members. Project approval by the Honors Program Advisory Committee necessary prior to register.

Typically offered in Fall and Spring

HON 299 Honors Special Topics - Visual and Performing Arts (3 credit hours)
Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Visual and Performing Arts, interdisciplinary in character and often team-taught.

Prerequisite: HON student
GEP Visual and Performing Arts
Typically offered in Fall and Spring

HON 300 Race, Membership, and Eugenics (3 credit hours)
Theories of race are linked to eugenics, a belief and practice of improving the genetic quality of the human population drove much of American social policy in the early 20th century. The practice and science that supports it has historical roots in the US and in particular for poor people and people of color. This course will examine race, membership, and eugenics and the impact on American society, as well as explore the scientific and social trends that supported the movement. Course restricted to University Honors Program Students; others by permission of the UHP.

R: University Honors Program Students; others by permission of the University Honors Program
GEP U.S. Diversity
Typically offered in Fall and Spring
HON 310 The Creative Process in Science: Realities, Comparisons, and Culture Perceptions (3 credit hours)
What is creativity in the context of the sciences? How does the creative process in science differ from and how is it similar to the creative process in other fields? This interdisciplinary perspectives course helps students develop an understanding of scientific creativity through readings in history and philosophy of science, in the psychology of creativity, in original scientific papers, in biography and in memoirs. Student will analyze representations of scientific creativity in films and literature, conduct interviews with scientists, artists, musicians, and humanists, and analyze the social and institutional context of creativity.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Spring only

HON 311 Words through Space and Time (3 credit hours)
Cultures differentiate and frame events in various ways. At the heart of conceptual events are WORDS: an inventory of the ways a particular group of people depict and understand the interactions they have with each other and with the world around them. Through a detailed examination of lexical phenomena in cultures around the world, we will become familiar with the ways in which language and culture interact, the extent to which these surface in our everyday lives and the explanations proposed by various fields for their existence.

GEP Global Knowledge, GEP Interdisciplinary Perspectives

HON 312 Outbreak (3 credit hours)
Students will evaluate disease outbreaks from multiple different perspectives, including the biology of the infectious agent, clinical implications, and social/economic/political factors contributing to the spread of the disease or that were impacted by a major epidemic/pandemic. This course will be inquiry-guided. The instructor will not generally be "presenting material", but rather providing the structure in which students will be guided to investigate the issues from multiple perspectives through the use of case studies, primary and secondary literature, student-driven research and presentations, and concept mapping.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

HON 313 Reading Machines (3 credit hours)
This course invites first-year students into a historically ranging, critically intensive, and hands-on learning environment about the technologies by which humans transmit our cultural inheritance and ideas. "Reading Machines" takes a long view of how we got to now, from the history of manuscripts and books to the electronic platforms of the digital present. These are all machines of reading; in turn, this class will "read" those machines as objects of study. The course proposes that 1) then and now, our technologies for sharing text, image, and data crucially shape the ideas which they convey, and 2) these contexts can help students plan and execute new mechanisms for communication in the present. The course's modules offer critical frameworks of background readings and discussions, a lab-like experience with the materials or skills involved, and applied projects for students to experiment with and study.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HON 314 Kantian Ethics (3 credit hours)
In this course students will be introduced to foundations of morality by exploring one of the most significant moral theories in the history of philosophy. Kantian ethics. The course will focus on Kant's ideas about morality and discuss his proof of the fundamental principles of ethics. Students will be introduced to some of the enduring moral questions, such as What ought I do? What can I hope? Are there universal moral principles and whether I ought to follow them? They will learn a variety of approaches to ethical issues and their reflection in social and political reality.

GEP Humanities
Typically offered in Spring only

HON 340 Religion and Freedom (3 credit hours)
For a variety of reasons, "religion" is one of the most controversial subject matters in contemporary cultures. Beyond sensationalism and outrage, though, modern societies have taken shape in part through complex debates about the role (or lack thereof) of religion in public life. At the core of these considerations are clashing understandings of the relation between religion and freedom, two broad categories with a range of different meanings. This course will explore these differing understandings by considering: legal arguments proposing freedom of religion, and the challenges of religious pluralism; arguments urging freedom from religion, in defense of secular public life; and invocations of freedom through religion, via human creative expression, social activism, ritual, or cosmology. We will examine not just scholarly writings about religion but literature, films, and other media that have shaped the ongoing conversation.

R: University Honors Program Students; others by permission of the University Honors Program
GEP Interdisciplinary Perspectives
Typically offered in Fall only

HON 341 Time Travel (3 credit hours)
A study of contemporary metaphysics organized around the topic of time travel. David Lewis, perhaps the foremost contemporary metaphysician, argues that time travel is possible. His argument is based on ingenious positions about three central topics of metaphysics, personal-identity, causation, and free will. Students will consider each of these topics in some detail, always with an eye to their implications for time travel.

Prerequisite: HON student
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

HON 344 On the Human (3 credit hours)
Students in this seminar course actively explore human singularity: the properties, if any, that distinguish persons from animals and machines. Do we have souls? To what extent can we give physical explanations of our thoughts and actions? What, if anything, do scientific experiments tell us about our differences from chimps and artificial intelligences? What are the ethical implications of new biotechnologies? Should we be allowed to use genetic and neural engineering to change human nature? Students read articles, watch videos, stimulate class discussions with prepared questions, write short essays and a final paper, and participate in a 60-minute team presentation.

GEP Humanities
Typically offered in Fall and Spring
HON 347 Freedom and the Self (3 credit hours)
This course explores the complex and interrelated concepts of freedom and the self. The bulk of our time will be devoted to a close reading of several philosophical texts in which these concepts loom large. The course ends with a careful examination of three novels that, in various ways, take up the central themes of the class. Our intention in doing so is to reflect on the way that imaginative novelists treat these themes. This will enable us to ask broader and more interesting questions about freedom and selfhood.

R: University Honors Program Students; others by permission of the University Honors Program
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HON 348 Emotion and Reason (3 credit hours)
Consider the range of emotions that one experiences in a lifetime, from the joy of being with your loved ones to the fear of losing them, from the thrill of success to the sadness of defeat. Pleasant or aversive, emotions play a central role in our lives. Despite their obvious importance, emotions have been considered by many philosophers to be inferior to another distinctive faculty in human beings, namely reason. The idea that emotions are primitive, irrational and dangerous and thus to be controlled and constrained by reason has been embraced by eminent thinkers from Plato and the Stoics to Kant. In this course, we will focus on the relationship between reason and emotion in moral cognition and cognition more generally, and we will investigate how/to what extent reason can be said to be distinct from and superior to emotion.

Restriction: University Honors Program students. Open to other students by permission of the UHP.
GEP Interdisciplinary Perspectives
Typically offered in Fall only

HON 352 Self, Schooling, and the Social Order: A Critical Examination (3 credit hours)
What is the purpose of schooling? What role does it play in producing particular types of citizens and social structures? Theorists have imagined education as a space for democracy, as a way to cultivate identity, or as a method to train workers. All of these imaginations attempt to understand interrelationship between the self, schooling, and the social order. This course will survey major social theories and, within the context of those theories, encounter texts which examine how schooling serves to maintain or subvert the social order. Course restricted to University Honors Program students; others by permission of the UHP.

GEP Social Sciences, GEP U.S. Diversity

HON 353 Code Breakers: Unlocking the Mysteries of One Human Language (3 credit hours)
This course will introduce you to the architecture of one language. Students will work from scratch with a speaker of a language that none of us know, with the goal of unlocking the mysteries of that language at all levels - sound system, word formation, sentence structure, semantics and pragmatics. You will learn how to elicit field data through direct questioning and gathering of texts, how to organize field data, how to prepare entries in a field dictionary, and how to organize and write grammar. Course restricted to University Honors Program students; others by permission of the UHP.

GEP Global Knowledge, GEP Social Sciences

HON 360 Music and Oppression (3 credit hours)
Music and Oppression will examine how people use music both as a tool of oppression and a method of resisting oppression. Course topics will include the use of western classical music by colonial powers; music and torture; music during World War II (including the use of music in concentration camps and as propaganda in Allied and Axis countries); music in Indian Boarding Schools; music in the American Civil Rights Movement; and hip hop as the music of oppressed populations in Europe and the United States. Reading assignments will come from a wide range of sources and disciplinary perspectives including scholarly articles, book chapters, and personal memoirs. We will listen to and discuss music from multiple genres including hip hop, pop, jazz, folk, and the western classical tradition. No previous musical experience as a performer is required to be successful in this class.

R: Honors or Scholars
GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HON 390 Music and the Celtic World (3 credit hours)
In this course, students explore the diverse musics of the Celtic world, from cultural practices of the ancient Celts to folk and popular traditions of Ireland, Scotland, Wales, Brittany, Galicia, Cape Breton, and the United States. They investigate the origin and meanings of “Celtic music,” and study its diverse instrumental, vocal, and dance traditions, and its varied performance practices, occasions, and purposes. Through history, literature, poetry, spirituality, and mythology, students examine the realities and fictions of the ancient and modern Celtic world. Through live and recorded music and dance performance, they consider the continuities of Celtic culture across time and space, and the significance of Celtic music today in terms of cultural identity, tradition, and globalization.

R: University Honors Program
GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Visual and Performing Arts
Typically offered in Spring only

HON 395 Honors Cooperative Education (3 credit hours)
Experimental work in government or industry for Honors Program students with two semesters completed in Honors. Typically students work 40 hrs/week with salary. Work supervisor, faculty adviser and Honors Program Director must sign HON 395 Honors Cooperative Ed contract. NC State cooperative Education requires paper work; student must pay fee rate for a 0-5 credit hour course. No other courses permitted along with HON 395. Student report of the independent project is required.

Prerequisite: Two semester full time in University Honors Program
Typically offered in Fall and Spring

HON 397 Honors Extension and Engagement (1-6 credit hours)
Opportunity for significant hands-on involvement in extension and engagement research/project as mentored by NC County Extension employees often in cooperation with community employers/executives, local and government officials, and county citizens. Approved plan of work required with significant independent research/project including a reflective journal, a final paper and presentation at the NC State Undergraduate Research Symposium or a venue appropriate to the discipline. Students must provide their own transportation.

Prerequisite: One semester good standing in University Honors Program
Typically offered in Fall and Spring
HON 398 Honors Special Topics (1-6 credit hours)
A seminar or other learning experience within an academic framework that may be on- or off-campus. Enables the development of new HON courses outside the GER list.

GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

HON 496 Honors Capstone Seminar (3 credit hours)
Honors Seminars open to Juniors and Seniors in all disciplinary Honors Programs, and others with permission of the University Honors Program. Repeatable if content differs. A series of seminars with differing subjects, interdisciplinary in character and sometimes team-taught, allowing advanced students to explore topics from a multidisciplinary perspective and to apply their knowledge to issues and problems in the present world. Permission of the University Honors Program

Prerequisite: HON student
Typically offered in Fall and Spring

HON 498 Honors Research/Creative Project 1 (3 credit hours)
Opportunity for hands-on faculty mentored research/creative project. Course may be stand-alone project completed in one semester/summer, or serve as part of a two semester project that is completed at the end of Honors Research/Creative Project 2 (HON 499). Approved plan of work required with significant independent research/creative project culminating with final paper and presentation at the NC State Undergraduate Research Symposium or other venues appropriate to the discipline. Research within or outside the student's discipline may fulfill experience. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: One semester in good standing in University Honors Program, UHP student
Typically offered in Fall, Spring, and Summer

HON 499 Honors Research/Creative Project 2 (3 credit hours)
Opportunity for hands-on faculty mentored research/creative project. Course serves as final part of a two-semester project that began with Honors Research/Creative Project 1 (HON 498) or approved disciplinary research experience. Approved plan of work

Prerequisite: One semester in good standing in University Honors Program, UHP student
Typically offered in Fall, Spring, and Summer

Horticulture Science (HS)

HS 101 Introduction to Ornamentals and Landscape Technology (1 credit hours)
Introduction to the collegiate experience, academic skills of successful students, and scope, purpose, and objectives of the Agricultural Institute with an emphasis on areas related to the ornamental and landscape plants industry. Students will explore college and departmental resources, academic policies and procedure, the green industry, career opportunities, and current trends and issues in horticulture.

Prerequisite: Agricultural Institute Only
Typically offered in Fall only

HS 111 Plant ID (3 credit hours)
Identification, adaptation, culture, and use of ornamental trees, shrubs, vines, ground covers and herbaceous plants.

Prerequisite: Agricultural Institute Only
Typically offered in Fall only

HS 115 Plant Growth and Development (3 credit hours)
Examination of how plants grow and respond to environmental and cultural stimuli. Topics include: cell growth; flower, fruit, seed, shoot, and root development and functions; anatomy of stems, roots and leaves; hormonal regulation of growth; adaptations for survival; plant responses to temperature, light and gravity; photosynthesis, transpiration, and absorption of water and nutrients.

Prerequisite: Agricultural Institute Only
Typically offered in Fall only

HS 121 Plant Propagation (3 credit hours)
Principles and practices involved in sexual (seed) and asexual (vegetative) propagation of a variety of plants. Methods of asexual propagation include cuttings, layering, budding and grafting, division, separation, and micropropagation (tissue culture). Emphasis on factors affecting the regeneration of species by particular techniques.

Prerequisite: Agricultural Institute Only
Typically offered in Spring only

HS 131 Fruit & Vegetable Production (3 credit hours)
The objective of this course is to give students a fundamental and practical understanding of small-scale fruit & vegetable production in North Carolina. Agricultural Institute students only.

Prerequisite: Agricultural Institute Only
Typically offered in Spring only

HS 141 Greenhouse Crop Production (3 credit hours)
Production of greenhouse crops. Emphasis on greenhouse construction and environmental manipulation of crop growth. Site selection, construction materials, greenhouse design. Specific flowering crops as models to demonstrate potted flowering plant, cut flower, and bedding plant production systems. Hands-on crop production experience plus trips to commercial floriculture production and marketing facilities.

Typically offered in Spring only

HS 144/PP 144 Weeds & Diseases of Ornamentals (3 credit hours)
The objective of this course is to give students a fundamental and practical understanding of weed, disease, and pesticide management in the ornamental industries in North Carolina. Agricultural Institute students only.

Prerequisite: Agricultural Institute Only
Typically offered in Fall only

HS 151 Nursery Production (3 credit hours)
Total aspects of field and container nursery stock production including site selection and development, propagation, growing procedures, harvesting, marketing, shipping and labor management practices.

Prerequisite: Agricultural Institute Only
Typically offered in Spring only
HS 162 Landscape Maintenance  (3 credit hours)
A study of the maintenance of landscaped areas including plant material selection, installation, pruning, fertilization, and pest control of trees, shrubs, lawns, flower beds, and interior plants.
Requisite: Agricultural Institute Only
Typically offered in Fall only

HS 171 Landscape Construction  (3 credit hours)
This course will provide students a fundamental and practical understanding of landscape construction techniques and equipment. AGI students only.
Requisite: Agricultural Institute Only
Typically offered in Spring only

HS 175 Horticulture Entrepreneurial Skills for Local Markets  (3 credit hours)
This course is structured to introduce students to entrepreneurship, startups and the basic principles of business administration and management with focus in the horticulture industry in local markets. The class will give students the opportunity to learn pragmatic skills and tools to start their own business or to be successful managers in local horticulture industries. Students will describe and discuss the following topics: marketing, management, accounting, finance, and the issues involved with starting and managing a small horticultural business.
Typically offered in Spring only

HS 200 Home Horticulture  (3 credit hours)
Introduction and review of home horticulture as it relates to the horticultural enthusiast. A general understanding of plant growth, structure, and development; house plant selection and care, selecting trees, shrubs, and flowers for the home landscape, and other related topics.
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

HS 201 The World of Horticulture: Principles and Practices  (3 credit hours)
Principles of plant growth and development relating to production and utilization of fruit, vegetable, floricultural, and ornamental crops. Historical, economic, and global importance of horticultural crops and services.
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

HS 202 Home Plant Identification  (3 credit hours)
An introductory course developed in conjunction with Longwood Gardens on plant taxonomy, identification, characteristics, and use in the home landscape. A palette of 150 plants will be covered including identification by scientific and common names and aspects of their cultivation. Not for Horticultural Science Majors [SH, THG, THL].
Typically offered in Spring only

HS 203 Home Plant Propagation  (3 credit hours)
Not for Horticultural Science Majors (SH, THG, THL). Substitution of HS 203 for HS 301 are not allowed. An introduction to the basic principles of sexual and asexual plant propagation, including seeds, cuttings, layering, Grafting, and Division.
GEP Natural Sciences
Typically offered in Spring only

HS 204 Home Landscape Maintenance  (3 credit hours)
An understanding of the basic principles of landscape maintenance including, but not limited to, soil fertility and management, tree biology, pruning, turfgrass maintenance, plant selection, irrigation management and waterwise gardening, integrated pest management, and hardscape construction. Not for Horticultural Science majors (SH, THG, THL).
Prerequisite: HS 200 or HS 201
GEP Natural Sciences
Typically offered in Fall and Spring

HS 205 Home Food Production  (3 credit hours)
Home food production will play an important role in increasing the sustainability of the world's food systems for the foreseeable future. The goal of this course is to familiarize students with the scientific knowledge and tried-and-true practices needed to successfully produce food at home, even in small-scale environments such as decks and patios. Off-campus students will be required to participate in two Saturday field trips to visit local home gardens. Distance educations students will be required to visit two home gardens in their area. Not for Horticultural Science Majors (SH, THG, THL).
GEP Natural Sciences
Typically offered in Fall only

HS 215/ANS 215 Agricultural Genetics  (3 credit hours)
To provide an introduction to the science of genetics as applied to agriculture. Emphasis is given to qualitative and quantitative genetics. By the end of this course, students should be able to apply genetic concepts to efficiently solve problems and make predictions necessary for “real-life” agricultural situations.
Prerequisite: BIO 183 or equivalent or instructor's consent
GEP Natural Sciences
Typically offered in Fall only

HS 242 Introduction to Small Scale Landscape Design  (3 credit hours)
Landscape Horticulture is concerned with the small-scale design and use of plants and other materials to help humans relate better to the land. In this course, we will pursue an understanding of this relationship and explore the social, environmental, and economic implications of landscape design and the processes by which this understanding can be employed to design residential landscapes. There are an infinite number of design possibilities for each project, so it's a designer's responsibility and challenge to develop a creative and functional design that accommodates the needs of the users and is appropriate for a specific site.
GEP Visual and Performing Arts
Typically offered in Spring only

HS 250 Home Landscape Design: Creating Garden Spaces  (3 credit hours)
Home landscape design is a 3-credit hour course for non-landscape design majors. Students will be introduced to the various issues associated with landscape design at the residential level. Through a series of Power Point lectures, on-line discussions, and small projects/ exercises, students will gain an understanding of landscape graphics. Skills in design, and develop landscape plans and other forms of landscape graphics. Students will use all of their learned skills to develop a design for a given site using provided design software.
Typically offered in Summer only
HS 252 Landscape Graphic Communication (2 credit hours)
This class is an introduction to the basic graphic skills necessary to develop and communicate creative ideas in landscape design. In the design process, we use graphic skills to communicate our ideas, starting with analysis, moving on to concept, then to design development, and finally to illustrative renderings. The design process will be introduced and serve as a backdrop for incrementally introducing graphic skills. The class will become confident in the use of manual drawing skills, and will be introduced to the use of computer drafting skills. Graphics supplies, with an estimated expense of $120.00, are required for the course.
Prerequisite: Horticultural Science Majors
Typically offered in Spring only

HS 272 Landscape Design/Build (6 credit hours)
This course will consist of the development of design and construction projects, which will incorporate the entire design process culminating with a complete set of construction documents, cost predictions and built projects. Critical and creative thinking strategies are incorporated in teaching and learning activities. Course materials and experiences will prepare the student for further design/build experiences as well as the NC Landscape Contractor's Licensing Exam.
Prerequisite: HS 201 and HS 242
Typically offered in Fall only

HS 280 Hands-On-Horticulture (3 credit hours)
This course will provide students a fundamental and practical understanding of applied techniques in horticulture. Students will learn basic hardscape construction, basic wooden landscape structure construction, vegetable harvest, propagation of perennial plants, principles of irrigation installation, safe and efficient use of landscape equipment including arboriculture, and professional certification and licensing. Pesticide Licensing Fee of $75 required.
Typically offered in Summer only

HS 290 Horticulture: Careers and Opportunities (1 credit hours)
Introduction and orientation to programs in horticultural science. Discussion of current status of horticulture, extension and research. Emphasis on undergraduate program management, internships, graduate education, and career planning. Guest lectures, career opportunities and qualifications for employment in horticulture and related fields.
Typically offered in Spring only

HS 301 Plant Propagation (4 credit hours)
Theoretical basis and techniques for successful asexual and sexual propagation of seed plants and ferns. Influence of heredity, phytopathological infection, and environmental conditions on success and quality of propagules. Recent developments and innovations in propagation techniques and methodologies.
Prerequisite: BIO 181 or BO 200
GEP Natural Sciences
Typically offered in Fall only

HS 302 Gardening with Herbaceous Perennials (3 credit hours)
Examination of the use of herbaceous perennials in the home garden and commercial landscapes. Topics include: general plant characteristics, culture and management, garden attributes, design usage, horticultural history, propagation, use of exotic (nonnative) species in the garden, heirloom roses and ornamental grasses.
Prerequisite: BIO 183 or BO 200
Typically offered in Spring only

HS 303 Ornamental Plant Identification I (3 credit hours)
Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasis on bedding plants, trees and gymnosperms.
Prerequisite: BIO 181
GEP Natural Sciences
Typically offered in Fall only

HS 304 Ornamental Plant Identification II (3 credit hours)
Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes shrubs, ground covers, and vines.
Prerequisite: BIO 181
GEP Natural Sciences
Typically offered in Spring only

HS 357 Landscape Grading and Drainage (4 credit hours)
This course is an introduction to landforms, site grading and drainage, and the manipulations of such landforms necessary to create built landscapes. Site design, site development, and site engineering all refer to the process of grading and drainage. Grading and drainage are processes used to reshape the earth's surface and to convey surface water runoff.
Prerequisite: Landscape Horticulture (11HORTTHL) students, HS 242 and 252
Typically offered in Spring only

HS 400 Residential Landscaping (6 credit hours)
Equips students with the necessary skills to create functional, aesthetic, and humanistic designs for residential and other small scale projects. Aspects of problem identification, project organization, design, execution, and evaluation. Required field trip with fee.
Prerequisite: HS 242, HS 252, HS 303, HS 304, and HS 357
Typically offered in Spring only

HS 410/CS 410 Community Food Systems (3 credit hours)
This course explores the economic, socio-cultural, policy and health perspectives of community food systems using a multidisciplinary and systems-level framework. Students will use a systems framework to critically examine local and global food challenges related to food insecurity, food justice and food sovereignty, food waste and sustainable approaches to addressing food challenges. Novel aspects of this course include student experiential learning opportunities that include service learning with community partners addressing local food challenges, team building through group work and in-class discussion and development of personal food ethic provocative proposition.
Prerequisite: Junior or senior standing
Typically offered in Fall only

HS 411 Nursery Management (3 credit hours)
Principles and practices of production, management, and marketing of field-grown and container-grown nursery plants. One of three scheduled weekend field trips required at students' expense.
Prerequisite: BIO 181, SSC 200, Junior standing
Typically offered in Fall only
HS 416/HS 516 Planting Design (4 credit hours)
Developing and cultivating a design process for creating meaningful and compelling ornamental planting designs through the study and practice of spatial articulation (form, enclosure, permeability), physical properties of plants (line, form, texture, color), client/site analysis and program development, visual journaling, garden narrative, presentation skills, utilizing principles of visual composition, design communication, and understanding and resolving technical and horticultural issues in contemporary planting design.
Prerequisite: Landscape Horticulture (11HORTTHL) concentration, HS 400
Typically offered in Fall only

HS 418 Digital Media Graphic for Landscape Designers (3 credit hours)
Digital media is used in the landscape design profession as a tool with analytic, expressive, and representational abilities. The course focuses on introducing landscape design students to digital representational tools used to communicate design ideas for small scale landscape design projects. Students will be introduced to techniques used in AutoCAD, Photoshop, Illustrator, InDesign, and Sketch Up modeling programs. Digital representation will be used to develop the variety of images necessary to explore and communicate design intentions. Materials for this course will cost approximately $50.
Prerequisite: HS 242 and HS 400
Typically offered in Fall only

HS 420/HS 520 Green Infrastructure (3 credit hours)
Green infrastructure is defined as the interconnected networks of natural and constructed ecological systems within and in-between urban areas. When implemented in a holistic way, green infrastructure can provide benefits at the residential, neighborhood, community levels providing for greater health and well-being, an improved functional environment, and a thriving dynamic economy. Well-designed urban landscapes offer significant economic and social benefits that directly improve the urban environment for people, plants and animals- from increasing real estate value and reducing energy costs, to enhancing health and food security, and providing habitat for a diverse population of animals and plants. Since addressing environmental issues requires a multidisciplinary approach, this course is designed for any student with interests in horticulture, biological engineering, landscape architecture, environmental sciences, urban forestry, and any others who care about the sustainability of their communities.
Typically offered in Fall only

HS 421/HS 521 Temperate-Zone Tree Fruits: Physiology and Culture (3 credit hours)
Physiology and culture of the major temperate-zone tree fruit and nut crops of the United States. Fundamental principles underlying woody plant growth as applied to the culture of specific tree-fruit crops with emphasis on crops of commercial importance.
Prerequisite: BIO 181 or B0 200
Typically offered in Spring only

HS 422 Small Fruit Production (3 credit hours)
Importance and economic value of blackberries, blueberries, cranberries, grapes, raspberries, strawberries and minor small fruit crops in the agricultural economy of the USA and the world. Cultural requirements of these crops and manipulation of their known morphological and physiological traits for successful production. Six all afternoon field trips are required.
Prerequisite: BIO 181, SSC 200, HS 201
Typically offered in Spring only

HS 423/HS 523 Viticulture (3 credit hours)
A presentation of the commercial importance, distribution, anatomy, physiology, and production of Genus Vitis (grapes) including cultivars, propagation, canopy management, diseases, weed control, physiology, anatomy, irrigation, wine production, climates and soils. This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities IS required for this class.
Prerequisite: Junior standing or Senior standing
Typically offered in Spring only

HS 428/SSC 428 Service-Learning in Urban Agriculture Systems (1 credit hours)
Course provides students a hands-on experience in urban agriculture with under-served youth in the Raleigh area. Students partner with a community gardening organization to provide knowledge and experience in soil science and agriculture to youth with the goals of increasing urban food security and developing student leadership skills. Particular emphasis is places on reflecting on course activities and deepening of skills related to extension, outreach, and working with diverse populations. Course designed to be taken as a companion course to SSC 427, however can be taken as a stand-alone course.
Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101 GEP U.S. Diversity
Typically offered in Spring only

HS 431 Vegetable Production (4 credit hours)
Principles and practices of production and marketing of seventeen vegetable crops grown in the U.S. Additional topics include pest management, seed technology, food safety, sustainable agriculture, use of genetically engineered crops, and consumer issues.
Prerequisite: BIO 181, SSC 200
Typically offered in Fall only

HS 432/HS 532 Introduction to Permaculture (3 credit hours)
Permaculture means "permanent culture," and ..."is the conscious design and maintenance of cultivated ecosystems that have the diversity, stability, and resilience of a natural ecosystem." [Bill Mollison] This course will explore a design/thinking methodology that seeks to provide our essential physical needs, food, water, shelter, energy, etc., while doing so in an environmentally friendly, sustainable manner. The three weekend field trips are required. This course is restricted to upper level undergraduate, graduate, or matriculated continuing education students. STUDENTS MAY NOT RECEIVE CREDIT FOR BOTH HS 432 AND HS 532.
Typically offered in Fall and Summer
**HS 433/HS 533 Public Garden Administration** (3 credit hours)
This course addresses the practices, programs, and professional skills that are critical to the successful management of public gardens. The aim of the course is to better prepare graduate students and upper-level undergraduates for potential careers in public garden administration. Topics will include a brief history, impact, and current trends of public gardens in the United States; plant collections; managing staff, volunteers, and boards, and the visiting public; finances and fund raising; educational programming; visitor services; and careers in public gardens. Two Saturday off-campus field trips are required.

*Typically offered in Fall only*

**HS 440 Greenhouse Management** (3 credit hours)
Perspective of greenhouse systems management. Selection of greenhouse site, construction, heating, cooling and production systems. Emphasis on greenhouse operations, cost accounting and analysis. Other topics: root substrates, sanitation, water, fertilization, chemical growth regulation, temperature, light and marketing. Hands-on experience in greenhouse operations plus trips to commercial greenhouses and markets.

Prerequisite: SSC 200 and HS 201

*Typically offered in Fall only*

**HS 442 Floriculture Crop Production** (3 credit hours)
Production of floricultural crops. Emphasis on environmental manipulation and scheduling of crop growth and development for targeted market periods. Specific flowering crops as models to demonstrate potted flowering plant, cut flower, and bedding plant production systems. Hands-on crop production experience plus field trips to commercial floriculture production and marketing facilities.

Prerequisite: SSC 200, HS 201

*Typically offered in Fall only*

**HS 451/HS 551 Plant Nutrition** (3 credit hours)
An understanding of the basic mineral nutrient requirements, nutritional monitoring procedures, and fertilizer application methods in horticultural production systems including those for fruits, field vegetables, fruits and vegetables under plasticulture, nursery crops, landscapes, greenhouse flowers and vegetables, interior plantscapes, hydroponics, and organic farming.

Prerequisite: SSC 200

*Typically offered in Spring only*

**HS 462/HS 562/FS 462/FS 562 Postharvest Physiology** (3 credit hours)
Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

Prerequisite: PB 421

*Typically offered in Spring only*

**HS 471 Landscape Ecosystem Management** (4 credit hours)
Well-designed, installed, and maintained urban/suburban ecosystems offer significant economic and social benefits that directly improve the environment for people, plants and animals. Learn how to select, install and maintain plants as part of a sustainable landscape. This course provides students with the tools to understand and implement landscape ecosystem management techniques that include, but are not limited to plant selection and maintenance, soil maintenance and renovation, thoughtful application of common landscape chemistry and IPM, urban/suburban wildlife conservation (including plant pollinators), and installation and promotion of green infrastructure practices.

Prerequisite: SSC 200

*Typically offered in Fall only*

**HS 475 Horticulture Entrepreneurship** (3 credit hours)
This course is structured to introduce students to entrepreneurship, startups and the basic principles of business administration and management with focus in the horticulture industry in a global context. The goal of this class is to give students pragmatic knowledge and tools to start their own business or to be successful managers in the horticulture industry. Students will describe and discuss the entrepreneurial thinking process and as they analyze the following business topics: marketing, management and leadership, accounting, and finance.

*Typically offered in Spring only*

**HS 476/HS 576 Crop Physiology and Production in Controlled Environments** (3 credit hours)
This course focuses on plant eco-physiological responses to different environmental factors such as: light intensity, quality, duration and penetration; CO2 diffusion; thermodynamic properties of moist air; root environment; air dynamics; water relations; and canopy energy balance. In addition, the course emphasizes the application of controlled environment technologies to manipulate crop responses. The laboratory is designed to optimize the production of edible crops in greenhouses and vertical farms by applying the foundational knowledge of plant eco-physiology in combination with advance controlled environment technologies.

Prerequisite: PB 321 or PB 421 and either MA 114 or MA 121 or MA 131 or MA 141

*Typically offered in Spring only*

**HS 480/CS 480 Sustainable Food Production (capstone)** (1 credit hour)
This course introduces students to the process of developing a project for presentation in the area of sustainable food production and food systems. Students are to synthesize and integrate knowledge acquired in previous course work and other learning e

Prerequisites: Senior standing and CS 430

*Typically offered in Fall only*
HS 491 Sustainable Agriculture Entrepreneurship Study Abroad (3 credit hours)
This course provides an international perspective on entrepreneurship and sustainability in agricultural and life sciences while examining one of three unique, Spanish-speaking locations (Oaxaca, Mexico; Valencia, Spain; and Queretaro, Mexico). The course is led by three instructors that speak Spanish, have very close ties to the communities visited, and are experts in the fields of sustainability and entrepreneurship. The different components of sustainability: increase in production, efficient use of non-renewable resources, ecological stewardship, economic improvement, and increase in quality of life will be experienced. The practice of entrepreneurship will be identified through examples of the implementation of these sustainable motivators as then analyze different businesses’ strengths and constraints. This course intends to give an intimate look into an international location with the intent of getting students out of their comfort zone, challenging their mindsets, and providing the opportunity to experience cultural and agricultural diversity.

Typically offered in Summer only

HS 492 Horticulture Internship (1-3 credit hours)
A learning experience in Horticultural Science where a student can gain real-world experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience (135 hours = 3 credits). The experience must be arranged by the student and approved by the Department of Horticultural Science prior to the start of the experience. To gain approval, a student must submit the completed HS 492 contract and have it approved by their research experience supervisor and the undergraduate coordinator. In addition to the work described in the contract, a student will complete two reflective assignments.

Typically offered in Fall, Spring, and Summer

HS 493 Research Experience in Horticultural Science (1-3 credit hours)
A learning experience in Horticultural Science where a student can gain research experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience (135 hours = 3 credits). The experience must be arranged by the student and approved by the undergraduate coordinator prior to the start of the experience. To gain approval, a student must submit the completed HS 493 contract and have it approved by their research experience supervisor and the undergraduate coordinator. In addition to the work described in the contract, a student will complete two reflective assignments.

Typically offered in Fall, Spring, and Summer

HS 494 Teaching Experience in Horticultural Science (1-3 credit hours)
A learning experience in Horticultural Science where a student can gain teaching experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience (135 hours = 3 credits). The experience must be arranged by the student and approved by the undergraduate coordinator prior to the start of the experience. To gain approval, a student must submit the completed HS 494 contract and have it approved by their experience supervisor and the undergraduate coordinator. In addition to the work described in the contract, a student will complete two reflective assignments.

Typically offered in Fall, Spring, and Summer

HS 495 Experimental Courses in Horticultural Science (1-6 credit hours)
Offering of new courses on a trial basis. Topic varies based on offering. Repetition with different course content acceptable up to 2 times and total of 6 units.

Typically offered in Fall, Spring, and Summer

HS 502/PP 502/CS 502 Plant Disease: Methods & Diagnosis (2 credit hours)
Introduction to the basic principles of disease causality in plants and the methodology for the study and diagnosis of plant diseases caused by fungi. Identification of plant-pathogenic fungi. Research project, disease profiles and field trips are required.

Prerequisite: PP 315
Typically offered in Fall only

HS 516/HS 416 Planting Design (4 credit hours)
Developing and cultivating a design process for creating meaningful and compelling ornamental planting designs through the study and practice of spatial articulation (form, enclosure, permeability), physical properties of plants (line, form, texture, color), client/site analysis and program development, visual journaling, garden narrative, presentation skills, utilizing principles of visual composition, design communication, and understanding and resolving technical and horticultural issues in contemporary planting design.

Prerequisite: Landscape Horticulture (11HORTTHL) concentration, HS 400
Typically offered in Fall only

HS 520/HS 420 Green Infrastructure (3 credit hours)
Green infrastructure is defined as the interconnected networks of natural and constructed ecological systems within and in-between urban areas. When implemented in a holistic way, green infrastructure can provide benefits at the residential, neighborhood, community levels providing for greater health and well-being, an improved functional environment, and a thriving dynamic economy. Well-designed urban landscapes offer significant economic and social benefits that directly improve the urban environment for people, plants and animals- from increasing real estate value and reducing energy costs, to enhancing health and food security, and providing habitat for a diverse population of animals and plants. Since addressing environmental issues requires a multidisciplinary approach, this course is designed for any student with interests in horticulture, biological engineering, landscape architecture, environmental sciences, urban forestry, and any others who care about the sustainability of their communities.

Typically offered in Fall only

HS 521/HS 421 Temperate-Zone Tree Fruits: Physiology and Culture (3 credit hours)
Physiology and culture of the major temperate-zone tree fruit and nut crops of the United States. Fundamental principles underlying woody plant growth as applied to the culture of specific tree-fruit crops with emphasis on crops of commercial importanc

Prerequisite: BIO 181 or B0 200
Typically offered in Spring only
HS 523/HS 423 Viticulture (3 credit hours)
A presentation of the commercial importance, distribution, anatomy, physiology, and production of Genus Vitis (grapes) including cultivars, propagation, canopy management, diseases, weed control, physiology, anatomy, irrigation, wine production, climates and soils. This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities IS required for this class.

Prerequisite: Junior standing or Senior standing
Typically offered in Fall only

HS 532/HS 432 Introduction to Permaculture (3 credit hours)
Permaculture means "permanent culture," and "is the conscious design and maintenance of cultivated ecosystems that have the diversity, stability, and resilience of a natural ecosystem." [Bill Mollison] This course will explore a design/thinking methodology that seeks to provide our essential physical needs, food, water, shelter, energy, etc., while doing so in an environmentally friendly, sustainable manner. The three weekend field trips are required. This course is restricted to upper level undergraduate, graduate, or matriculated continuing education students.

STUDENTS MAY NOT RECEIVE CREDIT FOR BOTH HS 432 AND HS 532.

Typically offered in Fall and Summer

HS 533/HS 433 Public Garden Administration (3 credit hours)
This course addresses the practices, programs, and professional skills that are critical to the successful management of public gardens. The aim of the course is to better prepare graduate students and upper-level undergraduates for potential careers in public garden administration. Topics will include a brief history, impact, and current trends of public gardens in the United States; plant collections; managing staff, volunteers, and boards, and the visiting public; finances and fund raising; educational programming; visitor services; and careers in public gardens. Two Saturday off-campus field trips are required.

Typically offered in Fall only

HS 541/CS 541 Plant Breeding Methods (3 credit hours)
Overview of plant breeding methods for advanced undergraduate and beginning graduate students. Covers principles and concepts of inheritance, germplasm resources, pollen control, measurement of genetic variances, and heterosis. Special topics include heritability, genotype-environment interaction, disease resistance, and polyploidy. In-depth coverage on methods for breeding cross-pollinated and self-pollinated crops. Prepares students for advanced plant breeding courses.

Prerequisite: ST 511, Corequisite: ST 512
Typically offered in Fall only

HS 550 Environmental Nursery Production (3 credit hours)
The course focuses on the impacts of the nursery industry on the environment and environmentally sound nursery practices. Exploration of the major challenges facing the nursery industry that drive decision making during production. Evaluation of past

Prerequisite: HS 411, Nursery Management, or an equivalent course.
Typically offered in Fall only

HS 551/HS 451 Plant Nutrition (3 credit hours)
An understanding of the basic mineral nutrient requirements, nutritional monitoring procedures, and fertilizer application methods in horticultural production systems including those for fruits, field vegetables, fruits and vegetables under plasticulture, nursery crops, landscapes, greenhouse flowers and vegetables, interior plantscapes, hydroponics, and organic farming.

Prerequisite: SSC 200
Typically offered in Spring only

HS 562/FS 562/FS 462/HS 462 Postharvest Physiology (3 credit hours)
Preharvest and postharvest factors that affect market quality of horticultural commodities with an emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

Prerequisite: PB 421
Typically offered in Spring only

HS 576/HS 476 Crop Physiology and Production in Controlled Environments (3 credit hours)
This course focuses on plant eco-physiological responses to different environmental factors such as: light intensity, quality, duration and penetration; CO2 diffusion; thermodynamic properties of moist air; root environment; air dynamics; water relations; and canopy energy balance. In addition, the course emphasizes the application of controlled environment technologies to manipulate crop responses. The laboratory is designed to optimize the production of edible crops in greenhouses and vertical farms by applying the foundational knowledge of plant eco-physiology in combination with advance controlled environment technologies.

Prerequisite: PB 321 or PB 421 and either MA 114 or MA 121 or MA 131 or MA 141
Typically offered in Spring only

HS 583 Advanced Floral Crop Production and Handling (3 credit hours)
Principles and commercial practices for producing floral potted crops and cut flowers emphasizing the physical responses of plants to their environment and post-harvest physiology. Lab will be conducted at the student's home location and students will document plant growth with photos or video. Some live plants will be mailed to the student; however, the student will be required to purchase some plants (e.g. African violet). Course is restricted to graduates students only.

Typically offered in Spring only

HS 590 Special Problems in Horticultural Science (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in horticultural science.

Typically offered in Fall, Spring, and Summer

HS 601 Professional Presentation Skills in Horticultural Science (2 credit hours)
The purpose of this course is to familiarize the students with the professional presentation skills they need to be successful. These skills include speaking, writing, poster and website development, based on the student's proposed research/project and literature review.

Typically offered in Fall only
HS 610 Special Topics in Horticultural Science (1-6 credit hours)
Investigation of special theoretical problems at 600 level in horticultural science not related to a thesis problem; new 600-level courses during developmental phase.

Typically offered in Fall, Spring, and Summer

HS 615 Advanced Special Topics (1-6 credit hours)
Investigation of theoretical problems at the 600 level in horticultural science not related to a thesis problem; new 600-level courses during the development phase.

Typically offered in Fall, Spring, and Summer

HS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall, Spring, and Summer

HS 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall and Spring

HS 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall and Spring

HS 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall, Spring, and Summer

HS 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall, Spring, and Summer

HS 695 Master's Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall, Spring, and Summer

HS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal coursework during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's in Horticultural Science
Typically offered in Summer only

HS 699 Master's Thesis Preparation (1-9 credit hours)
Original research on specific problems in fruit, vegetable and ornamental crops.

Prerequisite: Master's in Horticultural Science
Typically offered in Fall, Spring, and Summer

HS 701 Plant Metabolism (1 credit hours)
A brief introduction to various aspects of metabolism in plants including the basic biochemical processes including the syntheses, utilization and roles of amino acids, lipids, carbohydrates and secondary metabolites in plant growth, development and response to the environment. This course is taught as a 5-week mini course.

Prerequisite: (CH 223 or CH 227) and PB 421
Typically offered in Fall only

HS 702 Biology of Plant Hormones (1 credit hours)
Recent developments and current literature on the physiology, biochemistry, molecular biology, and practical applications of the primary plant hormones. The biosynthesis, signal transduction pathways, and biological functions of specific plant hormones will be examined. Taught as a five-week minicourse.

Prerequisite: BO 421, (GN 411 or BCH 451)
Typically offered in Fall only

HS 703 Breeding Asexually Propagated Crops (1 credit hours)
Principles and problems associated with breeding clonally propagated crops and techniques used in overcoming these problems. Taught third five weeks of semester. Drop date is by last day of 3rd week of minicourse.

Prerequisite: CS 413
Typically offered in Fall only

HS 704 Plant Nomenclature (1 credit hours)
A practical foundation in plant nomenclature and nomenclatural references. Emphasis on the evolution of international rules for naming plant taxa and their application in both wild and cultivated plants. Nomenclature applications used in patents, cultivar releases and journal articles. Taught mid-semester. Taught five weeks of semester.

Prerequisite: PB 421
Typically offered in Spring only

HS 705 Physiology Of Flowering (1 credit hours)
Examination of physiological basis of flowering in plants such as: floral initiation, transition to reproductive growth; floral development; plant response to light, temperature, nutrition, water supply; plant age; chemical growth regulation and in vitro flowering. Taught first five weeks of fall semester. Drop date is by last day of 3rd week of minicourse.

Prerequisite: PB 421
Typically offered in Fall only
HS 706  Fruit Development and Postharvest Physiology (1 credit hours)
Theories of plant senescence, both physiological and biochemical, and postharvest changes in all types of plant parts. Emphasis on physiological principles underlying current postharvest handling and storage techniques. A study of fruit development from fruit set to senescence. Taught third five weeks of semester. Drop date is by last day of 3rd week of minicourse.
Prerequisite: PB 421
Typically offered in Fall only

HS 707  Environmental Stress Physiology (1 credit hours)
Physiology of plant responses to environmental stresses, with emphasis on current research in selected physiological, molecular, and biochemical mechanisms for tolerance to environmental stresses such as temperature extremes, drought, salt, pathogens and other plants.
Prerequisite: PB 421
Typically offered in Fall only

HS 716/CS 716  Weed Biology (3 credit hours)
This course analyzes the interactions between human disturbance and dynamics of weed populations and communities. Emphasis is given to factors that drive weed control actions and the ecological and evolutionary processes by which weeds survive and adapt
Prerequisite: CS 414
Typically offered in Spring only

HS 717/CS 717  Weed Management Systems (1 credit hours)
Weed management systems including integration of cultural, biological, mechanical and chemical methods for vegetables, fruits, ornamentals, turf, small grains, corn, tobacco, cotton, peanuts, aquatic and non-cropland settings. Taught second 5 weeks of semester. Drop date is by last day of 3rd week of minicourse.
Prerequisite: CS 414
Typically offered in Fall only

HS 720/CS 720/GN 720  Molecular Biology In Plant Breeding (3 credit hours)
Theory and principles of molecular biology applied to plant breeding. Experimental approaches to induce genetic change, cytoplasmic recombination, haploid utilization and potentials of molecular techniques for solving breeding problems.
Prerequisite: CS(GN,HS) 741, GN 701, GN 702, GN 703
Typically offered in Spring only

HS 725/SSC 725/TOX 725/CS 725  Pesticide Chemistry (1 credit hours)
Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of the minicourse.
Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)
Typically offered in Fall only

HS 727/SSC 727/TOX 727/CS 727  Pesticide Behavior and Fate In the Environment (2 credit hours)
Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of the minicourse.
Prerequisite: CS(SSC,TOX) 725, SSC 200
Typically offered in Fall only

HS 729/CS 729  Herbicide Behavior In Plants (2 credit hours)
Chemical, physiological and biochemical actions of herbicides in plants including uptake, translocation, metabolism and mechanism of action.
Prerequisite: BO 751 and BO 752 and CS(HS,SSC) 725
Typically offered in Spring only

HS 745/CS 745/GN 745  Quantitative Genetics In Plant Breeding (1 credit hours)
Theory and principles of plant quantitative genetics. Experimental approaches of relationships between type and source of genetic variability, concepts of inbreeding, estimations of genetic variance and selection theory.
Prerequisite: CS(GN, HS) 541, ST 712, course in quantitative genetics recommended
Typically offered in Spring only

HS 746/CS 746/GN 746  Cytogenetics In Plant Breeding (2 credit hours)
Theory and principles of plant breeding methodology including population improvement, selection procedures, genotypic evaluation, cultivar development and breeding strategies.
Typically offered in Spring only

HS 757/GN 757/ST 757  Quantitative Genetics Theory and Methods (3 credit hours)
The essence of quantitative genetics is to study multiple genes and their relationship to phenotypes. How to study and interpret the relationship between phenotypes and whole genome genotypes in a cohesive framework is the focus of this course. We discuss how to use genomic tools to map quantitative trait loci, how to study epistasis, how to study genetic correlations and genotype-by-environment interactions. We put special emphasis in using genomic data to study and interpret general biological problems, such as adaptation and heterosis. The course is targeted for advanced graduate students interested in using genomic information to study a variety of problems in quantitative genetics.
Prerequisite: ST 511
Typically offered in Fall only

HS 790  Special Problems in Horticultural Science (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in horticultural science.
Typically offered in Fall, Spring, and Summer

HS 815  Advanced Special Topics (1-6 credit hours)
Investigation of theoretical problems at 600 level in horticultural science not related to a thesis problem; new 600-level courses during development phase.
Typically offered in Fall, Spring, and Summer
HS 860/CS 860/GN 860  Plant Breeding Laboratory  (1 credit hours)
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.

Prerequisite: CS(GN,HS)741
Typically offered in Spring only

HS 861/CS 861/GN 861  Plant Breeding Laboratory  (1 credit hours)
Visitation of plant breeding projects in the Depts. of CS and HS at NC State, along with commercial seed companies. Discussion and viewing of breeding objectives, methods and equipment and teaching and practice of hybridization methods.

Prerequisite: CS(GN,HS)741
Typically offered in Fall only

HS 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Typically offered in Fall, Spring, and Summer

HS 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

HS 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

HS 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

HS 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

HS 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Humanities and Social Sciences (HSS)

HSS 120  Introduction to Humanities & Social Sciences  (2 credit hours)
Introduction to humanities and social science disciplines by comparing methods of inquiry and perspectives on a social/cultural issue. The course will also facilitate exploration of college and university resources, opportunities, and policies, and address skills for academic, personal, and career success. First-year entering Humanities and Social Sciences majors only.

R: New Freshmen with majors in the College of Humanities and Social Sciences only
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

HSS 392/COM 392  International and Crosscultural Communication  (3 credit hours)
Patterns and problems of verbal and non-verbal forms of crosscultural communication. Avoidance and management of cultural conflict arising from awareness of characteristics and crosscultural communication. Impact on communication of differing cultural p

GEP Global Knowledge, GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Summer

Humanities (HUM)

HUM 295  Humanities Special Topics  (3 credit hours)
Special topics course offering for the general education Humanities category.

GEP Humanities
Typically offered in Fall, Spring, and Summer

Humanities and Global Knowledge (HUMG)

HUMG 295  Humanities and Global Knowledge Special Topics  (3 credit hours)
Special topics course offering for the general education Humanities and Global Knowledge categories. This course may be used for the Global Knowledge (GK) co-requisite and/or for the Humanities (HUM) requirement.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

Humanities and U.S. Diversity (HUMU)

HUMU 295  Humanities and U.S. Diversity Special Topics  (3 credit hours)
Special topics course offering for the general education Humanities and U.S. Diversity categories. This course may be used for the U.S Diversity (USD) co-requisite and/or for the Humanities (HUM) requirement.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer
Immunology (IMM)

**IMM 595 Special Topics** (1-6 credit hours)
Typically offered in Fall only

**IMM 705 Immunotoxicology** (2 credit hours)
Concepts in the study of adverse effects of chemicals on the immune system, including allergic responses, autoimmunity and immunosuppression. Significance of immunotoxic effects resulting from environmental or workplace exposure. Role of immunotoxicity in risk assessment.
Prerequisite: TOX 701
Typically offered in Spring only

**IMM 751/MB 751 Immunology** (3 credit hours)
Introduction to mechanisms of immunity in man and animals. Emphasis on interactions between cells of the immune system in production of immune responses and the molecules in control of these interactions.
Prerequisite: BCH 451, GN 411, MB 351
Typically offered in Spring only

**IMM 757/PO 757 Comparative Immunology** (3 credit hours)
Compare and contrast the immune system structure and function of animal species of agricultural and veterinary significance with that of humans and traditional biomedical model organisms. Discuss key evolutionary differences, how different species use different mechanisms to achieve the same outcomes, and the clinical implications for these differences.
Prerequisite: MB 751 or MB 441 or BIO 414
Typically offered in Spring only

**IMM 783/MB 783/CBS 783 Advanced Immunology** (3 credit hours)
In depth study of the basic cellular and molecular mechanisms of immunity, including antigen processing and presentation, T cell development, initiation of the immune response, effector mechanisms, and immunological memory. The course is designed for advanced graduate students who wish to focus on the current concepts in immunology.
Prerequisite: MB (IMM) 751
Typically offered in Fall only

**IMM 795 Special Topics** (1-6 credit hours)
Typically offered in Fall only

Industrial and Systems Engineering (ISE)

**ISE 135 Computer-Based Modeling for Engineers** (3 credit hours)
Introductory course in computer-based modeling and programming using Python for Engineering Applications. Emphasis on algorithm development and engineering problem solving. Methodical development of Python scripts to link with Microsoft Excel using xlwings plugin through proper specifications; documentation, style; control structures; data types and data abstraction; graphical user interface design. Projects: design problems from industrial engineering systems. Functional relationships will be given and programs will be designed and developed from a list of specifications.
Prerequisite: E 115, Corequisite: MA 141
Typically offered in Fall and Spring

**ISE 215 Foundations of Design & 3D Modeling for Engineers** (1 credit hours)
This is an 8 week course. An introductory engineering graphics course which builds on the foundations of computer-aided 2D sketching and 3D modeling for industrial engineers. Students will develop and refine their ability to communicate designs via modeling techniques prolific in industry. The concurrent nature of ideation, engineering analysis and manufacturing will be emphasized as students review case studies and develop their own models. Constraint-based design will drive strategies that accurately reflect design intent and promote part family relationships and automation. Students will work in small teams to create a mechanism that must achieve certain functional criteria. ISE majors have priority registration for this course.
Prerequisite: E115 and Corequisite: ISE216
Typically offered in Fall and Spring

**ISE 216 Product Development and Rapid Prototyping** (3 credit hours)
Introduction to product development and prototyping. Team-based development of a new product during the semester. Specific topics are voice of the customer, product specification and parameter specification, Quality Function Deployment and the House of Quality, concept generation, concept selection, detailed design using SolidWorks, prototyping, design for assembly, design for the environment, and intellectual properties and patents. Team presentations of a functional prototype of their product at the end of the semester.
Corequisite: ISE 215
Typically offered in Fall and Spring

**ISE 311 Engineering Economic Analysis** (3 credit hours)
Prerequisite: Grade of C or better in MA 141
Typically offered in Fall, Spring, and Summer

**ISE 315 Introduction to Computer-Aided Manufacturing** (1 credit hours)
This is an 8 week course. Introduction to the principles of modern-day multi-axis machine tool control, using computer-aided manufacturing (CAM) software tools. Emphasis is placed on transferring part geometry from CAD to CAM, for the development of CNC-ready programs. Industry file formats, machining strategies, G & M-code generation, optimization and verification techniques will also be investigated. Upon successful completion of this course, students will be able to demonstrate proficiency in the use of industry-relevant CAD/CAM software and will be able to extend that knowledge to practice through exercises and projects.
Use of CNC machine tools will be introduced and demonstrated in the department's physical lab spaces. ISE majors have priority registration for this course.
Prerequisite: ISE 215 and Co-requisite: ISE 316
Typically offered in Fall, Spring, and Summer
ISE 316 Manufacturing Engineering I - Processes (3 credit hours)
Analytical study and design of manufacturing engineering with emphasis on mfg. and processes. Addresses the interaction of design, materials, and processing. Laboratory instruction and hands-on experience in metrology, machining, process planning, economic justification, and current mfg. methodologies.
Prerequisite: MSE 200 and ISE 216; Co-requisite: ISE 315
Typically offered in Fall, Spring, and Summer

ISE 352 Fundamentals of Human-Machine Systems Design (3 credit hours)
Introduction to work methods and ergonomics. Coverage of methods to improve operator performance and production process efficiency. Techniques include project evaluation and review, operator-machine ratios, line balancing, work sampling, time study, wage payment, and predetermined time systems. Ergonomics component includes workstation and hand-tool design, and methods for designing cognitive work and work environment.
Prerequisite: C- or better in ST 371; C or better in ISE 135
Typically offered in Fall and Spring

ISE 361 Deterministic Models in Industrial Engineering (3 credit hours)
Introduction to mathematical modeling, analysis techniques, and solution procedures applicable to decision-making problems in a deterministic environment. Linear programming models and algorithms and associated computer codes are emphasized.
Prerequisite: (MA 303 or MA 341) and C or better in ISE 135
Typically offered in Fall and Spring

ISE 362 Stochastic Models in Industrial Engineering (3 credit hours)
Introduction to mathematical modeling, analysis, and solution procedures applicable to uncertain (stochastic) production systems. Methodologies covered include probability theory and stochastic processes. Applications relate to design and analysis of problems, capacity planning, inventory control, waiting lines, and system reliability and maintainability.
Prerequisite: C or better in ISE 135 and (MA 303 or MA 341) and C- or better in ST 371 or ST 370
Typically offered in Fall and Spring

ISE 408 Design and Control of Production and Service Systems (3 credit hours)
This course focuses on understanding the behavior of manufacturing plants and service systems through a thorough, generalizable and fundamental understanding of the factors affecting their behavior.
Prerequisite: ISE 135, ISE 362, and C- or better in ST 371
Typically offered in Fall and Spring

ISE 411/ISE 511 Supply Chain Economics and Decision Making (3 credit hours)
This course introduces students to the principles of microeconomic analysis applied to decision-making in supply chains. Emphasis will be put on strategic interactions between different decision makers in the supply chain, including suppliers, manufacturers, retailers, and consumers. Topics include classical demand and production theory, pricing and revenue management, competition between firms, and cooperation between and within firms under information asymmetry.
Typically offered in Fall only

ISE 413/ISE 513 Humanitarian Logistics (3 credit hours)
This course provides a comprehensive treatment of humanitarian logistics (HumLog) from an operations research perspective, focusing on the use of quantitative modeling for decision making and best practices in disaster management. Background and overview on disaster management will be covered. The four phases of the disaster management cycle are introduced as well as the types of decisions that are made in each phase. Mathematical models are presented for typical humanitarian logistics decisions, such as inventory prepositioning, facility location, transportation, routing, and capacity planning.
Prerequisite: ISE 361
Typically offered in Spring only

ISE 416 Manufacturing Engineering II - Automation (3 credit hours)
Integration of design and mfg. through computer aided/automated process planning, concurrent engineering, and rapid prototyping. Fixed and programmable automation in mfg. and service. Autonomous mfg. systems such as computer numerical control (CNC), industrial robotics, automated inspection, electronics manufacturing and assembly.
Prerequisite: ISE 316
Typically offered in Fall only

ISE 417 Database Applications in Industrial & Systems Engineering (3 credit hours)
Rapid applications development (RAD) tools to design and implement database-based applications. The SQL database query language, a standard RAD environment and how to access information in a database from it, use of Visual Basic for Applications, and how to integrate these tools together to design and build engineering applications. Examples will be from manufacturing and production systems.
Prerequisite: C or better in ISE 135
Typically offered in Fall and Spring

ISE 433/ISE 533/OR 433/OR 533 Service Systems Engineering (3 credit hours)
This course intends to provide a comprehensive treatment on the use of quantitative modeling for decision making and best practices in the service industries. The goal of this class is to teach students to able to identify, understand, and analyze services; and acquire the quantitative skills necessary to model key decisions and performance metrics associated with services. Students will be exposed both to classical and contemporary examples of challenges and opportunities that arise when working in the service sector.
Prerequisite: ISE 361
Typically offered in Spring only
ISE 435/ISE 535 Python Programming for Industrial & Systems Engineers (3 credit hours)
The objective of this course is to build on your knowledge of computing and data analysis by focusing on programming using the Python language. In particular, you will learn more about the Python and its ecosystem of libraries, how to use data structures in Python programs, conduct file I/O operations, and perform numerical and scientific computing within Python. This course is designed for senior undergraduate and graduate students to get the basics of the Python language and learn to use it to perform scientific computing within Python with two of its most popular packages in use for heavy data intensive analysis - Numpy and SciPy. Several engineering examples from physics, industrial engineering core courses and general engineering will be used to contextualize the programming examples.

Prerequisites: ST 370 OR ST 371 and ISE/TE 110 OR CSC 111 OR CSC 113 OR CSC 116 or ST 307 OR ST 308 OR ECE 209. Restrictive Statement: Department Approval Required
Typically offered in Fall only

ISE 437 Data Analytics for Industrial Engineering (3 credit hours)
In this course undergraduate students will learn to integrate statistical and mathematical modeling tools they learned in their previous classes to be able to design, develop and implement comprehensive advanced analytics solutions to address real industry problems. All class modules will be illustrated through real applications in Media, Financial, Retail and Manufacturing industries.

Prerequisites: (ST 370 OR ST 371) and (ISE 135 OR CSC 111 OR CSC 113 OR CSC 116 or ST 307 OR ST 308 OR ECE 209) Restrictive Statement: Department Approval Required
Typically offered in Spring only

ISE 441 Introduction to Simulation (3 credit hours)
Discrete-event stochastic simulation for the modeling and analysis of systems. Programming of simulation models in a simulation language. Input data analysis, variance reduction techniques, validation and verification, and analysis of simulation output. Random number generators and random variate generation.

Prerequisite: MA 242, ST 372, C or better in ISE 110
Typically offered in Fall and Spring

ISE 443 Quality Design and Control (3 credit hours)

Prerequisite: ST 372 Restriction: ST 435 cannot be used as a substitute for this course.
Typically offered in Fall and Spring

ISE 447/ISE 547 Applications of Data Science in Healthcare (3 credit hours)
Health professionals are capable of collecting massive amounts of data and look for best strategies to use this information. Healthcare analytics have the potential to reduce costs of treatment, predict outbreaks of epidemics, avoid preventable diseases and improve the quality of life in general. This course will explore some of the frequently used data science methods in healthcare and examine a compilation of the most recent academic journal articles on the subject. Students are expected to have a strong background in optimization and stochastic modeling.

Prerequisite: ISE 362
Typically offered in Fall only

ISE 452 Advanced Human-Machine Systems Design (3 credit hours)
Advanced concepts in human-machine systems design. Consideration of anatomical and physiological bases for design of work systems. Advanced biomechanical analysis and modeling for manual material handling design. Physiological and psychological capabilities and limitations as related to work systems design and human performance. Coverage of human information processing and performance theories and models, including pipe-line, signal detection theory, information theory, and motor control theory. Additional topics include human factors experimentation and neuroergonomics (brain and behavior).

Prerequisite: CE 214 and ISE 352
Typically offered in Spring only

ISE 453 Modeling and Analysis of Supply Chains (3 credit hours)
This course presents an overview of the basic issues and strategies involved in operating today’s global supply chains, from the design of the supply chain network through the management and location of inventories to the design and operation of the logistics systems that distribute goods from their source to the consumer.

Prerequisite: ST 371 (C- or better), ISE 135, ISE 361, ISE 362
Typically offered in Fall and Spring

ISE 462 Advanced Stochastic Models in Industrial Engineering (3 credit hours)
Advanced topics related to mathematical modeling, analysis, and solution procedures applicable to uncertain (stochastic) production systems. Methodologies covered include economic analysis under uncertainty, discrete and continuous time stochastic processes. Applications relate to design, analysis and control relating to capacity planning, inventory control, waiting lines, and system reliability and maintainability.

Prerequisite: ISE 362
Typically offered in Fall only

ISE 489 Special Topics in Industrial and Systems Engineering (1-3 credit hours)
Directed coursework in Industrial and Systems Engineering with an emphasis on special topics and emerging areas of interest within the discipline.

Typically offered in Fall, Spring, and Summer
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credit Hours</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISE 495</td>
<td>Project Work in Industrial Engineering (1-3 credit hours)</td>
<td></td>
<td>Special investigations, study or research related to the field of industrial engineering. In a given semester several students and/or student groups may be working in widely divergent areas under the direction of several members of the faculty. Prerequisite: Junior standing. Typically offered in Fall and Spring.</td>
</tr>
<tr>
<td>ISE 498</td>
<td>Senior Design Project (3 credit hours)</td>
<td></td>
<td>Individual or group design projects requiring problem definition and analysis, synthesis, specification and presentation of a designed solution. Students work under faculty supervision either on actual industrial engineering problems posed by local industrial, service and governmental organization or on emerging research issues. Prerequisite: ISE 408 and ISE 441 and ISE 453. Typically offered in Fall and Spring.</td>
</tr>
<tr>
<td>ISE 501/501</td>
<td>Introduction to Operations Research (3 credit hours)</td>
<td></td>
<td>OR Approach: modeling, constraints, objective and criterion. Problems of multiple criteria, optimization, model validation and systems design. OR Methodology: mathematical programming; optimum seeking; simulation, gaming; heuristic programming. Examples. OR Applications: theory of inventory; economic ordering under deterministic and stochastic demand. Production smoothing problem; linear and quadratic cost functions. Waiting line problems: single and multiple servers with Poisson input and output. Theory of games for two-person competitive situations. Project management through PERT-CPM. Prerequisite: MA 421 or ST 421 or ST 371 and ST 372. Typically offered in Fall and Spring.</td>
</tr>
<tr>
<td>ISE 505/505</td>
<td>Linear Programming (3 credit hours)</td>
<td></td>
<td>Introduction including: applications to economics and engineering; the simplex and interior-point methods; parametric programming and post-optimality analysis; duality matrix games, linear systems solvability theory and linear systems duality theory; polyhedral sets and cones, including their convexity and separation properties and dual representations; equilibrium prices, Lagrange multipliers, subgradients and sensitivity analysis. Prerequisite: MA 405. Typically offered in Fall only.</td>
</tr>
<tr>
<td>ISE 510</td>
<td>Applied Engineering Economy (3 credit hours)</td>
<td></td>
<td>Engineering economy analysis of alternative projects including tax and inflation aspects, sensitivity analysis, risk assessment, decision criteria. Emphasis on applications. Prerequisite: Undergrad. courses in engineering economics and ST. Typically offered in Spring only.</td>
</tr>
<tr>
<td>ISE 511/411</td>
<td>Supply Chain Economics and Decision Making (3 credit hours)</td>
<td></td>
<td>This course introduces students to the principles of microeconomic analysis applied to decision-making in supply chains. Emphasis will be put on strategic interactions between different decision makers in the supply chain, including suppliers, manufacturers, retailers, and consumers. Topics include classical demand and production theory, pricing and revenue management, competition between firms, and cooperation between and within firms under information asymmetry. Typically offered in Fall only.</td>
</tr>
<tr>
<td>ISE 513/413</td>
<td>Humanitarian Logistics (3 credit hours)</td>
<td></td>
<td>This course provides a comprehensive treatment of humanitarian logistics (HumLog) from an operations research perspective, focusing on the use of quantitative modeling for decision making and best practices disaster management. Background and overview on disaster management will be covered. The four phases of the disaster management cycle are introduced as well as the types of decisions that are made in each phase. Mathematical models are presented for typical humanitarian logistics decisions, such as inventory prepositioning, facility location, transportation, routing and capacity planning. Prerequisite: ISE 361. Typically offered in Spring only.</td>
</tr>
<tr>
<td>ISE 515</td>
<td>Manufacturing Process Engineering (3 credit hours)</td>
<td></td>
<td>Manufacturing process engineering, primary, secondary, finishing and assembly processes. Traditional and non-traditional manufacturing processes, group technology, manufacturing analyses and application of economic analyses. Graduate standing in Engineering. Typically offered in Fall and Spring.</td>
</tr>
<tr>
<td>ISE 519</td>
<td>Database Applications in Industrial and Systems Engineering (3 credit hours)</td>
<td></td>
<td>Rapid application development (RAD) tools to design and implement database-based applications. This includes: SQL query language, Visual Basic for Applications in database application construction, a standard RAD environment and how to access information in a database, entity/attribute modeling of the database structure, anomalies of database structures that create problems for applications, modeling of application system’s functionality, and integrating these tools together to design and implement engineering applications. Examples from manufacturing and production systems. Restricted to advanced undergraduates and graduate students. Prerequisite: ISE 110. Typically offered in Fall and Spring.</td>
</tr>
<tr>
<td>ISE 520</td>
<td>Healthcare Systems Performance Improvement I (3 credit hours)</td>
<td></td>
<td>Methods used to improve the performance of health care delivery systems with emphasis on patient care cost, access, and quality. Adaptation of lean and six-sigma to rapid and continuous health care systems improvement through organizational and process transformation. Fundamentals of scheduling, staffing, and productivity in health systems employing simulation and optimization. Health care policy and management. Prerequisite: ST 372, ISE 352, ISE 361, and ISE 441. Typically offered in Fall only.</td>
</tr>
<tr>
<td>ISE 521</td>
<td>Healthcare Systems Performance Improvement II (3 credit hours)</td>
<td></td>
<td>Continuation of ISE 520 with a concentration on the completion of a healthcare systems process improvement project at the sponsoring health care institution. Project must employ the tools and techniques of healthcare systems process improvement. The project is done in conjunction with a diverse and multi-disciplinary team from the healthcare institution. The student must serve as a facilitator and coach, resulting in a project with measured success. Success will be determined by the improvement in patient care as quantified in cost, quality, and access. Prerequisite: ISE 520. Typically offered in Spring only.</td>
</tr>
</tbody>
</table>
ISE 533/OR 433/OR 533/ISE 433  Service Systems Engineering  (3 credit hours)
This course intends to provide a comprehensive treatment on the use of quantitative modeling for decision making and best practices in the service industries. The goal of this class is to teach students to able to identify, understand, and analyze services; and acquire the quantitative skills necessary to model key decisions and performance metrics associated with services. Students will be exposed both to classical and contemporary examples of challenges and opportunities that arise when working in the service sector.
Prerequisite: ISE 361
Typically offered in Spring only

ISE 535/ISE 435  Python Programming for Industrial & Systems Engineers  (3 credit hours)
The objective of this course is to build on your knowledge of computing and data analysis by focusing on programming using the Python language. In particular, you will learn more about the Python and its ecosystem of libraries, how to use data structures in Python programs, conduct File I/O operations, and perform numerical and scientific computing within Python. This course is designed for senior undergraduate and graduate students to get the basics of the Python language and learn to use it to perform scientific computing within Python with two of its most popular packages in use for heavy data intensive analysis - Numpy and SciPy. Several engineering examples from physics, industrial engineering core courses and general engineering will be used to contextualize the programming examples.
Prerequisites: ST 370 OR ST 371 and ISE/TE 110 OR CSC 111 OR CSC 113 OR CSC 116 or ST 307 OR ST 308 OR ECE 209. Restrictive Statement: Department Approval Required
Typically offered in Fall only

ISE 537  Data Science for Industrial and Systems Engineers  (3 credit hours)
In this course, graduate students will learn basic data science methodologies. Examples of the methodologies include linear regression, generalized linear models, regularization and variable selection, and dimensionality reduction. In addition, students will also learn how to use these methods to solve real-world Industrial Engineering-related problems by analyzing industrial datasets and projects.
Prerequisite: ST 370: "Probability and Statistics for Engineers" or equivalent
Typically offered in Fall only

ISE 540/PSY 540  Human Factors In Systems Design  (3 credit hours)
Introduction to problems of the systems development cycle, including human-machine function allocation, military specifications, display-control compatibility, the personnel sub-system concept and maintainability design. Detailed treatment given to people as information processing mechanisms.
Prerequisite: IE 452 or PSY 340, Corequisite: ST 507 or 515
Typically offered in Spring only

ISE 541  Occupational Safety Engrg  (3 credit hours)
Typically offered in Spring only

ISE 543 Musculoskeletal Mechanics  (3 credit hours)
Anatomy, physiology and biomechanics of musculoskeletal system including muscle bone, tendon, ligament, cartilage, nerve. Modeling of tissue and joints with special emphasis on spine and upper extremity. Physical, mathematical, optimization and finite element modeling techniques as applied in biomechanics research.
Prerequisite: BIO 125 or BAE(BIO) 235 or Graduate standing

ISE 544  Occupational Biomechanics  (3 credit hours)
Prerequisite: Graduate standing
Typically offered in Fall only

ISE 546/CSC 546  Management Decision and Control Systems  (3 credit hours)
Planning, design, and development and implementation of comprehensive computer-based information systems to support management decisions. Formal information systems principles; information requirements analysis; knowledge acquisition techniques; information modeling. Information resource management for quality operational control and decision support; system evaluation, process improvement and cost effectiveness.
Prerequisite: CSC 423 or BUS 541
Typically offered in Fall only

ISE 547/ISE 447  Applications of Data Science in Healthcare  (3 credit hours)
Health professional are capable of collecting massive amounts of data and look for best strategies to use this information. Healthcare analytics have the potential to reduce costs of treatment, predict outbreaks of epidemics, avoid preventable diseases and improve the quality of life in general. This course will explore some of the frequently used data science methods in healthcare and examine a compilation of the most recent academic journal articles on the subject. Students are expected to have a strong background in optimization and stochastic modeling.
Prerequisite: ISE 362
Typically offered in Fall only
ISE 552 Design and Control of Production and Service Systems (3 credit hours)
Basic terminology and techniques for the control of production and service systems including economic order quantity models; stochastic inventory models; material requirements planning; Theory of Constraints; single and mixed model assembly lines; and
Prerequisite: ST 371 or ST 372
Typically offered in Fall only

ISE 553 Modeling and Analysis of Supply Chains (3 credit hours)
Basic issues in operating supply chains, using state of the art modeling tools available for their analysis. Emphasis on using engineering models to develop insights into the behavior of these systems.
Prerequisite: ISE 361 and ST 372
Typically offered in Spring only

ISE 560/OR 560 Stochastic Models in Industrial Engineering (3 credit hours)
ISE/OR 560 will introduce mathematical modeling, analysis, and solution procedures applicable to uncertain (stochastic) production and service systems. Methodologies covered include probability theory and stochastic processes including discrete and continuous Markov processes. Applications relate to design and analysis of systems, capacity planning, inventory control, waiting lines, and service systems.
Typically offered in Fall only

ISE 562/TE 562/OR 562 Simulation Modeling (3 credit hours)
This course concentrates on design, construction, and use of discrete/continuous simulation object-based models employing the SIMIO software, with application to manufacturing, service, and healthcare. The focus is on methods for modeling and analyzing complex problems using simulation objects. Analysis includes data-based modeling, process design, input modeling, output analysis, and the use of 3D animation with other graphical displays. Object-oriented modeling is used to extend models and enhance re-usability.
Typically offered in Spring only

ISE 589 Special Topics in Industrial Engineering (1-6 credit hours)
Special developments in some phase of industrial engineering using traditional course format. Identification of various specific topics and prerequisites for each section from term to term.

ISE 601 Seminar (1 credit hours)
Seminar discussion of industrial engineering problems for graduate students. Case analyses and reports.
Typically offered in Fall and Spring

ISE 610 Special Topics in Industrial Engineering (3-6 credit hours)
Special developments in some phase of industrial engineering using traditional course format. Identification of various specific topics and prerequisites for each section from term to term.

ISE 637 Directed Study in Industrial Engineering (1-3 credit hours)
Independent study providing opportunity for individual students to explore topics of special interest under direction of a member of faculty.
Typically offered in Fall and Summer

ISE 639 Advanced Directed Study in Industrial Engineering (1-3 credit hours)
Independent study providing an opportunity for individual graduate students to explore advanced topics of special interest under the direction of a member of the faculty.
Typically offered in Fall, Spring, and Summer

ISE 677 Industrial Engineering Projects (1-6 credit hours)
Investigation and written report on assigned problems germane to industrial engineering. Maximum of six credits to be earned for MIE degree.
Prerequisite: MIE candidates
Typically offered in Fall, Spring, and Summer

ISE 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ISE 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ISE 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ISE 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ISE 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Typically offered in Fall, Spring, and Summer

ISE 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only
ISE 699 Master's Thesis Preparation (1-9 credit hours)
For student who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ISE 707 Real-Time Control of Automated Manufacturing (3 credit hours)
Concepts and application of real-time control of automated manufacturing systems. Development of prototype manufacturing control applications involving introductions to following topics: computer architecture; real-time, multi-tasking operating systems; data modeling; multi-processing systems; local area networks; inter-task communication; and development of multi-tasking control systems. Design development of control system.
Typically offered in Fall only

ISE 708/MA 708/OR 708 Integer Programming (3 credit hours)
General integer programming problems and principal methods of solving them. Emphasis on intuitive presentation of ideas underlying various algorithms rather than detailed description of computer codes. Students have some "hands on" computing experience
Prerequisite: MA 405, OR(IE,MA) 505, Corequisite: Some familiarity with computers (e.g., CSC 112)
Typically offered in Spring only

ISE 709/OR 709 Dynamic Programming (3 credit hours)
Introduction to theory and computational aspects of dynamic programming and its application to sequential decision problems.
Prerequisite: MA 405, ST 421
Typically offered in Spring only

ISE 711 Capital Investment Economic Analysis (3 credit hours)
Analysis of economic merits of alternatives including interest and income tax considerations. Risk and sensitivity exploration techniques. Introduction to analytical techniques for multiple objectives or criteria. Use of mathematical programming and comp
Prerequisites: ISE 311 and ST 371
Typically offered in Fall only

ISE 712 Bayesian Decision Analysis For Engineers and Managers (3 credit hours)
The Bayesian approach to decision making, with numerous applications in engineering and business. Expected value maximization, decision trees, Bayes' theorem, value of information, sequential procedures and optimal strategies. Axiomatic utility theory and controversies, utility of money, theoretical and empirical determination of utility functions and relationship to mean-variance analysis. Brief introduction to multi-attribute problems, time streams and group decisions.
Prerequisite: ST 371 or ST 421
Typically offered in Spring only

ISE 714 Product Manufacturing Engineering for the Medical Device Industry (3 credit hours)
Product development course targeted toward the medical device industry. Product design and development, concept generation and selection, parametric feature-based CAD, design for manufacturability (DFM) and assembly (DFA), tolerancing, rapid prototyping, tool design, tool fabrication, and medical device fabrication.
Prerequisite: ISE 515
Typically offered in Spring only

ISE 715 Manufacturing Process Engineering (3 credit hours)
Manufacturing process engineering, primary, secondary, finishing and assembly processes. Concurrent engineering, process planning, group technology, manufacturing analyses and application of economic analyses.
Typically offered in Spring only

ISE 716 Automated Systems Engineering (3 credit hours)
General principles of operation and programming of automated systems. Automated assembly, automated manufacturing, and inspection systems. Control of automated manufacturing. Industrial logic systems and programmable logic controllers. Computer numerical control, industrial robotics, and computer integrated manufacturing.
Typically offered in Spring only

ISE 718 Micro/Nano-Scale Fabrication and Manufacturing (3 credit hours)
Introduction to physical theory, process design, analysis, and characterization of micro/nano scale fabrication and manufacturing. The main focus of the course is on the fabrication/manufacturing of important types of microstructures used in micro/nano devices and the techniques and tools used to fabricate and characterize them.
Prerequisite: ISE 316 or graduate standing in the college of engineering
Typically offered in Spring only

ISE 723 Production Planning, Scheduling and Inventory Control (3 credit hours)
An analysis of Production-Inventory systems. Discussion of commonly used planning and scheduling techniques. Introduction to use of math modeling for solution of planning and scheduling problems. Interface with quality control and information systems.
Prerequisite: OR 501 and ST 511
Typically offered in Fall and Spring

ISE 726 Theory of Activity Networks (3 credit hours)
Introduction to graph theory and network theory. In-depth discussion of theory underlying (1) deterministic activity networks (CPM); optimal time-cost trade offs; the problem of scarce resources; (2) probabilistic activity networks (PERT); critical evaluation of underlying assumptions; (3) generalized activity networks (GERT, GAN): applications of signal flow graphs and semi-Markov process to probabilistic branching; relation to the theory of scheduling.
Prerequisite: OR 501, OR(IE,MA) 505
Typically offered in Spring only
Typically offered in Spring only

**ISE 740/PSY 740 Engineering Psychology of Human-computer Interaction** (3 credit hours)
Exploration of usability of computer technology. Theory and practice of user-centered design for HCI applications. Course focuses on current usability paradigms and principles, psychology of users, iterative and participatory design processes, system requirements specification, prototyping, user support systems, usability evaluation and engineering, interface design guidelines and standards. Application domains include, universal design, virtual reality, and scientific data visualization.

Prerequisite: IE(PSY) 540 or CSC 554

**ISE 741 Systems Safety Engineering** (3 credit hours)
Systems safety engineering. Course familiarizes students with techniques for identifying and recognizing potential safety hazards and the concept of risk assessment. Preliminary Hazard Analysis, Failure Modes and Effects Analysis, System and Subsystem Hazard Analysis, Fault Tree Analysis, Process Safety Management (29CFR1910.119) are explored together with applications to hazard analysis and control. Industrial situations and case studies are employed to illustrate usefulness of various system safety techniques.

Typically offered in Fall only

**ISE 742 Environmental Stress, Physiology and Performance** (3 credit hours)

Typically offered in Spring only

**ISE 743/PSY 743 Ergonomic Performance Assessment** (3 credit hours)
Fundamentals of ergonomic performance measurement used to assess the effects of environment and system design on human performance. Treatment of topics such as workload measurement, measurement of complex performance, simulator studies, measurement of change, task taxonomies, criterion task sets and statistical methods of task analysis. Problems of laboratory and field research, measurement of change and generalizability of findings.

Prerequisite: PSY 200, ST 507 and 508
Typically offered in Fall only

**ISE 744 Human Information Processing** (3 credit hours)
Fundamentals of human information processing basic to skilled operator performance and the design of displays, controls and complex systems. Treatment of topics such as channel capacity, working memory, long-term memory, decision making, attention and process monitoring. Problems of display and control design and evaluation, evaluation of textual material, and human-computer interaction.

Prerequisite: PSY 200, ST 507 and 508
Typically offered in Spring only

**ISE 745/PSY 745 Human Performance Modeling** (3 credit hours)

Prerequisite: ST 507 or 515 or equivalent; IE (PSY) 540, CSC 554 or IE (PSY) 744

**ISE 747/OR 747 Reliability Engineering** (3 credit hours)
Introduction to basic concepts of reliability engineering. Application of probability and statistics to estimate reliability of industrial systems; development of reliability measures; analysis of static and dynamic reliability models; development and a

Prerequisite: ST 511
Typically offered in Fall only

**ISE 748 Quality Engineering** (3 credit hours)
Introduction to basic concepts of quality engineering. Statistical process control (SPC) methods, acceptance sampling techniques, concept of parameter design and statistical as well as analytical techniques for its implementation, tolerance analysis and design, components of cost of poor quality and an introduction to quality management.

Prerequisite: OR 501, ST 511
Typically offered in Fall only

**ISE 754 Logistics Engineering** (3 credit hours)
Elements of logistics networks. Supply chain design: facility location and allocation; great-circle distances; geocoding. Multi-echelon production and inventory systems; sourcing decision systems. Vehicle routing: exact, approximation, and heuristic procedures; traveling salesman problem; basic vehicle routing problem and extensions; backhauling; mixed-mode transportation system design.

Prerequisite: ISE 453
Typically offered in Spring only
ISE 760/760  Applied Stochastic Models in Industrial Engineering  (3 credit hours)
Formulation and analysis of stochastic models with particular emphasis on applications in industrial engineering; univariate, multivariate and conditional probability distributions; unconditional and conditional expectations; elements of stochastic processes; moment-generating functions; concepts of stochastic convergence; limit theorems; homogeneous, nonhomogeneous and compound Poisson processes; basic renewal theory; transient and steady-state properties of Markov processes in discrete and continuous time.
Prerequisite: MA 303, ST 371
Typically offered in Fall only

ISE 761/761  Queues and Stochastic Service Systems  (3 credit hours)
Introduction of general concepts of stochastic processes. Poisson processes, Markov processes and renewal theory. Usage of these in analysis of queues, from with a completely memoryless queue to one with general parameters. Applications to many engineering problems.
Typically offered in Spring only

ISE 762/CSC 762/762  Computer Simulation Techniques  (3 credit hours)
Basic discrete event simulation methodology: random number generators, simulation designs, validation, analysis of simulation output. Applications to various areas of scientific modeling. Simulation language such as SLAM and GPSS. Computer assignments and projects.
Prerequisite: ST 512 and a scientific programming language
Typically offered in Fall only

ISE 766/MA 766/766  Network Flows  (3 credit hours)
Study of problems of flows in networks. These problems include the determination of shortest chain, maximal flow and minimal cost flow in networks. Relationship between network flows and linear programming developed as well as problems with nonlinear cost functions, multi-commodity flows and problem of network synthesis.
Prerequisite: OR(IE,MA) 505
Typically offered in Spring only

ISE 767  Upper Extremity Biomechanics  (3 credit hours)
Gross and functional anatomy of upper extremity; properties of tendons and synovial fluid; epidemiology; disorders of shoulder, elbow, wrist, hands, fingers; biomechanical modeling; personal factors affecting cumulative trauma disorder (CTD) risk, diagnosis and treatment of upper extremity CTDs; wrist splints; workplace ergonomics to alleviate upper extremity CTDs.
Typically offered in Fall only

ISE 768  Spine Biomechanics  (3 credit hours)
Gross and fine anatomy of spine, mechanism of pain, epidemiology, in vitro testing, psychophysical studies, spine stability models, bioinstrumentation: intradiscal pressure, intra-abdominal pressure and electromyography. Biomechanics of lifting and twisting, effects of vibration, effects of posture/lifting style, lifting belts, physical models, optimization models, mathematical models, muscle models, finite element models, current trends in medical management and rehabilitation, chiropractic.
Typically offered in Fall only

ISE 772/772  Stochastic Simulation Design and Analysis  (3 credit hours)
Advanced topics in stochastic system simulation, including random variate generation, output estimation for stationary and non-stationary models, performance optimization techniques, variance reduction approaches. Student application of these techniques to actual simulations. A current topic research paper required.
Prerequisite: (CSC,ECE,IE,OR) 762 and ST 516
Typically offered in Spring only

ISE 789  Advanced Special Topics In Industrial Engineering  (3-6 credit hours)
Advanced topics in some phase of industrial engineering using traditional course format. Identification of various specific topics and prerequisites for each section from term to term.
Typically offered in Fall and Spring

ISE 790/MA 790  Advanced Special Topics System Optimization  (1-6 credit hours)
Advanced topics in some phase of system optimization using traditional course format. Identification of various specific topics and prerequisites for each section from term to term.
Typically offered in Fall and Spring

ISE 791  Advanced Problems in Ergonomics  (3 credit hours)
Exploration in depth of a problem area of contemporary interest involving man-machine-environment interface. Class discussion and analysis of research and theory, with special focus on human factors aspects of systems design and operation.
Typically offered in Fall only

ISE 796  Research Practicum in Human-Systems Engineering  (3 credit hours)
Human-systems engineering research topic development, literature evaluation, experimental design, use of research instrumentation, data collection, basic data interpretation, statistical analysis, manuscript preparation.
Typically offered in Spring only

ISE 801  Seminar  (1 credit hours)
Seminar discussion of industrial engineering problems for graduate students. Case analyses and reports.
Typically offered in Fall and Spring

ISE 812/MA 812  Special Topics in Mathematical Programming  (1-6 credit hours)
Study of special advanced topics in area of mathematical programming. Discussion of new techniques and current research in this area. The faculty responsible for this course select areas to be covered during semester according to their preference and interest. This course not necessarily taught by an individual faculty member but can, on occasion, be joint effort of several faculty members from this university as well as visiting faculty from other institutions. To date, a course of Theory of Networks and another on Integer Programming offered under the umbrella of this course. Anticipation that these two topics will be repeated in future together with other topics.
Prerequisite: IE(IA,OR) 505
Typically offered in Spring only
ISE 816/MA 816 Advanced Special Topics Sys Opt (1-6 credit hours)
Advanced topics in some phase of system optimization. Identification of various specific topics and prerequisite for each section from term to term.

Typically offered in Fall and Spring

ISE 837 Directed Study in Industrial Engineering (1-3 credit hours)
Independent study providing opportunity for individual students to explore topics of special interest under direction of a member of faculty.

Typically offered in Fall, Spring, and Summer

ISE 839 Advanced Directed Study in Industrial Engineering (1-3 credit hours)
Independent study providing an opportunity for individual graduate students to explore advanced topics of special interest under the direction of a member of the faculty.

Typically offered in Fall, Spring, and Summer

ISE 861 The Design of Production Systems (3 credit hours)
The structure and operation of production planning, scheduling and control systems; emphasis on system structure, capacity planning, master production scheduling, shop loading and supply chain; investigation of current trends.

Typically offered in Fall only

ISE 877 Industrial Engineering Projects (1-6 credit hours)
Investigation and written report on assigned problems germane to industrial engineering. Maximum of six credits to be earned for MIE degree.

Prerequisite: MIE candidates
Typically offered in Fall, Spring, and Summer

ISE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ISE 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ISE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ISE 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ISE 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

ISE 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Industrial Design (ID)

ID 102 Basic Industrial Design Studio (6 credit hours)
This course is a continuation of the work introduced in D104 with a focus on the industrial design discipline. This studio course examines the techniques and attitudes for dealing with exploration, identification, prototyping, evaluation and communication of problems and solutions arising from the design of physical artifacts in the natural and product environment. The design studio process includes the acquisition of languages and skills appropriate to creativity, design thinking, industrial design vocabulary and disciplined work habits.

Prerequisite: D104 and ID 110 Corequisites: ID 210 and ID216
Typically offered in Spring only

ID 110 Introduction to Digital Techniques (3 credit hours)
Introduction to the computer as a design tool for generating and manipulation of two-dimensional raster and vector imagery; techniques in two-dimensional concept rendering; 2D applications for design and production of presentation documentation; and an introduction to basic 3D digital techniques. Industrial design majors, department approved minor, and department approved elective for all other college of design majors.

Corequisite: D 104
Typically offered in Fall only

ID 201 Industrial Design Studio I (6 credit hours)
This course is an introduction to the theories, methods, and language of industrial design; elementary problems in form and function; transitional implications of hand-crafted and mass-produced objects in various materials. Industrial Design majors, and department approved elective (“swing”) studio for all other College of Design majors.

Prerequisite: D 104 and ID 102 and ID 210 and ID 216; Corequisite: ID 310 and ID 316
Typically offered in Fall only

ID 202 Industrial Design Studio II (6 credit hours)
Introduction to the fundamentals of product development and design with emphasis on analytical and intuitive approaches to problem solving, technical skills, manufacturing and structural considerations in design of simple products/systems.

Prerequisite: ID 201 and ID 310 and ID 316; Corequisite: ID 255 and ID 240
Typically offered in Spring only
ID 210 Intermediate Digital Techniques (3 credit hours)
Progression of digital experiences that expand upon and combine the intellectual and conceptual skills required for digital 3D design visualization. Emphasis on solving design problems through development and manipulation of 3D form within the virtual
Prerequisite: ID 110 and D 104; Corequisite: ID 102 and ID 216
Typically offered in Spring only

ID 216 Visualization I (3 credit hours)
This course is an introduction to the ideation process of conceiving, developing and recording ideas two-dimensionally.
Prerequisite: D 104 and ID 110; Corequisite: ID 102 and ID 210
Typically offered in Spring only

ID 240 Human-Centered Design (3 credit hours)
Introduction to the spectrum of human physical and cognitive capabilities as they relate to user interaction with designed products and environments. Industrial Design Majors and Department approved Elective for all other College of Design Majors with J
Junior standing or above
Typically offered in Spring only

ID 244 History of Industrial Design (3 credit hours)
This survey class focuses on the history of modern design from the world of Art Nouveau in 1900 to Contemporary Design. The emphasis falls squarely on the development of mass production and its alignment with the Modern movement, with elements drawn from the history of architecture and the fine arts. The Bauhaus (1919-1933) is examined in detail as is the growth of the industrial design profession in the US between 1927 and 1944, when the Society of Industrial Designers was formed. Postwar styling and consumerism in the US are examined in conjunction with the development of human factors, its early investigations and influence on design since 1955. Material culture issues are examined through visits to the Gregg Museum of Art & Design and its growing collection of industrial design. Postmodernism, Universal Design, and User Experience Design are examined in the contexts of their emergence and relevance to design today.

GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

ID 255 Contemporary Manufacturing Processes I (3 credit hours)
Introduction to mass production processes and their influences on design. Wood, paper and metal manufacturing processes utilized in quantity production. Emphasis on materials comparison and process selection in relation to product function, form, safety, human factors and manufacturability. Field trips required. Industrial Design majors, department approved minor, and department approved elective for all other College of Design majors.
Prerequisite: ID 201 and ID 315; Corequisite: ID 202
Typically offered in Spring only

ID 256 Contemporary Manufacturing Processes II (3 credit hours)
Second course in mass production processes and their influences on design. Emphasis on material search and process selection in relation to form, function, human factors, finishes, and joining methods. Plastics and rubber and their specific manufacturing processes utilized in mass production. Industrial Design Majors and Department approved Elective for all other College of Design Majors.
Prerequisite: ID 255
Typically offered in Fall only

ID 262 Professional Practice in Industrial Design (3 credit hours)
Issues and situations encountered in a design practice. Topics include patents, trademarks, contracts, basic marketing skills within corporations and in design consultancies.
Typically offered in Spring only

ID 292 Special Topics in Industrial Design (1-3 credit hours)
Topics of current interest in Industrial Design. Normally used to develop new courses.
Typically offered in Fall, Spring, and Summer

ID 301 Industrial Design Studio III (6 credit hours)
This course provides individual and team-oriented design experiences that expand upon and combine intellectual and manual skills required for the practice of industrial design. Intermediate level integration of computer technology, including 3D digital modeling, rapid prototyping, interactive virtual product visualization. Emphasis on identifying and solving design problems through manipulation of design theory, ecological/environmental concerns, advanced materials and manufacturing techniques.
Prerequisite: ID 202 and ID 255 and ID 240; Corequisite: ID 340
Typically offered in Fall only

ID 302 Industrial Design Studio IV (6 credit hours)
This course provides individual and team-oriented design experiences that expand upon and combine intellectual and manual skills required for the practice of industrial design. Continuity and increased complexity of project categories from the previous semester, developed through advanced use of digital technology. Emphasis is placed on identifying and solving design problems through manipulation of design theory, application of human factors, product safety awareness, universal design principles and digital presentation of concepts.
Prerequisite: ID 301; Corequisite: ID 440
Typically offered in Spring only

ID 310 Advanced Digital Techniques (3 credit hours)
Methods and techniques for developing 3D digital models and animations that are compelling, unique, and relevant in the creative process of Industrial Design. Students begin to strategically integrate 3D digital technology as part of the larger curriculum relative to studios and support classes and are encouraged to look beyond current conventions to find new means of creating digital artifacts.
Prerequisite: ID 210
Typically offered in Fall only

ID 316 Visualization II (3 credit hours)
This course expands the ideation process of conceiving, developing and recording ideas two-dimensionally, placing greater emphasis on the creative development and recording of the design process.
Prerequisite: ID 216; Corequisite: ID 310
Typically offered in Spring only

ID 340 Research Methods in Industrial Design (3 credit hours)
This class provides an overview of the role of human centered design research throughout the stages of the design process. Students will use primary and secondary sources to place people at the center of the design inquiry process and gain insights about
Prerequisite: ID 240 and ID 202; Corequisite: ID 301
Typically offered in Fall only
ID 401 Advanced Industrial Design Studio I (6 credit hours)
This course is an advanced studio experience that expands upon the intellectual, digital, and practical skills required of an industrial design practitioner. Emphasis on identifying and solving design problems through manipulation of design theory, application of human factors, product safety awareness, appropriate combination of materials and manufacturing techniques, and presentation of concepts.

Prerequisite: ID 302 and ID 440
Typically offered in Fall only

ID 402 Advanced Industrial Design Studio II (6 credit hours)
This course is the second advanced studio that expands upon and combine the intellectual, digital, and practical skills required of an industrial design practitioner. This is a capstone experience where the outcomes, in the form of product proposals, reflect synthesis of design research, problem framing, and solution of complex design problems. Students achieve these outcomes through as mastery and manipulation of design theory, the application of human factors, an awareness of product safety, and appropriate combination of materials and manufacturing techniques. An emphasis is placed on the presentation and communication of processes and concepts.

Prerequisite: ID 401
Typically offered in Spring only

ID 440 Experience Design for ID (3 credit hours)
This course explores the theory and practice of the user-experience (UX) development process in the context of Industrial Design (ID). Students will clearly identify principles and professional processes for research, development, documentation and implementation of various stages of work, including requirements analysis, user needs analysis, prototyping, mockups, and production as these relate to industrial design best practices.

Prerequisite: ID 301 and ID 340; Corequisite: ID 302
Typically offered in Spring only

ID 490 Industrial Design International Studio (6 credit hours)
Define industrial design problems and develop design solutions in an international setting. Studio projects related to design, culture, and traditional and contemporary limited and mass produced products. Focus on artifact making through directed studies. Industrial Design Majors, and Department approved Elective ("swing") Studio for all other College of Design Majors with Junior or Graduate standing in Major.

Prerequisite: Junior standing in Major, Approval of Study Abroad Office
Typically offered in Summer only

ID 492 Special Topics in Industrial Design (1-3 credit hours)
Topics of current interest in Industrial Design. Normally used to develop new courses. Industrial Design Majors, and Department approved Elective for all other College of Design Majors with Junior, Senior or Graduate standing in Major.

Junior standing or above
Typically offered in Fall, Spring, and Summer

ID 494 Internship in Industrial Design (1-6 credit hours)
Supervised field experience in product design offices, galleries, museums and other related organizations. Maximum of 6 credit hours. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: Junior standing, 3.0 GPA or better. Instructor Consent.
Typically offered in Fall, Spring, and Summer

ID 495 Independent Study in Industrial Design (1-3 credit hours)
Special projects in industrial design developed under the direction of a faculty member on a tutorial basis. Maximum 6 credit hours - May be repeated. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled

Prerequisite: Junior standing in Industrial Design and 3.0 GPA or better. Instructor Consent.
Typically offered in Fall, Spring, and Summer

ID 500 Advanced Industrial Design (Series) (6 credit hours)
Advanced studies in industrial design. Special emphasis given to problem identification, program formulation and application of advanced design methods. All problems of an individual nature leading to a synthesis of previous design experience.

Prerequisite: Portfolio review
Typically offered in Fall and Spring

ID 511 Industrial Design Materials and Processes I (3 credit hours)
Analysis of paper, wood, metal and manufacturing processes utilized in production of mass-produced products. Advanced studies in mass production processes and their influence on design and development of products. Emphasis on material search and process selection in relation to product safety, cost, function, human factors, form, finishes and joining methods.

Prerequisite: Graduate standing
Typically offered in Spring only

ID 512 Industrial Design Materials and Processes II (3 credit hours)
Analysis of plastics and rubber and related manufacturing processes utilized in production of mass-produced products. Advanced studies in mass production processes and their influence on design and development of products. Emphasis on material search and process selection in relation to cost, product safety, function, human factors, form, finishes and joining methods.

Prerequisite: Graduate standing
Typically offered in Fall only

ID 581 Industrial Design Project Preparation (3 credit hours)
A seminar course designed to assist students in preparing groundwork for the final project to be conducted in design studio.

Prerequisite: Graduate standing
Typically offered in Fall only

ID 582 Special Topics In Industrial Design (1-6 credit hours)
F.S. Topics of current interest to program/option offered by faculty in the School. Subjects offered under this number normally used to test and develop new courses.

Prerequisite: Graduate standing
Typically offered in Fall and Spring
Integrated Manufacturing Systems (IMS)

IMS 675 Manufacturing Systems Engineering Project (1-6 credit hours)
Individual or team project work in integrated manufacturing systems engineering resulting in an engineering report. Required of all degree candidates in IMSE master's program. Forms the basis for IMSE student's final oral examination.

Prerequisite: Graduate standing in IMSE
Typically offered in Fall, Spring, and Summer

IMS 680 Master's Directed Study (1-3 credit hours)
Independent study providing opportunity for individual students to explore topics of special interest under direction of a member of faculty.

Prerequisite: Graduate standing in IMSE
Typically offered in Fall, Spring, and Summer

IMS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

IMS 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

IMS 696 Summer Project Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to project research.

Typically offered in Summer only

Interdisciplinary Perspectives (IPGE)

IPGE 295 Interdisciplinary Perspectives Special Topics (2-3 credit hours)
Special Topics course offered on a trial basis for the General Education Interdisciplinary perspectives category. Offered for a letter grade.

GEP Interdisciplinary Perspectives
Interdisciplinary Perspectives and Global Knowledge (IPGK)

IPGK 295 Interdisciplinary Perspectives and Global Knowledge
Special Topics (2-3 credit hours)
Special topics course offering for the general education Interdisciplinary Perspectives and Global Knowledge categories. This course may be used for the Global Knowledge (GK) co-requisite and/or for the Interdisciplinary Perspectives (IP) requirement.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

Interdisciplinary Perspectives and U.S. Diversity (IPUS)

IPUS 295 Interdisciplinary Perspectives and U.S. Diversity Special Topics (2-3 credit hours)
Special topics course offering for the general education Interdisciplinary Perspectives and U.S. Diversity categories. This course may be used for the U.S. Diversity (USD) co-requisite and/or for the Interdisciplinary Perspectives (IP) requirement.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

Interdisciplinary Studies (IDS)

IDS 201 Environmental Ethics (3 credit hours)
Interdisciplinary consideration of ways in which field of study coupled with personal/cultural values contribute towards either solving or compounding environmental problems; provides framework for process of making ethical decisions.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

IDS 210 Introduction to American Studies (3 credit hours)
Introduction to the interdisciplinary study of American culture through exploration of questions asked and methods used in the field of American Studies. Will incorporate historical, literary, anthropological, and cultural studies approaches and methods for studying culture through texts, objects, and people. Topics to be considered include literary and popular texts, music, clothing, and historical and contemporary American experiences and cultures. Includes one field trip for which students will need to provide their own transportation.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Spring only

IDS 211 Eating through American History (3 credit hours)
Examination of cultural and scientific forces that have shaped our relationship with food. Science and politics of dietary recommendations. Influence, over time, of economic, social and political conditions on food preparation, preference and nutritional knowledge. Role of religion, family, tradition and personal experience in shaping eating attitudes and behaviors. Roles played only by women in American food culture.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

IDS 220 The Science and Art of Happiness (3 credit hours)
Interdisciplinary inquiry into the nature of happiness; why it matters, how to promote it, and what harms it. The relevance of the body-mind connection for one's happiness. Current scientific insights into happiness from physiology, neuroscience, and psychology, as well as their connections to Aristotelian ethics and to the concept of suffering in Buddhism. Experiential component of the course consisting of scientifically supported techniques for daily practice for deepening the understanding of course materials and discussions.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Summer only

IDS 295 Special Topics in Interdisciplinary Studies (1-12 credit hours)
Detailed investigation of an interdisciplinary topic. Topic and mode of study to be determined by faculty member and/or teach team.

Typically offered in Fall, Spring, and Summer

IDS 303/NR 303 Humans and the Environment (3 credit hours)
Interactions among human populations in the biophysical system and the environment. Emphasis on current issues, ecological principles and their relationships to basic biophysical processes; considers food, population dynamics, public land and common resources, renewable natural resources, pollution, water resources, energy and non-renewable resources.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

IDS 310 Animals in the Global Community (3 credit hours)
A lecture/seminar exploring the interdisciplinary field of Human Animal Studies in a global context, examining cultural, economic, ethical, ecological, geographical, political, and psychological aspects of human/nonhuman interactions using readings, films, and guest lectures. E.g. what are global ecological/political ramifications of treating cattle as sacred versus breeding them for beef? Why are there more tigers in captivity than in the wild? What are our ethical obligations to the Great Apes? Concepts such as place and placelessness, boundaries, animals as refugees, and interspecies justice will be explored. Course includes team work, and a research project focusing on personal area of interest. Junior Standing or higher.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall only

IDS 490 Interdisciplinary Methods and Issues (3 credit hours)
Capstone seminar for students in the IDS self-design major. Intensive study of student's area of concentration, leading to a major research paper.

Prerequisite: Interdisciplinary Studies Self-Design Majors, Senior standing
Typically offered in Fall and Spring

IDS 495 Special Topics in Interdisciplinary Studies (1-12 credit hours)
Examination of selected topics of an interdisciplinary nature.

Typically offered in Fall and Spring
International Studies (IS)

IS 200 Introduction to International Studies (3 credit hours)
Introductory analysis of the diverse processes of globalization, and an interdisciplinary survey of the social, political, economic, and cultural patterns reflected in the interrelations between various regions of the world. Emphasis on the historical and cultural contexts of debates in current global issues. A foundation course for students preparing an International Studies major or minor.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

IS 250 Globalizing North Carolina (3 credit hours)
Examines from an anthropological and historic perspective the impact of transnational and global forces on specific communities in North Carolina post World War II. Emphasis placed on studying the consequences of urban growth and economic shifts away from the agricultural and manufacturing industries and toward financial services, scientific and technological research, and the knowledge-based industries. Consequences include increased infrastructural demands, environmental issues, increased income and educational inequalities, food production, socio-cultural clashes, and migration and immigration concerns. Course requires students to visit 1 to 2 museums outside of class times.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

IS 393 Theories of Globalization (3 credit hours)
This course offers an in-depth and interdisciplinary examination of various aspects of globalization including economics, human dimensions of environmental change, culture, ethics and power. The course aims to build student understanding of the relationship between theory and application in the field of international studies. This course is designed for international studies minors, as well as majors who are expected to bridge between introductory materials and capstone coursework. Restriction: Minimum of 45 credit hours complete; IS majors and minors only

Prerequisite: IS 200
Typically offered in Fall and Spring

IS 395 Special Topics in International Studies (1-3 credit hours)
Typically offered in Fall, Spring, and Summer

IS 471/IS 571/ANT 471/ANT 471 Understanding Latino Migration (3 credit hours)
This collaborative, hands-on class examines what ultimately drives migration and how families, communities, and policy-makers respond to migration in ways that can keep the process going. Focusing on emigration from Mexico, Guatemala, Honduras, and El Salvador, the course reviews the historical foundation for today's migration with attention to migration to North Carolina.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Summer only

IS 491 Senior Seminar in International Studies (3 credit hours)
An intensive study of selected international issues, global dimensions and implications, leading to a major research paper.

Prerequisite: IS 393
Typically offered in Fall and Spring

IS 571/ANT 571/ANT 471/IS 471 Understanding Latino Migration (3 credit hours)
This collaborative, hands-on class examines what ultimately drives migration and how families, communities, and policy-makers respond to migration in ways that can keep the process going. Focusing on emigration from Mexico, Guatemala, Honduras, and El Salvador, the course reviews the historical foundation for today's migration with attention to migration to North Carolina.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Summer only

International Studies (MIS)

MIS 598 Special Topics in International Studies (1-6 credit hours)
In-depth investigation of a contemporary topic in the field of international studies in a class context. Topic and mode of instruction to be determined by faculty member. May be taken for up to six hours of credit.

Prerequisite: Advanced Undergraduate standing, PBS status, or Graduate standing
Typically offered in Fall, Spring, and Summer

MIS 601 Colloquium in International Studies (3 credit hours)
Selected topics in international studies required for writing and oral presentation of MIS capstone paper.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

MIS 630 Independent Study (1-3 credit hours)
Investigation of topics of particular interest to advanced students under faculty direction on a tutorial basis. Credits and content vary with student/faculty discretion and needs.

Restricted: MIS Students Only
Typically offered in Fall, Spring, and Summer
MIS 651 Internship in International Studies (1-6 credit hours)
Exposure of student to value systems and technological environment of cultures other than his/her own through a supervised work experience. Application of technological knowledge to development problems. Required technical paper summarizing and analyzing.
Prerequisite: MIS standing
Typically offered in Fall, Spring, and Summer

MIS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring

MIS 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Fall and Spring

MIS 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall and Spring

**Landscape Architecture (LAR)**

LAR 200 Landscape Architecture Introductory Studio (6 credit hours)
Small scale landscape architectural design. Site observation exercises and visits, physical design projects, reading and discussion. Basic skills in landscape architecture, discerning the environmental issues in design, understanding design process, drawing and verbally communicating issues, and idea conceptualization and realization.
Prerequisite: Design Majors and D 104
Typically offered in Fall only

LAR 210 Digital Drawing for Landscape Architecture (3 credit hours)
Digital modeling and computer aided design in landscape architecture. Integration of digital data in visualization of past, existing and future designs.
Prerequisite: LAR Majors
Typically offered in Fall only

LAR 211 Digital Design Media for Landscape Architecture (3 credit hours)
Principles and practices related to the use of digital applications in landscape architectural design. Includes two-dimensional raster imaging, vector graphics, photo simulation, and three-dimensional modeling.
Prerequisite: LAR Majors
Typically offered in Spring only

LAR 221 Introduction to Environment and Behavior for Designers (3 credit hours)
Integration of behavioral and environmental systems related to design. Exploration of humane, ecologically sound design alternatives.
GEP Humanities
Typically offered in Summer only

LAR 222 Perception and Behavior for Designers (3 credit hours)
Perceptual systems, linkages among them, and linkages between them and language and culture as these affect the design process.
Typically offered in Spring only

LAR 292 Special Topics in Landscape Architecture (1-3 credit hours)
Topics of current interest in Landscape Architecture. Normally used to develop new courses.
Typically offered in Fall, Spring, and Summer

LAR 400 Landscape Architecture Studio (6 credit hours)
Projects cover small scale design, urban landscapes, community design, and environmental management. Design process stressed, including attention to project organization, design synthesis and realization.
Prerequisite: D 105, LAR 200; or Departmental Head Approval
Typically offered in Spring only

LAR 430 Site Planning (3 credit hours)
Technical operations and environmental landscape controls for site development. Site analysis, grading and drainage, earthwork, horizontal and vertical control for road alignment. Graphic exercises.
Prerequisite: LAR 400 or LAR 501
Typically offered in Spring only

LAR 444 History of Landscape Architecture (3 credit hours)
The history of designed landscapes. Environmental, social and cultural factors which influence human made landscapes presented with history and art of landscape architecture.
GEP Visual and Performing Arts
Typically offered in Fall only

LAR 457 Landscape Construction Materials, Methods and Documentation (3 credit hours)
Materials, standards, and construction methods used to implement landscape architectural designs. Development of construction documents.
Prerequisite: LAR 400 or LAR 502
Typically offered in Summer only

LAR 465 Landscape Architecture International Studio (6 credit hours)
Define landscape architectural problems and develop design solutions in an international setting. Exercises and projects related to design, culture and the physical environment of the host country. Focus on landscape architecture, gardens and urbanism studied through sketching and documentation, discussion, site investigation, historical context, current design examples and design applications.
Prerequisite: Junior Standing in the College of Design and Approval of the International Study Abroad Office.
Typically offered in Spring only
LAR 492 Special Topics in Landscape Architecture (1-3 credit hours)
Topics of current interest in Landscape Architecture. Normally used to develop new courses.
Typically offered in Fall, Spring, and Summer

LAR 495 Independent Study in Landscape Architecture (1-3 credit hours)
Individual projects in landscape architecture developed under the direction of a faculty member on a tutorial basis. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed.
Typically offered in Fall only

LAR 500 Landscape Design Studio (6 credit hours)
Application of information and skills developed in course work to environmental design problems. Process of site selection, activity programming, site planning and program evaluation followed employing creation of interactive communication systems between designer, clients and users. Goals include design of satisfying new landscapes as well as preservation and design strategies for existing culturally important landscapes and townscapes.
Prerequisite: Junior standing in Landscape Architecture 3.0 GPA or better
Typically offered in Fall, Spring, and Summer

LAR 501 Landscape Architecture Introduction Design Studio (6 credit hours)
Introduction to landscape architectural design thinking processes and applications that include: site analysis, post occupancy user studies, programming, site planning, graphic representation (drawing, model making, digital graphics), verbal communication, and criticism and reflection.
Typically offered in Fall only

LAR 502 Site Design and Environmental Planning Studio (6 credit hours)
Strategies, principles, and methods for designing and evaluating resilient ways and means to fit an intensive development program(s) on environmentally challenging, regionally specific sites. This design studio is integrally linked with courses LAR 527- Landform, Grading and Environmental Site Systems and LAR 520- Environment and Culture.
Prerequisite: LAR 501
Typically offered in Spring only

LAR 503 Landscape Architecture Design Development & Construction Documentation Studio (6 credit hours)
Site planning design refinement from conceptual schematic design through to the preparation of technical landscape architectural construction plans and details.
Prerequisite: LAR 501 and LAR 502 or permission of Department Head of DGP
Typically offered in Fall only

LAR 504 Landscape Architecture International Design Studio (6 credit hours)
Application of design thinking processes in landscape architectural design situations resident within a host international urban venue. This is a studio course for Landscape Architecture students studying abroad.
Prerequisite: LAR 501 and LAR 502 and LAR 503 or department head or DGP consent.
Typically offered in Fall only

LAR 505 Landscape Architecture Final Project Studio (6 credit hours)
Individual semester long projects demonstrating capabilities in a full range of design and production skills.
Typically offered in Fall and Spring

LAR 506 Landscape Architecture Design + Build Studio (6 credit hours)
Design and construction implementation of sustainable construction practices for a low impact landscape system installation that responds to degraded environmental conditions.
Prerequisite: LAR 501 and LAR 502 and LAR 503 or department head or DGP consent.
Typically offered in Spring only

LAR 507 Advanced Topics Studio in Landscape Architecture and Environmental Planning (6 credit hours)
Advanced engagement, emphasizing research, development and application of experimental and best practices, on current and emerging landscape architectural and environmental planning topics of increased complexity. Advanced Topics Studios in LA and Env Plng integrate, apply, and reinforce materials including history and theory, site works, modeling and representation, research methods, environmental analysis, and professional practice delivered in LAR subject area courses.
Prerequisite: LAR 501 and LAR 502 and LAR 503 or department head or DGP consent.
Typically offered in Fall and Spring

LAR 508 Landscape Architecture Design Research Project (6 credit hours)
Independent research in a specific area of landscape architectural design with the requirement that the research be integrated and applied within a landscape architectural design context; provides opportunities for a student or team of students (up to 4 people) to engage in independent inquiry leading to the completion of a definitive scholarly, research-oriented landscape architectural design project. Requires consent of department head or DGP.
Prerequisite: LAR 507 and LAR 541 and LAR 697 or department head consent.
Typically offered in Fall, Spring, and Summer

LAR 509 Landscape Architecture Design Fundamentals (3 credit hours)
Introduction to the language, topics, and processes associated with landscape architectural design and the means used to envision and transform ideas into physical form in the landscape.
Typically offered in Summer only
Typically offered in Fall only

Prerequisite: Graduate standing

Typically offered in Fall only

LAR 510 Introduction to Landscape Architectural Drawing Applications (3 credit hours)
Introduction to fundamental drawing principles and methods utilized in landscape architectural design and representation applications. Topics covered include: freehand sketching, field observation diagrams and sketches, freehand and constructed perspectives, plan and section view drawings, shade and shadow, color, design process drawings, and presentation layout.

Typically offered in Summer only

LAR 513 Landscape Architecture Digital Media 1 (3 credit hours)
Introduction to the principles and practices related to the use of 2D and 3D digital media in landscape architectural design representation and communication applications.

Typically offered in Summer only

LAR 514 Landscape Architecture Digital Design Media 2 (3 credit hours)
Digital modeling and representation methods, applications and production using two and three-dimensional digital design media; this course is integrally linked with LAR 501, Landscape Architecture Introduction Design Studio.

Prerequisite: LAR 513 or instructor or department head, or DGP consent

Typically offered in Fall only

LAR 515 Advanced Landscape Architecture Digital Design Media (3 credit hours)
Advanced digital media tools and techniques to create and refine routines used in landscape architectural modeling and representation applications.

Prerequisite: LAR 513 and LAR 514 or consent of Department Head or DGP.

Typically offered in Fall only

LAR 517/GIS 517 GIS Applications in Landscape Architecture and Environmental Planning (3 credit hours)
Introduction to the methods and applications of geographic spatial modeling technology in landscape architecture and environmental planning.

Typically offered in Fall only

LAR 520 Environment and Culture (3 credit hours)
An integrative approach to human and natural systems, specifically the dynamic social and ecological forces that act upon, modify, and give meaning to landscapes.

Typically offered in Fall only

LAR 521 Values, Theory and Methods of Landscape Architecture (3 credit hours)
Radical change in profession of landscape architecture in the past decade. New and emerging roles for landscape architect include regional analysis, landscape assessment, land development, urban planning, recreation planning, etc. Development of core values and theories from which each emerged and survey of the techniques and methods of their development.

Prerequisite: Graduate standing

Typically offered in Fall only

LAR 523 Landscape Architecture Plant Identification (2 credit hours)
Introduction to the vocabulary and methods necessary to identify ornamental and native plants in the built and natural landscape. The course is structured around the understanding of the taxonomic tools necessary to identify plants.

Typically offered in Summer only

LAR 524 Planting Design Applications in Landscape Architecture (2 credit hours)
Introduction to theories, practices, and implications associated with the diverse uses of plants in landscape architectural design applications considerate of functional, ecologic, aesthetic, economic, maintenance, health, safety, welfare, and other factors.

Prerequisite: LAR 501 and LAR 502 or permission of Department Head of DGP.

Typically offered in Summer only

LAR 525 Landscape Architecture Field Studies (3 credit hours)
On-site observation and assessment of constructed landscape architectural projects focused on historic and contemporary design practices that promote environmental health, safety, wellbeing, and beauty through industry defined practices.

Typically offered in Fall only

LAR 526 Landform, Grading, and Environmental Site Systems (3 credit hours)
Introduction to landform representation, grading, environmental site systems, and best practices required in landscape architectural site design and environmental planning applications.

Prerequisite: LAR 501 and LAR 513 or consent of instructor or department head or DGP.

Typically offered in Spring only

LAR 527 Landscape Architecture Construction Materials and Methods (3 credit hours)
Introduction to landscape architectural construction materials, methods, documentation, and implementation practices including best professional practices, and current and emerging technologies.

Prerequisite: LAR 501 and LAR 502 and LAR 527 or permission of department head or DGP.

Typically offered in Summer only

LAR 534 Landscape Architecture Theory and Criticism (3 credit hours)
Introduction to the pervasive principles, concepts, movements, and applications influencing landscape architectural planning and design.

Prerequisite: LAR 501 and LAR 502 and LAR 520 or consent of Department Head or DGP.

Typically offered in Fall only

LAR 535 Environmental Social Equity and Design (3 credit hours)
Principles of environmental justice and social equity in the context of design and community engagement; focus on the trends affecting environmental and human health in the built environment.

Typically offered in Spring only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAR 540</td>
<td>Research Methods in Landscape Architecture and Environmental Planning (3 credit hours)</td>
<td></td>
<td>An overview of the role of research in landscape architecture and environmental planning with introductions to systematic inquiry that help to understand the complex relationships between people and their environment. The course explores different tools. Typically offered in Fall only</td>
</tr>
<tr>
<td>LAR 542</td>
<td>Human Use of the Urban Landscape (3 credit hours)</td>
<td></td>
<td>Urban environment-behavior field research methods at site planning scale (behavior and cognitive mapping, interview and survey methods, archival research), suitable for application in practice. Methods of integrating user needs into design programming using participatory approaches. Evidence-based design applied to residential neighborhood, health, education, and recreation settings. Research activities conducted in small groups. No required texts. Overnight, weekend field trip at student expense. Typically offered in Spring only</td>
</tr>
<tr>
<td>LAR 544</td>
<td>Landscape Performance and Metrics (3 credit hours)</td>
<td></td>
<td>Concepts, tools and methods, and research to measure and integrate considerations of landscape performance including environmental, economic/life cycle, management, social, and aesthetic factors in landscape architectural applications. Typically offered in Spring only</td>
</tr>
<tr>
<td>LAR 546</td>
<td>City Planning and Design - Building Great Communities (3 credit hours)</td>
<td></td>
<td>This course explores the history and heritage of city planning and design in an ever-urbanizing world, the legal underpinning and practice of the tools of planning in the US - comprehensive planning, zoning, infrastructure planning and design guidelines, environmental and social challenges for an urban planet, and the procurement of planning and design services, both from the perspective of the hiring entity as well as from that of the consultant. Typically offered in Spring only</td>
</tr>
<tr>
<td>LAR 547</td>
<td>Greenway Planning and Design (3 credit hours)</td>
<td></td>
<td>Exposure to complex interrelationships in the planning, design, development and operations of greenway corridors and systems, including natural systems evaluation, community planning, public engagement, preparation of construction documents, construction administration, business practices, regulatory issues, legal framework, programming and funding. Typically offered in Fall only</td>
</tr>
<tr>
<td>LAR 550</td>
<td>Landscape Architecture Professional Practice (3 credit hours)</td>
<td></td>
<td>Exposure to the range of practice opportunities in landscape architecture with an overview of career opportunities in the public (Federal, State, and Local) and private sectors as well as in non-traditional and emerging roles. Typically offered in Spring only</td>
</tr>
<tr>
<td>LAR 555</td>
<td>International Landscape Architecture Design Studio (6 credit hours)</td>
<td></td>
<td>Landscape architectural problems and design solution in international setting. Exercises and projects related to design, culture and physical environment of host country. Focus on landscape architecture, gardens and urbanism through sketching and documentation, discussion, site investigation, historical context, current design examples and design applications. Prerequisite: Graduate standing the College of Design and approval of the International Study Abroad Office Typically offered in Fall only</td>
</tr>
<tr>
<td>LAR 560</td>
<td>Special Topics In Landscape Architecture (1-6 credit hours)</td>
<td></td>
<td>Topics of current interest to programs in School of Design offered by faculty in the School. Subjects offered under this number are normally used to test and develop new courses. Prerequisite: Graduate standing Typically offered in Fall and Spring</td>
</tr>
<tr>
<td>LAR 650</td>
<td>Internship in Landscape Architecture (3 credit hours)</td>
<td></td>
<td>Supervised field experience in a professional landscape architecture office, related design office, or governmental agency. Prerequisite: LAR 501 and LAR 502 and LAR 503 or department head or DGP consent. Typically offered in Fall, Spring, and Summer</td>
</tr>
<tr>
<td>LAR 685</td>
<td>Master's Supervised Teaching (1-3 credit hours)</td>
<td></td>
<td>Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment. Prerequisite: Master's student Typically offered in Fall and Spring</td>
</tr>
</tbody>
</table>
LAR 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Fall and Spring

LAR 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall and Spring

LAR 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

LAR 696 Summer Thesis Res (1 credit hours)

LAR 697 Design Research Project Independent Study (3 credit hours)
Advanced Independent study under taken by 1-4 students leading to the preparation of the Project Proposal, as a prerequisite for undertaking LAR 508-Design Research Project. (Permission to proceed with LAR 697 requires approval by department head or DGP and faculty mentor.)

Prerequisite: LAR 540 or approval from Department Head or DGP.
Typically offered in Fall, Spring, and Summer

LAR 896 Summer Dissert Res (1 credit hours)

Leadership in the Public Sector (LPS)

LPS 200 Introduction to Public Leadership (3 credit hours)
This introductory course is designed for students who are interested in exploring public sector leadership. It starts with acquainting how to conduct adequate academic research for studying leadership. Covering fundamental concepts and assumptions of leadership, it will focus on necessary skills and approaches for good public and non-profit sector leadership. The course will also address contemporary e-government practices and the role of information technology in the public sector.

Typically offered in Fall, Spring, and Summer

LPS 201 The Humanitarian Response to Conflict (3 credit hours)
LPS 201 offers up an introduction to the ideals and paradoxes of humanitarian intervention, with a special emphasis on military responses to humanitarian crises. This course explores the history, animating ideals and contemporary paradoxes of humanitarian action and related military interventions. Throughout history and ever increasingly in the present, there is an intersection between military and humanitarian operations in conflict zones.

Typically offered in Fall only

LPS 202 Essentials of Fundraising for Leaders in Public and Non-Profit Institutions (3 credit hours)
The course covers the basics of fundraising for public and non-profit agencies which include the agencies history, board development, event planning, and the motivation of the giver. In addition, the students will learn the elements of grant proposals related to public sector agencies. The work will include case studies, weekly lectures, discussion assignments, final exam and a special event planning proposal.

Typically offered in Fall only

LPS 205 International Leadership for the Public Sector (3 credit hours)

Typically offered in Fall only

LPS 210 LPS Career Development (1 credit hours)
This course is designed for senior status LPS students who are considering a career change and are interested in exploring job opportunities related to the public sector field. Students will learn about their personal strengths, values, skills, and understand how these self-assessments will affect their career choices. Explorations of these areas include specific emphasis on developing and refining interviewing skills, professional and personal networks, and job application and selection.

Restriction: LPS Senior Status Only
Typically offered in Spring only

LPS 302 Diversity and Leadership in the Public Sector (3 credit hours)
This course provides students with information regarding diversity and leadership in history as well as material and activities that foster an understanding of how diversity and leadership intersect in the public sector and how diversity can improve org

GEP U.S. Diversity
Typically offered in Fall and Spring

LPS 315 Public Leadership (3 credit hours)
Nature and varieties of political leadership by elected and appointed officials in government, officials and volunteers in nonprofit organizations, and leaders of political movements and community groups. The course draws on literature in political science, self-assessment of student’s leadership characteristics, and examination of outlets for political leadership activity.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer
LPS 200 Research Methodology for the Public Sector (3 credit hours)
This course will teach students to investigate political and policy related questions in a systematic and scientifically rigorous fashion. Students will become familiar with the basic toolkit of social science methodology, practice basic data analysis, and develop a research project. They will acquire the skills essential for evaluating the claims of others and for advancing sound arguments of their own. This knowledge is applicable in a wide variety of organizational research, needs assessment, program and performance evaluation.

Typically offered in Fall, Spring, and Summer

LPS 398 Special Topics in Leadership in the Public Sector (3 credit hours)
For topics not part of regular course offerings, or offering of new courses on a trial basis. May be taken up to three times provided the topics are different.

Typically offered in Fall, Spring, and Summer

LPS 400 Advanced Military Leadership Theory (3 credit hours)
Advanced Military Leadership Theory (AMLT) is a challenging course that will study, practice, and apply the fundamentals of leadership, values and ethics, personal development, decision-making, influencing and motivating others and team tactics in problem solving and mission accomplishment. Especially military officers enrolled in the LPS program will gain immediate benefit from the leadership self-assessments and new leadership strategies.

Typically offered in Fall and Summer

LPS 425 Leadership in the Public & Nonprofit Sectors Capstone (3 credit hours)
Leadership is a critical topic in public, nonprofit, and business administration. Leadership is what we expect of U.S. presidents, association directors, and CEOs, as well as of mid-level and frontline supervisors. Clearly, leaders are awarded the accolades when the organization succeeds and given the blame for its failures. But organizations succeed not just because of the top leader's actions; a positive leadership climate that pervades the organization helps it to learn, adapt, and perform at a high level. Only LPS major students must complete LPS 200 Introduction to Public Leadership course prior to enrolling in LPS 425.

Prerequisite: LPS Majors need to have passed LPS 200
Typically offered in Spring only

LPS 490 Undergraduate Internship in Leadership in the Public Sector (1-3 credit hours)
Students can earn 1-3 credits for completing internships in the public sector or non-profit agencies. Emphasis is placed on gaining work experience needed to explore and plan careers in the public and non-profit sector. Students must prepare an intern

Prerequisite: LPS 200
Typically offered in Fall, Spring, and Summer

Liberal Studies (MLS)

MLS 501 Seminar In Liberal Studies (3 credit hours)
Intensive study of an interdisciplinary issue or area. Seminars, varying each semester, address such topics as arts studies, history and literature, sociobiology and social sciences, world trade and world conflict, and technology and social change.

Prerequisite: Admission to M.A. in liberal studies
Typically offered in Fall, Spring, and Summer

MLS 630 Independent Study (1-3 credit hours)
Advanced independent study of an interdisciplinary topic under supervision of a faculty member.

Prerequisite: Admission to M.A. in liberal studies
Typically offered in Fall, Spring, and Summer

MLS 676 Independent Project (1-3 credit hours)
Advanced independent research on an interdisciplinary project under supervision of a faculty member.

Prerequisite: Admission to M.A. in liberal studies
Typically offered in Fall, Spring, and Summer

MLS 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MLS 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

Life Sciences First Year (LSC)

LSC 101 Critical and Creative Thinking in the Life Sciences (2 credit hours)
Through case studies and discussion-based classes, this course guides students through a metacognitive approach to (1) critical and creative thinking, (2) the nature and practice of science, (3) the rhetoric of science, and (4) the process of learning. This course will challenge students to apply the standards of critical and creative thinking in critiquing their own work and the work of others; guide students to an understanding and appreciation of the rhetoric of science; help students gain an understanding of fundamental principles of the nature and conduct of science within the life science disciplines; and encourage students to become active, engaged learners through an understanding of effective approaches to learning with an emphasis on the neurobiology of learning. Incoming freshmen admitted to the Life Sciences First Year Program (will open available seats to other FR in the spring semester section).

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer
LSC 103 Exploring Opportunities in the Life Sciences (1 credit hours)
The overarching goal of this course is to help students create a solid foundation on which they can build to enhance their success in college and especially in their studies within the life sciences. Students will be challenged to think intentionally about how they will approach learning inside and outside the classroom and what factors might influence their college experience. Through this course, students will think about their transition from high school to college; identify campus resources and explore academic policies; research potential majors in the life sciences and potential minors; attend and reflect upon cultural and educational events across campus; and create a "plan for success" for their time at NC State. Cannot get credit for both LSC 103, and BCH 103, or MB 103, or PB 103. Restricted to incoming freshmen admitted to the Life Sciences First Year Program.

R: 11LSFY or 17LSFY
Typically offered in Fall and Spring

LSC 170 First Year Seminar in the Life Sciences (1 credit hours)
Topical problems in the life sciences. LSC 170 provides an opportunity for LSFY students to work in a small group setting with a faculty member to explore a topic within the faculty member's area of expertise. Emphasis will be placed on active, collaborative learning; effective communication skills; higher order cognitive skills; and applying the intellectual standards of critical thinking. Topics and instructors will vary from section to section and from semester to semester. Students can repeat LSC 170 once as long as the two sections are on different topics.

R: 11LSFY or 17LSFY
Typically offered in Fall and Spring

LSC 205 Class Assistant Experience (1 credit hours)
LSC 205 provides an opportunity for students to gain experience as Class Assistants within the Life Sciences First Year Program and to reflect on that experience as it relates to their own college experiences, personal growth, and professional development. Expectations, to be detailed in the LSC 205 contract, will include attendance at all LSC 205 class meetings, attendance at all class meetings of the section for which you are working as Class Assistant, and completion of written reflection assignments. Instructor consent required.

Typically offered in Fall only

LSC 295 Special Topics in Life Science (1-3 credit hours)
New courses offered on a temporary or trial basis for Life Sciences First Year students.

R: 11LSFY or 17LSFY
Typically offered in Fall, Spring, and Summer

Logic (LOG)

LOG 201 Logic (3 credit hours)

GEP Mathematical Sciences
Typically offered in Fall and Spring

LOG 335/MA 335 Symbolic Logic (3 credit hours)
Intermediate level introduction to modern symbolic logic focusing on standard first-order logic; topics include proofs, interpretations, applications and basic metalogical results.

Prerequisite: LOG 201 or MA 225 or CSC 226
GEP Mathematical Sciences
Typically offered in Fall only

LOG 430 Varieties of Logic (3 credit hours)
Study of various non-classical logics such as modal logic, many-valued logic, paraconsistent logic, second-order logic, and intuitionistic logic. Emphasizes their applications in fields such as philosophy, linguistics, mathematics, computer science, and artificial intelligence. Students cannot receive credit for both LOG 430 and LOG 530.

P: LOG 201 or LOG 335 or MA 335 or MA 225 or CSC 226
Typically offered in Spring only

LOG 435 Advanced Logic & Metamathematics (3 credit hours)
Advanced topics in logic and metamathematics; proof procedures, first-order theories, soundness and completeness theorems, recursive functions, the formalization of arithmetic, the Goedel Incompleteness Theorems. Emphasis on mathematical study of logic and mathematics. Students cannot receive credit for both LOG 435 and LOG 535

Prerequisite: LOG 335. Credit is not allowed for both LOG 435 and LOG 535

LOG 498/LOG 598 Special Topics in Logic (1-6 credit hours)
Detailed investigation of selected topics in logic. Topics determined in consultation with head of the department. Course may be used for individualized study. Students cannot receive credit for both LOG 498 and LOG 598 unless the topic is different.

Prerequisite: One of the following: (MA/LOG 335, LOG 435, LOG 437, MA 403, MA 407, MA 408, MA 410, MA/CSC 416, MA 421, MA 425, MA 426, CSC 333, CSC 411, or CSC 417)
Typically offered in Fall and Spring

LOG 530 Varieties of Logic (3 credit hours)
Study of various non-classical logics such as modal logic, many-valued logic, paraconsistent logic, second-order logic, and intuitionistic logic. Emphasizes their applications in fields such as philosophy, linguistics, mathematics, computer science, and artificial intelligence. Students cannot receive credit for both LOG 430 and LOG 530.

Prerequisite: Graduate standing
Typically offered in Spring only

LOG 535 Advanced Logic and Metamathematics (3 credit hours)
Advanced topics in logic and metamathematics; proof procedures, first-order theories, soundness and completeness theorems, recursive functions, the formalization of arithmetic, the Goedel Incompleteness Theorems. Emphasis on mathematical study of logic and mathematics. Students cannot receive credit for both LOG 435 and LOG 535

Prerequisite: LOG 335. Credit is not allowed for both LOG 435 and LOG 535.
LOG 598/LOG 498  Special Topics in Logic (1-6 credit hours) Detailed investigation of selected topics in logic. Topics determined in consultation with head of the department. Course may be used for individualized study. Students cannot receive credit for both LOG 498 and LOG 598 unless the topic is different.

Prerequisite: One of the following: (MA/LOG 335, LOG 435, LOG 437, MA 403, MA 407, MA 408, MA 410, MA/CSC 416, MA 421, MA 425, MA 426, CSC 333, CSC 411, or CSC 417) Typically offered in Fall and Spring

Management Innovation Entrepreneurship (MIE)

MIE 201  Introduction to Business Processes (3 credit hours) Cross-functional treatment of major activities of business, such as product design, distribution, production, and marketing. Description of specific tasks, via lectures and case studies, in support of major business activities. Interactions among various functional areas of business.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

MIE 295  Special Topics in MIE (1-6 credit hours) Presentation of material at the 200-level not normally available in regular course offerings, or offering of new courses on a trial basis. Course may be taken multiple times only if topic is different.

Typically offered in Fall, Spring, and Summer

MIE 305  Legal and Regulatory Environment (3 credit hours) Introduction to fundamental subfields, rules, and concepts of law that are regularly significant to business operations. Emphasis on the law of contracts, torts, property and intellectual property rights, business organizations, and agency. Includes principals of constitutional, administrative and criminal law in a business context, and issues of ethics, fiduciary duty, civil procedure and legal risk management generally. Credit is not allowed for both BUS 305 and MIE 305.

Typically offered in Fall, Spring, and Summer

MIE 306  Managing Ethics in Organizations (3 credit hours) Management practices to define, communicate, and implement ethical conduct in business organizations. Normative and applied analysis of current ethical dilemmas of corporations in free markets, techniques for effective management of corporate social responsibility, and formulation and implementation of ethics management programs. College of Management majors only.

Prerequisite: MIE 201
Typically offered in Fall and Spring

MIE 310  Introduction to Entrepreneurship (3 credit hours) Introduction to planning, formation, and management of entrepreneurial ventures. Fundamental business concepts and managerial skills applied to entrepreneurial ventures. Course projects support experiential learning of critical skills. Some individual off-campus travel is required.

Typically offered in Fall, Spring, and Summer

MIE 315  Managing a Growth Venture (3 credit hours) Managing a growth venture with emphasis on entrepreneurial planning in the dynamic context of rapidly growing ventures and the development of managerial skills necessary for successful leadership in high growth ventures. Fundamental concepts, issues and skills are taught through an integrated combination of readings, lectures, discussions, cases analyses, and applied project with a local venture. Students need to provide their own transportation to off-campus sites.

Prerequisite: MIE 310
Typically offered in Spring only

MIE 330  Human Resource Management (3 credit hours) The systematic principles for managing the human resource component of organizations. Topics include: environmental influences on planning, recruitment, and selection; managing workforce diversity; developing effectiveness and enhancing productivity; compensation, benefits, and security; and strengthening employee-management relations.

Prerequisite:MIE 201, Sophomore standing
Typically offered in Fall, Spring, and Summer

MIE 335  Organizational Behavior (3 credit hours) Survey of contemporary managerial applications for managing people in modern organizations. Topics include: motivation, group dynamics, team development, ethics, communications, organizational politics, leadership, power, organizational development, organizational design and structure. Current managerial issues include total quality management and technology management.

Prerequisite: 9 hrs. of social science or 6 hours of social science plus MIE 201
Typically offered in Fall only

MIE 410  Business Opportunity Analysis (3 credit hours) Issues and management processes related to the identification of new business opportunities with emphasis on commercializing new technologies. Students will analyze and develop individual plans for commercialization of a new technology or other innovation. New venture formation is the primary focus, but the processes and skills students develop are relevant to new product introductions by existing firms.

Prerequisite: MIE 310
Typically offered in Fall, Spring, and Summer

MIE 411  Managing the Growth Venture (3 credit hours) Managing a growth venture with emphasis on entrepreneurial planning in the dynamic context of rapidly growing ventures and the development of managerial skills necessary for successful leadership in high growth ventures. Fundamental concepts, issues and skills are taught through an integrated combination of readings, lectures, discussions, cases analyses, and applied project with a local venture. Students need to provide their own transportation to off-campus sites.

Prerequisite: MIE 310
Typically offered in Spring only

MIE 412  Finance and Accounting for Entrepreneurs (3 credit hours) Financial planning for new ventures including financial reporting conventions and projection of critical financial amounts for new ventures. Introduction to fundamental accounting and finance concepts applied in the context of entrepreneurial ventures. Topics include projection of revenues, expenses, capital expenditures, cash flows, and balance sheet amounts; and the creation of pro-forma financial statements. Individual student projects integrate financial projections and pro-forma financial statements with the preparation of a complete business plan. Some individual off-campus travel is required.

Prerequisite: MIE 410
Typically offered in Fall and Spring
MIE 413 New Venture Planning (3 credit hours)
Developing the business plan for a new venture and the entrepreneurial process of executing the first phases of new venture creation. Topics include idea conception, entrepreneurial process, business planning, market research, entrepreneurial opportunities, and strategies. Emphasis is placed on high growth business opportunities. The final deliverable is a complete business plan for a high growth venture and formal presentation of the plan to mock investors. Some individual off-campus travel is required.

Prerequisite: MIE 410
Typically offered in Fall and Spring

MIE 416 The Legal Dynamics of Entrepreneurship (3 credit hours)
Overview of important legal and regulatory issues facing entrepreneurs and start-up entities including legal structure of the organization, intellectual property protection, human resource requirements, product liability, and risk management.

Prerequisite: MIE 310
Typically offered in Fall only

MIE 418 Social Entrepreneurship Practicum (3 credit hours)
Application of entrepreneurial skills and knowledge to plan a social entrepreneurial venture envisioned by the student. This course is a capstone course for the Minor in Entrepreneurship and the Concentration in Entrepreneurship. The deliverables include:

Prerequisite: MIE 410
Typically offered in Fall and Spring

MIE 419 Entrepreneurship Practicum (3 credit hours)
Application of entrepreneurial skills and knowledge to plan an entrepreneurial venture envisioned by the student. This course is the capstone course for the Minor in Entrepreneurship. The final deliverable includes an evaluation of the project and a final report.

Prerequisite: MIE 410
Typically offered in Fall and Spring

MIE 430 Teamwork in Organizations (3 credit hours)
This course will impart cutting edge thinking on leading in team-based organizations including the organizational changes required to move to a team-based structure and the organizational factors required to create successful work teams.

Prerequisite: MIE 330
Typically offered in Fall and Spring

MIE 432 Labor and Employee Relations (3 credit hours)
Utilizing textbook, readings, lectures, and practitioner presentations, students will become familiar with Employee Relations. Concepts in maintaining positive employer-employee relationships to promote productivity, morale, motivation and engagement will be reviewed. The course will explore the history of labor unions and the regulations that impact present day domestic and international business. The course will review approaches to negotiations.

Prerequisite: MIE 330
Typically offered in Spring only

MIE 434 Compensation Systems (3 credit hours)
Compensation philosophy, strategy, and policy. Earnings, individual and group incentive plans, voluntary and mandated benefits. Legal, regulatory, economic, and strategic issues affecting compensation and benefits. Strategies for developing the structure and level of compensation to enhance organizational performance.

Prerequisite: MIE 330
Typically offered in Fall and Spring

MIE 435 Leadership and Management (3 credit hours)
Development of leadership and management skills for organizational settings. Self-awareness: interpersonal needs, attitudes toward change; cognitive styles, ethics and values; listening; communicating; interviewing; time and stress management; creativity and managing creativity. Team building and group dynamics. Leadership and followership: theory and case studies (Churchill, Antigone; Henry V; Machiavelli); the use of power and authority; women and leadership the use of language in leadership embodiment of leadership traits; effective traits and characteristics of great leaders.

Prerequisite: MIE 330
Typically offered in Spring only

MIE 436 Training and Development (3 credit hours)
Training and development functions in organizations. Needs assessment, legal issues, training program design, learning, training methods, transfer of training, effectiveness and utility of training programs, and executive development.

Prerequisite: MIE 330
Typically offered in Fall and Spring

MIE 437 Human Resources Analytics (3 credit hours)
This course is an introduction to common analytical approaches used in human resource management. Various methods and analyses are helpful for HR professionals to evaluate questions and issues. Students in this course will learn statistical techniques that are often used to interpret organizational situations and information decision making. At the end of the course, students will be able to (a) develop and test research questions relevant for the organizational context; (b) critically evaluate quantitative information and illustrations you encounter; (c) communicate your understanding of statistics to others; and (d) perform common statistical analysis in Microsoft Excel, SAS, and/or R.

Prerequisite: MIE 330
Typically offered in Fall and Spring

MIE 438 Staffing (3 credit hours)
Staffing of contemporary organizations including strategic and environmental influences on: HR planning, job analysis, measurement, recruitment, assessment and selection, decision making, employment, and termination. Considerable emphasis on employment and labor legislation.

Prerequisite: MIE 330
Typically offered in Fall and Spring
M 00 Personal and Professional Identity Development (1 credit hours)

Personal and Professional Identity Development is a one-hour Poole required course which will help you learn about and develop multiple facets of your social and cultural identity, your strengths, and about how these things interrelate with leadership and career choices. By exploring the diverse components of your personal identity, you will have a better understanding of how you relate to and interact with others in a global business market. Through this course, you will learn about yourself, others and how you can use your strengths and your identity to create an action plan for future success at NC State, become engaged in your local community and engage in career path exploration.

R: Poole College of Management Students Only
GEP U.S. Diversity
Typically offered in Fall and Spring

MIE 439 Human Resources Practicum (3 credit hours)

Utilizing textbooks, readings, lectures, and practitioner presentations, and an extended study of an organization's Human Resources practice and identified problem area, students will gain practical experience with diagnosing needs and then planning and recommending interventions to address identified needs. Experience with identifying needs will occur through needs assessment interviews with company representatives and analysis and interpretation of key demographic and relevant operational and HR metric data. Student groups need to provide their own transportation to off-campus sites.

Prerequisite: MIE 330
Typically offered in Spring only

MIE 480 Business Policy and Strategy (3 credit hours)

Comprehensive analysis of administrative policy-making from the point of view of the general manager. Integration of perspectives from marketing, finance, and other functional areas of management. Use of case analyses and written reports to develop decision making skills.

Corequisites: MIE 305, MIE 330, BUS 320, BUS 340, BUS 360, BUS 370, and (BUS/ST 350 or ST 305 or ST 312 or ST 370 or ST 372), and (ENG 331 or ENG 332 or ENG 333)
Typically offered in Fall, Spring, and Summer

MIE 495 Special Topics in MIE (1-6 credit hours)

Presentation of material normally not available in regular course offerings, or offering of new courses on a trial basis.

MIE 498 Independent Study in MIE (1-6 credit hours)

Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Credits and content determined by faculty member in consultation with Department Head. Individualized/Independent Study and

Typically offered in Fall, Spring, and Summer

Management (M)

M 120 Professional Development and Career Planning (1 credit hours)

The Professional Development Course is a one-credit hour course designed to give you the tools necessary to start your career. The course involves thoughtful self-assessment, career exploration, planning and follow-through with preliminary employment strategies. Taking advantage of the opportunities in this course will aid you in your transition from college student to intern to professional employee. The course navigates you through a more direct route to your long-term career goals by anticipating and acquiring the essential skill sets and experiences for an internship or entry-level job that will be the best starting point for your career.

R: Poole College of Management Students Only
Typically offered in Fall and Spring

M 298 Special Topics in Management (1-6 credit hours)

Presentation of material normally not available in regular course offering.

Typically offered in Fall, Spring, and Summer

M 299 Professional Internship in Management (1 credit hours)

Poole College of Management students participating in an approved internship with an organization providing no monetary compensation and where academic credit is required will have an opportunity to gain real world insight and experience into the day-to-management.

Management Students Only
Typically offered in Fall, Spring, and Summer

M 300 Leadership and Professional Development (1 credit hours)

This course is specifically designed for new Peer Leaders and Ambassadors in the Poole College of Management. The goal of the course is to give students the necessary skills to become effective leaders and representatives both within and outside of the College. As a part of this course, students will attend Poole College of Management events/activities. Some topics we will discuss are: professional networking, communication, leadership, working in groups, and presentation skills.

Typically offered in Fall only

M 380 Doing Business Globally (3 credit hours)

International academic and cultural immersion into how business is conducted in a specific country/region abroad. Interdisciplinary exploration of political and economic factors as they impact global business practices. Focus on key macro-environmental influences within a specific country/region as contrasted to those in the United States.

Restricted to: Study Abroad Students Only
GEP Interdisciplinary Perspectives
Typically offered in Summer only

M 399 International Business Dual Degree Student Professional Internship in Management (1-6 credit hours)

International Business Dual Degree students participating in an approved internship with an organization will have an opportunity to gain real world insight and experience into the day-to-day functions and responsibilities encountered in the profession.

R: Poole College of Management major enrolled in the International Business Dual Degree Program
Typically offered in Fall, Spring, and Summer
Marine, Earth, and Atmospheric Sciences (MEA)

**MEA 100 Earth System Science: Exploring the Connections** (4 credit hours)

Prerequisite: Competence in high school algebra and chemistry
GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Natural Sciences
Typically offered in Fall only

**MEA 101 Geology I: Physical** (3 credit hours)
Systematic consideration of processes operating on and below the earth's surface and the resulting features of landscape, earth structures, and earth materials. Occurrences and utilization of the earth's physical resources.

Corequisite: Recommended that MEA 110 be taken concurrently
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

**MEA 110 Geology I Laboratory** (1 credit hours)
Scientific methodology applied to the study of common rock-forming minerals, common rocks, topographic maps, geologic structures and geologic maps. Field trips.

Corequisite: MEA 101 or Prerequisite: MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

**MEA 130 Introduction to Weather and Climate** (3 credit hours)
Explores the structure, physical causes, and climatology of weather systems including the jet streams, mid-latitude cyclones, hurricanes, thunderstorms, and tornadoes. Clouds and precipitation, air pollution, climate modification, optical effects (rainbows, halos) and weather instruments. Weather systems and forecasting techniques are illustrated through daily weather map discussions.

Prerequisite: For Non-Majors
GEP Natural Sciences
Typically offered in Fall and Spring

**MEA 135 Introduction to Weather and Climate Laboratory** (1 credit hours)
Experiments include effects of air pressure change on temperature and density (gas law); measurement of atmospheric moisture; formation of clouds and hail; effects of variable solar heating. Graphical display and interpretation of data; weather instrum

Corequisite: MEA 130
GEP Natural Sciences
Typically offered in Fall and Spring

**MEA 150 Environmental Issues in Water Resources** (4 credit hours)
The science of current environmental concerns, particularly those related to water resources. Major topics include weather and climate, natural resource cycles, resource depletion and contamination, societal impacts. Scientific aspects of environmental issues. Required field trips.

GEP Natural Sciences
Typically offered in Fall only

**MEA 200 Introduction to Oceanography** (3 credit hours)
The ocean as a part of our environment including interactions between atmosphere and ocean, ocean circulation, physical and chemical properties of sea water, marine geology and marine biology.

Corequisite: Recommended that MEA 210 be taken concurrently
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

**MEA 202 Geology II: Historical** (3 credit hours)
The second semester of the basic introductory sequence in geology. Utilization of the principles of geology to reconstruct and understand the earth's history. Geologic events that cause modification of the earth's crust, emphasizing North America. History of life and the environmental significance of changes in animal and plant life through geologic time.

Prerequisite: (MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200 )and MEA 110; Corequisite: Recommended that MEA 211 be taken concurrently
GEP Natural Sciences
Typically offered in Spring only

**MEA 210 Oceanography Lab** (1 credit hours)
Complements the lecture course in Oceanography. Numerous demonstrations and resource materials visualize basic oceanographic concepts such as geological processes operating in the marine realm, the chemical properties of seawater, oceanic circulation, tides and waves, as well as processes affecting the biology of the oceans.

Corequisite: MEA 200
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

**MEA 211 Geology II Laboratory** (1 credit hours)
Reconstruction and interpretation of events in the history of the earth. Interpretation of sedimentary rocks, construction and interpretation of geological maps, identification of fossil organisms and utilization of fossils in the reconstruction of earth history.

Corequisite: MEA 202
GEP Natural Sciences
Typically offered in Spring only

**MEA 215 Introduction to Atmospheric Sciences** (4 credit hours)
Introduction to the Earth's atmosphere. Fundamental concepts and applications of meteorology and how they relate to daily and seasonal weather, major types of storms, and climate.

Corequisite: MA 141
Typically offered in Spring only
MEA 217 Introduction to Computing in the Geosciences (3 credit hours)

This course is for students with little or no programming experience. It provides students with programming and problem solving skills using MATLAB with emphasis on the systematic development of algorithms and programs. Topics include Boolean math, data representation and types (array, vectors, strings, structures), evaluation of expressions, program control (iteration, functions), algorithm development (pseudo code, physical problem solving, numerical algorithms), basic MATLAB graphics, and limits of computing. Problems and projects are selected from the Geosciences. Students are expected to be proficient in solving algebraic equations, solving non-calculus physics problems, including dimensional analysis, and operating a computer.

Typically offered in Fall only

MEA 220 Marine Biology (3 credit hours)

Introduction to marine plants and animals, their adaptations to life in the sea and ecological interactions in selected marine environments (e.g. coral reefs, deep sea, salt marshes). Interactions of man with the sea: food from the seas, biology of diving. Optional trip.

Prerequisite: MEA 200 or BIO 181

GEP Natural Sciences

Typically offered in Fall only

MEA 240 The Planets of Our Solar System (3 credit hours)

This course will cover the formation mechanisms, physical properties, and processes of the vast array of bodies that compose our Solar System, and how they compare and contrast with our own world. Among the diverse range of topics we will explore are planetary formation, volcanism of Mars, the deep oceans of Jupiter's icy moons, the atmosphere of Venus, and the fate of our Sun. We will also focus on what other planetary bodies can tell us of the early and future Earth, as well as the conditions required for planetary habitability. Finally, we will consider the exciting field of exoplanet research, including the search for extraterrestrial intelligence, and discuss key milestones in the exploration of the Solar System. Delivered through lectures, in-class discussion, and associated reading, the course will be assessed through a series of quizzes, an essay, a group project, and two mid-term exams and a final exam.

GEP Natural Sciences

Typically offered in Fall only

MEA 250 Introduction to Coastal Environments (3 credit hours)

A global survey of coastal habitats, the processes that shape these dynamic environments, and the physicochemical controls that regulate their indigenous biological communities.

Prerequisite: MEA 200/210 or MEA 101/110

GEP Natural Sciences

Typically offered in Spring only

MEA 251 Introduction to Coastal Environments Laboratory (1 credit hours)

Complements the lecture course Introduction to Coastal Environments (MEA 250). Experiments involving the physical, chemical and biological processes that shape a variety of coastal environments.

Corequisite: MEA 250

Typically offered in Spring only

MEA 252 Biology of Marine Mammals (3 credit hours)

Biology of marine mammals, including cetaceans, pinnipeds, sirenians and sea otters. Topics covered include the evolution, physiology, behavior and ecology of marine mammals. We will focus on current topics in conservation and management of marine mammals. Instructor permission required.

Typically offered in Spring only

MEA 260 Human Dimensions of Climate Change (3 credit hours)

Climate is changing with potentially catastrophic implications for the Earth and for people. In this course we discuss how and why climate is changing and how climate change is affecting and will affect human well-being in society. We draw upon the multiple disciplinary lenses and diverse perspectives needed to evaluate, across multiple dimensions, proposed solutions to climate change and/or to assess fully the consequences of inaction.

GEP Interdisciplinary Perspectives

Typically offered in Fall only

MEA 300 Environmental Geology (4 credit hours)

Geologic aspects of the environment. Effects of humans upon or interactions with geologic processes. Geologic considerations in land use planning, waste disposal, water resources, and natural resources. A field and lab oriented course with combined lecture/laboratory. Inquiry-based learning approach to study the basic processes of environmental geology and develop research skills. Required field trips.

Prerequisite: MEA 101 or MEA 150 or MEA 140 or SSC 200

Typically offered in Spring only

MEA 312 Atmospheric Thermodynamics (4 credit hours)

Introduction to atmospheric thermodynamics for meteorology majors. Topics include the equation of state for mixture of gases; first and second laws of thermodynamics; diabatic and adiabatic processes for dry and moist air; measurement and phase changes.

Prerequisite: MA 141, PY 205; Corequisite: MA 241, PY 208

Typically offered in Spring only

MEA 315/MA 315 Mathematics Methods in Atmospheric Sciences (4 credit hours)

For sophomore meteorology and marine science students. A complement to MA 242 designed to prepare students for quantitative atmospheric applications. Topics include an introduction to vectors and vector calculus, atmospheric waves, phase and group velocity, perturbation analysis, fourier decomposition, matrix operations, chaos and predictability. For MY, MMY, and MRM majors only.

Prerequisite: MEA 217 or MA 116 or CSC 113; Corequisite: MA 242

Typically offered in Spring only

MEA 320/ET 320 Fundamentals of Air Pollution (3 credit hours)

Air pollution sources, and the influence of natural and anthropogenic processes on the atmosphere. Roles of local, state and federal governments in air pollution control and importance of the Clean Air Act and its amendments.

Prerequisite: (MA 121, MA 131, or MA 141) and (PY 131 or PY 201 or PY 205 or PY 211)

Typically offered in Spring only
ME 321 Fundamentals of Air Quality and Climate Change (3 credit hours)
An intermediate-level introduction, for meteorology majors, to the physical and chemical environment of the atmosphere and to climate change. Topics include the atmosphere’s chemical composition; atmospheric chemical reaction processes in gas phase, liquid phase, and on particle surfaces
Prerequisite: CH 101, CH 201, MA 141, MA 241; Corequisite: PY 205
Typically offered in Fall only

ME 323 Geochemistry of Natural Waters (3 credit hours)
Biogeochemical processes related to water in the natural environment. Course focuses on chemical equilibria and kinetics of: precipitation and dissolution, acid-base chemistry and the carbonate system, oxidation-reduction chemistry, and organic geochemistry in lakes, rivers, estuaries, and oceans. Topics revolve around water quality and global change. Course includes in class field sampling and lab work as well as a mandatory Saturday field trip.
Restriction: MEA and ENE Majors Only. Other Majors With Permission of Instructor; Prerequisite: CH 201 or CH 203
Typically offered in Fall and Spring

ME 350 Marine Conservation Biology (3 credit hours)
This course will focus on the field of marine conservation, including the scientific, regulatory, social and economic factors that must be considered when trying to solve complex conservation issues. Important concepts will include: (i) sampling and experimental design, (ii) modern definitions of conservation, scientific areas of expertise in conservation, (iii) priority threats to biodiversity, (iv) laws which govern conservation in the US and internationally, and (v) social and economic considerations. The class will include presentation and critical evaluation of global, regional and local case studies marine conservation actions. Optional Friday field trips. Instructor permission required.
Typically offered in Spring only

ME 369 Life on Earth: Principles of Paleontology (3 credit hours)
This class offers an interdisciplinary introduction to the history of life on Earth and the principles of paleontology that allow for its study and application. Key topics include: fossil records and description, evolution and extinction, paleoecology and biostratigraphy, field/lab methods, and a survey of major life forms from the early Earth through the present. This course is a learning-centered program aimed at students interested in past life and using paleontology as a tool for examining the natural world. Required field trips.
P: BIO 181 or MEA 202
Typically offered in Spring only

ME 409 Watershed Forensics (3 credit hours)
Spatial analysis of watersheds with emphasis on pollution and controversies concerning water quality and regulation issues. GIS exercises will introduce students to the latest spatial analytical techniques. Case studies and lectures will be used to exam
Prerequisite: GIS 280
Typically offered in Fall only

ME 410 Introduction to Mineralogy and Petrology (4 credit hours)
Introduction to the fundamentals of mineralogy, optical mineralogy, and igneous and metamorphic petrology. Description and identification of minerals, using physical properties and geological associations. Optical properties of non-opaque rock-forming minerals, emphasizing petrographic thin sections. Introduction to igneous and metamorphic environments and rocks. Description and classification of common crystalline rocks. Required overnight field trips; additional expenses required.
Prerequisite: (MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200), and MEA 110 and CH 101/102
Typically offered in Fall only

ME 411 Marine Sediment Transport (3 credit hours)
Quantitative study of sediment transport in the marine environment including an introduction to fluid mechanics and sediment transport theory. Discussion of the processes and products of sediment transport in specific marine environments from estuaries
Prerequisite: MEA 101 or MEA 200, MA 241, PY 201 or PY 205
Typically offered in Fall only

ME 412 Atmospheric Physics (3 credit hours)
Physical and analytical descriptions of atmospheric aerosols, clouds/ fogs, and precipitation processes; size distribution and sources of atmospheric aerosols; impact of aerosols on visibility and climate; microstructure of warm and cold clouds and their interaction with solar and terrestrial radiation; collision-coalescence and ice phase mechanisms of precipitation formation; atmospheric electricity; planned and inadvertent weather modification; weather radar; atmospheric optics.
Prerequisite: MA 242, PY 208
Typically offered in Spring only

ME 415/MEA 515 Climate Dynamics (3 credit hours)
A comprehensive look at climate integrated across terrestrial, marine, and atmospheric perspectives. Topics include an in-depth look at climate proxies, drivers of future, current and past climate change, climate monitoring approaches, and climate model projections. Students will be exposed to the quantitative aspects (chemistry, physics, theory, observations, models) scientists use to place constraints on climate conditions over broad spatial and temporal scales. MEA 415 is open to upper-level undergraduate science majors interested in learning more about Earth’s climate systems and the dynamics within. MEA 515 is open to all graduate students with the expectation of an additional climate assessment course project relevant to the student’s own research discipline. Students cannot receive credit for both MEA 415 and MEA 515.
Prerequisite: MA 121 or MA 131 or MA 141 and CH 101 or CH 103 and PY 201 or PY 205 or PY 211
Typically offered in Fall only

ME 421 Atmospheric Dynamics I (3 credit hours)
Meteorological applications of fluid kinematics: divergence, vorticity, deformation, advection, mass continuity and vertical motion. Atmospheric dynamics: the equation of motion on a rotating earth; component equations in Cartesian, polar-sphericaland pressure coordinates. Scale analysis and simplifications. Cases of horizontal flow: geostrophic and gradient wind, ageostrophy and acceleration; thermal wind and vorticity.
Prerequisite: MA 242 and PY 208 and MEA 312
Typically offered in Fall only
ME 422  Atmospheric Dynamics II  (3 credit hours)
Vorticity and potential vorticity equations; dynamics of synoptic-scale motions; quasi-geostrophic theory; atmospheric waves including shallow water, internal gravity, inertia-gravity, and Rossby waves; finite difference methods; numerical weather prediction; atmospheric instabilities including static, Kelvin-Helmholtz, inertial, symmetric, barotropic, and baroclinic instabilities.

Prerequisite: ME 421
Typically offered in Spring only

ME 425/MEA 525 Introduction to Atmospheric Chemistry  (3 credit hours)
The course covers history, regulations, sources, physics, and chemistry of major air pollutants and factors affecting their transport and fate. Emphasis is placed on atmospheric chemistry and physics underlying five major air pollutant problems including urban outdoor air pollution, indoor air pollution, acid deposition, stratospheric ozone reduction, and global climate change. Credit will not be allowed for MEA 425 and MEA 525.

Prerequisite: MA 141, CH 201, (PY 205, PY 211 or MEA 320)
Typically offered in Fall, Spring, and Summer

ME 440 Igneous and Metamorphic Petrology  (4 credit hours)
The study of rocks formed by the crystallization of magmas (igneous) and by the recrystallization of existing rocks (metamorphic), with emphasis on whole-rock and mineral compositions, classification, petrography, hand-sample and thin-section identification, and the rock origins in terms of magma genesis and emplacement and tectonics. Field trips are required.

Prerequisite: ME 410
Typically offered in Fall only

ME 443 Synoptic Weather Analysis and Forecasting  (4 credit hours)
Analysis and forecasting of mid-latitude weather systems with emphasis on simplified models and methods. Barotropic model, Rossby waves; baroclinic structure, upper-level wave evolution, forecasting; surface cyclone evolution, Sutcliffe-Petterssen model. Numerical computation methods; numerical weather prediction and operational models, subjective and objective analysis of meteorological fields.

Prerequisite: ME 421
Typically offered in Fall only

ME 444 Mesoscale Analysis and Forecasting  (4 credit hours)
Analysis and forecasting of mid-latitude weather systems with emphasis on mesoscale phenomena. Definition of the mesoscale, approximations to the governing equations, basic measurements and techniques; observations, basic governing dynamics, and forecasting of mesoscale phenomena, including drylines, low-level jets, conditional symmetric instability, crogaphically-induced circulations, thunderstorms, mesoscale convective, and severe convective weather.

Prerequisite: ME 443
Typically offered in Spring only

ME 449/MEA 549 Principles of Biological Oceanography  (3 credit hours)
Environmental dependencies, biological productivity, and trophic relationships in plankton, nekton and benthos; Sampling methods and experimental design; Human impacts on marine systems. Credit is not allowed for both MEA 449 and MEA(ZO)549.

Typically offered in Fall only

ME 450 Introductory Sedimentology and Stratigraphy  (4 credit hours)
Properties and classification of sediments and sedimentary rocks, geologic occurrences and origin of minerals and rocks formed by physical, chemical, and biologic processes at and near the Earth’s surface. Principles of the division of stratified terrains into natural units, the correlation of strata and associated data, the interpretation of depositional environments, facies, and sequences, description of burial histories, and sedimentary basin analysis. Required field trips.

Prerequisite: MEA 410
Typically offered in Fall only

ME 451 Structural Geology  (4 credit hours)
Basic principles of geometric, kinematic and dynamic analysis as applied to fractures, shear zones, folds, and fabrics of deformed rock bodies. Considers both brittle and ductile realms of the crust from microscale to regional tectonics. Required overnight field trips.

Prerequisite: MEA 410
Typically offered in Fall only

ME 454/MEA 554 Marine Physical-Biological Interactions  (3 credit hours)
Space-time relationships between physics and biology; influence of Reynolds Number on aquatic life style; aspects of physical and biological mathematical modeling; influence of biology on physical phenomena; influence of static physical/chemical properties on biology; influence of dynamic physical phenomena (turbulence, waves and advection) on biology within the water column and its boundaries. Credit is not allowed for both MEA 454 and 554.

Prerequisite: MEA 460 and MEA/ZO 449
Typically offered in Spring only

ME 455 Micrometeorology  (3 credit hours)
Energy budget near the earth’s surface; soil temperatures and heat transfer; air temperature, humidity, and wind distribution in the planetary boundary layer; fundamentals of viscous flows and turbulence; semiempirical theories of turbulence; exchanges of momentum, heat and moisture in the atmospheric surface layer; air modification due to changes in surface properties; agricultural and forest micrometeorology.

Prerequisite: MEA 422 or MAE 308
Typically offered in Fall only

ME 458 Introduction to Tropical Meteorology  (3 credit hours)

Prerequisite: MEA 422
Typically offered in Fall only
MEA 459 Field Investigation of Coastal Processes (5 credit hours)
Coastal zone processes and dynamics with emphasis on the forcing factors that regulate changing coastal landforms, the ecology and physiochemical character of coastal ocean water-masses, seabed morphologies, landscape academies, etc. Field observations and field techniques will be emphasized in tidal-freshwater coastal wetlands, estuaries, barrier island, tidal inlets, continental shelves and shelf-margin habitats. Additional fees required.

Prerequisite: MEA 250
Typically offered in Summer only

MEA 460 Principles of Physical Oceanography (3 credit hours)
Introduction to principles and practices of physical oceanography. Equation of state of seawater; energy transfer to the ocean by thermal, radiative and mechanical processes; the heat budget; oceanic density distribution; oceanic boundary conditions; conservation equations; air-sea interaction; global fluxes and description of major ocean currents. Credit is not allowed for both MEA 460 and MEA 540

Prerequisite: MA 241 or MA 231; Corequisite: PY 203, PY 208 or PY 212.
Typically offered in Fall only

MEA 462 Observational Methods and Data Analysis in Marine Physics (3 credit hours)
Practical experience in the observational techniques used by physical oceanographers. Basic instrumentation described, emphasizing principles rather than detailed descriptions. Both direct and indirect techniques used to define the three-dimensional circulation of the ocean as a function of time.

Prerequisite: MEA 460
Typically offered in Spring only

MEA 463 Fluid Physics (3 credit hours)
A derivation of the basic equations governing fluid motion in a rotating coordinate system. Equations include conservation of mass or the continuity equation, momentum equations, thermodynamic energy equation and the vorticity equation. Application of equations to simplified oceanic flows which include surface gravity waves, inertial motion, geostrophic motion, Ekman dynamics and vorticity dynamics.

Prerequisite: MA 341 and PY 208
Typically offered in Fall only

MEA 464 Ocean Circulation Systems (3 credit hours)
Dynamical processes governing ocean circulation. Driving of ocean currents by the atmosphere, currents on a rotating spherical earth. Mid-ocean gyre, western boundary currents, equatorial current systems, and polar circulation. Currents in coastal regions and shallow-water processes.

Prerequisite: MEA 460
Typically offered in Fall only

MEA 465 Geologic Field Camp (4 credit hours)
Introduction to field instruments and techniques used in geological sciences. Geologic field mapping in areas ranging from undeformed sedimentary rocks to complexly deformed crystalline rocks. May include field techniques specific to engineering geology, geophysics, hydrogeology, and paleontology. Preparation of maps and reports. Four-week course taught off-campus, typically out-of-state. Additional fees required.

Prerequisite: MEA 450 and MEA 451
Typically offered in Summer only

MEA 466 Preparatory Course for Field Camp (1 credit hours)
Introduction to theory, instruments, and techniques used in MEA 465 geologic field camp. Geologic context of the area where field camp will be held. Students will supply their own graph paper for a map cross-section exercise. Credit for this course cannot be used to fulfill elective credits in any Geology curricula.

Typically offered in Spring only

MEA 467 Marine Meteorology (3 credit hours)
Basic equation and concepts. Review of ocean and atmospheric circulations. Ocean mixed layer, air-sea interaction and coastal ocean and meteorological processes, marine boundary layer and cloud processes.

Prerequisite: MA 241 and PY 205
Typically offered in Spring only

MEA 468/MEA 568 Aquatic Microbiology (3 credit hours)
Aquatic microbes are key drivers of biogeochemistry on Earth. They also influence the 'health' of valuable ecosystems, e.g. estuaries, coasts, lakes, as well as, larger organisms (e.g. shellfish, humans). In this course, multiple facets of aquatic microbiology will be covered, including (not limited to): population diversity, spatial and temporal dynamics, sampling methodologies, metabolisms, and their environmental and societal importance. A primary goal for this course is for students to be exposed to key paradigms and current challenges within the field of aquatic microbiology, but also a general perspective on how aquatic microbes thrive in nature. Although largely a classroom-based course, select class periods will be devoted to hands-on activities and/or measurements providing students with methodological experience or in-depth exposure to key topics.

Prerequisite: BIO 183
Typically offered in Fall only

MEA 469 Ecology of coastal Resources (3 credit hours)
Anthropogenic impacts on estuarine and coastal marine ecosystems. Survey of basic biological, physical, chemical and geological mechanisms underlying habitat-specific functioning, followed by discussion, in-class presentation, and critique of real and hypothetical case studies involving anthropogenic impacts.

Prerequisite: MEA 250 and MEA 220 or MEA 449
Typically offered in Spring only

MEA 470 Introduction to Geophysics (3 credit hours)
Structure of the earth, a dynamic and evolving entity, as inferred from seismology, gravity, magnetism and heat flow. Geodynamic processes responsible for continental drift; plate tectonic theory; regional geophysics of selected areas.

Prerequisite: PY 208 or 212

MEA 471 Exploration and Engineering Geophysics (3 credit hours)
Geophysical methods applied to exploring the earth's shallow subsurface. Principles of gravity, magnetic, electrical, and seismic exploration surveys. Planning, conducting, and interpreting geophysical surveys.

Prerequisite: PY 208 or PY 211
ME 473/MEA 573  Principles of Chemical Oceanography  (3 credit hours)
Chemical processes controlling the composition of oceans, including discussions of chemical equilibria, biological cycling of nutrients and use of chemical tracers in marine environment; consideration of origin and chemical history of oceans. Credit is not allowed for both MEA 473 and MEA 573.
Prerequisite: CH 201 or CH 203
Typically offered in Fall only

ME 476 Worldwide River and Delta Systems: Their Evolution and Human Impacts  (3 credit hours)
Survey of major world rivers and deltas, such as the Amazon, Mississippi, Yello, Yangtze, Mekong, Ganges-Brahmaputra, Indus, Nile, etc. Descriptions of their initiation, development, and evolution processes. Definitions of the impacts caused by climate changes and human activities. Examination of the river-ocean interactions and sedimentary and geochemical processes in terms of sea-level change, monsoon, and sediment dispersal and deposition.
Prerequisite: Senior undergraduate or Graduate standing
Typically offered in Fall only

ME 479/CE 479  Air Quality  (3 credit hours)
Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the "acid rain: problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.
CE 282 and CE 373; or CHE 311 (CHE Majors); or MEA 421 (MEA Majors); Corequisite: ST 370; or ST 380 (MEA Majors)
Typically offered in Spring only

ME 481 Geomorphology: Earth’s Dynamic Surface  (3 credit hours)
Landforms and the processes responsible for their origin. Emphasis on the geologic principles involved in interpreting the origin and evolution of various landforms, and discussion of North American geomorphic process.
Prerequisite: (MEA 100 or MEA 101 or MEA 200) and MEA 110
Typically offered in Spring only

ME 485 Introduction to Hydrogeology  (3 credit hours)
Basic science of groundwater flow in geological media. Saturated and unsaturated flow, Darcy’s equation, heterogeneity and anisotropy, flow nets, storage properties of geological materials, effective stress, equations for steady and unsteady flow, recharge, groundwater exchange with surface water, groundwater flow to pumping wells, estimation of hydraulic properties of aquifers, contaminant plumes and chemical transport in groundwater.
Prerequisite: (MEA 101 or MEA 202), (MA 131 or MA 141), (CH 201 or CH 203), and (PY 201, PY 205, or PY 211)
Typically offered in Fall only

ME 488  Meteorology for Media  (3 credit hours)
Communication of weather and climate information with the public, including examination of communication theory, public communication of science, and geoscience communication research. Production techniques for television and digital graphics, presentation to camera, and audio recordings.
Prerequisite: One of the following ENG 331, ENG 332, ENG 333, or COM 110
Typically offered in Fall only

ME 493 Special Topics in MEAS  (1-6 credit hours)
Directed individual study or experimental course offering.
Typically offered in Fall, Spring, and Summer

ME 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences  (1 credit hours)
Emphasis on student professional development. Discussions of professional opportunities, resources, and ethics. Professionals from the public and private sectors introduce students to career options in marine, earth and atmospheric sciences. Strategies for finding jobs and graduate programs. Students reflect on future career goals and plans. For MEAS majors only.
R: MEAS Majors Only
Typically offered in Spring only

ME 498 Internship in MEAS  (1-6 credit hours)
Awards academic credit for learning that occurs during internships. Requires daily journal and written summary report. Successful completion of the course based on review of summary report by an MEAS faculty, who shall be identified by the student prior to the internship. Transportation expenses may be incurred. MEAS majors only. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

ME 507 Discipline-based Education Research in the Geosciences  (3 credit hours)
This course will prepare students to explain the conditions necessary for learning to occur in college geoscience classes; plan lessons that address geoscience literacy standards and incorporate activities that feature multiple levels of Bloom’s taxonomy.
Typically offered in Spring only

ME 510 Air Pollution Meteorology  (3 credit hours)
Wind structure in atmospheric surface layer and planetary boundary layer; temperature structure and stability; mixed layer and inversions; turbulence intensity and scale; meteorological factors affecting dispersion of pollutants; diffusion theories and models; diffusion and transport experiments; plume rise, fogulation and trapping; removal processes; effects of buildings and hills; effects of local winds.
Prerequisite: MAE 308 or MEA 455 or MEA 700
Typically offered in Spring only
ME 511 Introduction to Meteorological Remote Sensing (3 credit hours)
Meteorological remote sensing data sets used in operational forecast and research applications. Sensor physical principles. Emphasis is on understanding the strengths and weaknesses of the different types of observational data so that the student can just

Typically offered in Fall only

ME 514 Advanced Physical Meteorology (3 credit hours)
Fundamental laws and concepts of thermodynamics and electromagnetic radiative transfer considered in an atmospheric context. Application of these principles to a number of meteorological problems, including radiative climate models, the global energy balance, atmospheric aerosols, lidar/radar backscatter and remotely sensed temperature fields.

Prerequisite: MEA 412, MEA 421
Typically offered in Fall only

ME 515/MEA 415 Climate Dynamics (3 credit hours)
A comprehensive look at climate integrated across terrestrial, marine, and atmospheric perspectives. Topics include an in-depth look at climate proxies, drivers of future, current and past climate change, climate monitoring approaches, and climate model projections. Students will be exposed to the quantitative aspects (chemistry, physics, theory, observations, models) scientists use to place constraints on climate conditions over broad spatial and temporal scales. MEA 415 is open to upper-level undergraduate science majors interested in learning more about Earth's climate systems and the dynamics within. MEA 515 is open to all graduate students with the expectation of an additional climate assessment course project relevant to the student's own research discipline. Students cannot receive credit for both MEA 415 and MEA 515.

Prerequisite: MA 121 or MA 131 or MA 141 and CH 101 or CH 103 and PY 201 or PY 205 or PY 211
Typically offered in Fall only

ME 517 Fundamentals of Climate Change Science (3 credit hours)
This course will present the basic science of climate change, including chemical and physical systems and processes. The students will be introduced to how the climate system works and the role of greenhouse gases in the climate system. Students will learn about climatological data, climate models and how predictions/projections are made. Emphasis will be placed upon relating predicted/projected changes to manifestations such as sea level rise and changes in the distribution and character of precipitation. Topics include the primary climate components, ocean-atmospheric teleconnections, decadal and multi-decadal climate indices, natural and anthropogenic climate variability, and climate model projections.

Prerequisite: Graduate standing
Typically offered in Fall only

ME 518 Climate Risk Analysis (3 credit hours)
Applying methods of risk analysis to evaluate options for dealing with climate change, this course will introduce appropriate statistical methods and develop applications to climate-change related issues. This course provides practical hands-on experience for professionals in analyzing climate risks and developing adaptation strategies in climate sensitive sectors. The specific content will rely heavily on case studies in hydrology, health, energy, and transportation sectors.

Prerequisites: MEA 517 and ST 511 (or equivalent) and Graduate student status
Typically offered in Spring only

ME 519 Barriers to Climate Change Literacy (3 credit hours)
Investigates the discipline-based geoscience education lenses of the cognitive, affective, and behavioral barriers to climate literacy and the practical interventions for addressing them. Critically analyzes key aspects of climate science, common misconceptions, mental models, cultural influences, and risk perceptions about climate change. Students engage with the public and design projects for overcoming barriers to climate change literacy. The course features relevant readings, classroom discussions, student peer-review, and summative and formative course feedback though course assignments and exams.

Minimum of 50% seats reserved for Climate Change and Society Certificate program students.

Prerequisite: Graduate standing
Typically offered in Spring only

ME 525/MEA 425 Introduction to Atmospheric Chemistry (3 credit hours)
The course covers history, regulations, sources, physics, and chemistry of major air pollutants and factors affecting their transport and fate. Emphasis is placed on atmospheric chemistry and physics underlying five major air pollutant problems including urban outdoor air pollution, indoor air pollution, acid deposition, stratospheric ozone reduction, and global climate change. Credit will not be allowed for MEA 425 and MEA 525.

Prerequisite: MA 141, CH 201, (PY 205, PY 211 or MEA 320)
Typically offered in Spring only

ME 540 Principles of Physical Oceanography (3 credit hours)
Introduction to principles and practice of physical oceanography. The equation of state of seawater; energy transfer to the ocean by thermal, radiative and mechanical processes; the heat budget; oceanic boundary conditions; geographical distribution of oceanic properties; observational methods; conservation equations; simple waves and tides; physical oceanography of North Carolina coastal zone. Application of Fourier analysis techniques to interpretation of low-frequency motions in ocean and atmosphere. Review of Fourier method. Filtering of tidal signals. Spectral estimates and calculation of current ellipses. Identification of coherent motions and their empirical orthogonal modes. Data from field experiments used in lectures and homework assignments. Credit is not allowed for both MEA 460 and MEA 540

Prerequisite: MA 231 and PY 212
Typically offered in Spring only
ME 549/MEA 449 Principles of Biological Oceanography (3 credit hours)
Environmental dependencies, biological productivity, and trophic relationships in plankton, nekton and benthos; Sampling methods and experimental design; Human impacts on marine systems. Credit is not allowed for both MEA 449 and MEA(ZO)454.

Typically offered in Fall only

ME 553 Estuarine Biogeochemistry (3 credit hours)
Biogeochemical cycles of carbon, nitrogen, and phosphorus in coastal rivers and estuaries with selected topics on the origin, physics, and chemistry of estuarine waters and sediments. Emphasis is placed on organic matter and nutrient cycling in estuaries within the context of anthropogenic effects and climate change.

Typically offered in Spring only

ME 554/MEA 454 Marine Physical-Biological Interactions (3 credit hours)
Space-time relationships between physics and biology; influence of Reynolds Number on aquatic life style; aspects of physical and biological mathematical modeling; influence of biology on physical phenomena; influence of static physical/chemical properties on biology; influence of dynamic physical phenomena (turbulence, waves and advection) on biology within the water column and its boundaries. Credit is not allowed for both MEA454 and 554.

Prerequisite: MEA 460 and MEA/ZO 449
Typically offered in Spring only

ME 562 Marine Sediment Transport (3 credit hours)
Quantitative study of sediment transportation in the marine environment including introduction to fluid mechanics and sediment transportation theory. Processes and products of sediment transportation in specific marine environments from estuaries to deep marine environments from estuaries to deep.

Prerequisite: MEA 101 or MEA 200, MA 241, PY 201 or PY 205
Typically offered in Fall only

ME 568/MEA 468 Aquatic Microbiology (3 credit hours)
Aquatic microbes are key drivers of biogeochemistry on Earth. They also influence the 'health' of valuable ecosystems, e.g. estuaries, coasts, lakes, as well as, larger organisms (e.g. shellfish, humans). In this course, multiple facets of aquatic microbiology will be covered, including (not limited to): population diversity, spatial and temporal dynamics, sampling methodologies, metabolisms, and their environmental and societal importance. A primary goal for this course is for students to be exposed to key paradigms and current challenges within the field of aquatic microbiology, but also a general perspective on how aquatic microbes thrive in nature. Although largely a classroom-based course, select class periods will be devoted to hands-on activities and/or measurements providing students with methodological experience or in-depth exposure to key topics.

Prerequisite: BIO 183
Typically offered in Fall only

ME 570 Geological Oceanography (3 credit hours)
A comprehensive overview of the geological aspects of oceanography. Topics include: a) marine geophysics and the evolution of ocean basins, b) sedimentological processes and the formation of marine deposits, c) marine geochemistry and authigenic sedimentation, d) paleoceanography and the interpretation of marine stratigraphy.

Typically offered in Spring only

ME 573/MEA 473 Principles of Chemical Oceanography (3 credit hours)
Chemical processes controlling the composition of oceans, including discussions of chemical equilibria, biological cycling of nutrients and use of chemical tracers in marine environment; consideration of origin and chemical history of oceans. Credit is not allowed for both MEA 473 and MEA 573.

Prerequisite: CH 201 or CH 203
Typically offered in Fall only

ME 574 Advanced Igneous Petrology (3 credit hours)
Physicochemical principles related to igneous petrogenesis. General principles and specific problems including origin, differentiation and emplacement of magmas and the possible relationships of igneous processes to global tectonics.

Prerequisite: MEA 440
Typically offered in Fall only

ME 577 Electron Microprobe Analysis of Geologic Material (2 credit hours)
Theory of quantitative analysis of geologic material by electron beam application; laboratory operation of electron microprobe to acquire chemical composition and x-ray images of geologic material.

Prerequisite: MEA 410
Typically offered in Fall only

ME 579 Principles of Air Quality Engineering (3 credit hours)
Introduction to: risk assessment, health effects, and regulation of air pollutants; air pollution statistics; estimation of emissions; air quality meteorology; dispersion modeling for non-reactive pollutants; chemistry and models for tropospheric ozone formation; aqueous-phase chemistry, including the "acid rain" problem; integrated assessment of air quality problems; and the fundamentals and practical aspects of commonly used air quality models. Credit is allowed only for one of CE/MEA 479 or CE/MEA 579.

Prerequisite: CE 373, CE 282; or CHE 311 (CHE Majors); or MEA 421 (MEA Majors), Corequisite: ST 370; ST 380 (MEA Majors)
Typically offered in Spring only

ME 580 Air Quality Modeling and Forecasting (4 credit hours)
Topics include numerical solutions to ODEs/PDEs, atmospheric chemistry, cloud and aerosol microphysics, emission modeling, meteorological modeling, and model design, applications, and evaluation. It is targeted for students who would like to learn about air quality modeling and who are prospective air quality model users.

Prerequisite: CSC 112, MEA 425/525, CE 479/579
Typically offered in Fall and Spring

ME 581/CE 581 Fluid Mechanics in Natural Environments (3 credit hours)
Free surface flows of water and air occurring in natural fluid systems and influencing environmental transport and mixing. Review of fundamental principles of fluids, covering the scales relevant to both engineering and geo-physical applications. Topics and examples include waves, instability, stratification, turbulent boundary layers, jets and plumes, and open channel flows. Cannot receive credit for both CE 581 and MEA 581.

Prerequisite: CE 282 or MEA 463 or permission of instructor
Typically offered in Fall only
MEA 582/GIS 582  Geospatial Modeling  (3 credit hours)
The course provides foundations in methods for GIS-based surface analysis and modeling. The topics include proximity analysis with cost surfaces and least cost paths, multivariate spatial interpolation and 3D surface visualization. Special focus is on terrain modeling, geomorphometry, solar irradiation, visibility, and watershed analysis. Students are also introduced to the basic concepts of landscape process modeling with GIS and to the principles of open source GIS. Introductory level knowledge of GIS or surveying/geomatics principles is required.

Typically offered in Fall and Spring

MEA 584/GIS 584  Mapping and Analysis Using UAS  (3 credit hours)
The course provides an overview of UAS mapping technology and its rules and regulations. The principles of UAS data collection are explained along with optional hands-on practice with in flight planning and execution. The main focus is on processing imagery collected from UAS using structure from motion techniques and deriving orthophoto mosaics and ultra-high resolution digital elevation models of land surface, vegetation and structures. More advanced topics include multi-temporal 3D data analysis, fusion with lidar data and 3D visualization.

Prerequisite: GIS 510 or GIS/MEA 582 or Permission of Instructor
Typically offered in Summer only

MEA 585  Physical Hydrogeology  (3 credit hours)
Physical aspects of groundwater flow in geological media. Saturated and unsaturated flow, Darcy’s equation, heterogeneity and anisotropy, storage properties of geological materials, effective stress, governing equations for steady and unsteady flow, recharge, groundwater exchange with surface water, groundwater flow to wells, estimation of hydraulic properties of aquifers.

Prerequisite: MEA 101, MEA 110, MA 241, and PY 201 or PY 205
Typically offered in Spring only

MEA 591  Special Topics in Marine Science  (1-6 credit hours)
Opportunity for advanced undergraduate and graduate students to study timely special problem areas in Marine Science and Engineering

Typically offered in Fall, Spring, and Summer

MEA 592  Special Topics in Earth Sciences  (1-6 credit hours)
Special topics in earth sciences, provided to groups or to individuals.

Typically offered in Fall, Spring, and Summer

MEA 593  Special Topics in Atmospheric Science  (1-6 credit hours)
Special topics in atmospheric science, provided to groups or to individuals.

Typically offered in Fall, Spring, and Summer

MEA 599  Regional Geology of North America  (1-6 credit hours)

Prerequisite: MEA 101 or MEA 120, Senior standing
Typically offered in Fall only

MEA 601  Seminar  (1 credit hours)
Presentation by each student of one seminar on his/her current research.

Prerequisite: Graduate standing

Typically offered in Fall and Spring

MEA 611  Special Topics in Marine Sciences  (1-6 credit hours)
Special topics in earth sciences, provided to groups or to individuals.

Typically offered in Fall, Spring, and Summer

MEA 612  Special Topics in Earth Sciences  (1-6 credit hours)
Special topics in atmospheric science, provided to groups or to individuals.

Typically offered in Fall, Spring, and Summer

MEA 613  Special Topics Atmospheric Sciences  (1-6 credit hours)
Typically offered in Fall and Spring

MEA 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MEA 690  Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MEA 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

MEA 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research

Prerequisite: Master's Student
Typically offered in Fall and Spring

MEA 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

MEA 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits Arranged

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
MEA 700 Environmental Fluid Mechanics (3 credit hours)
Basic concepts and laws governing motion of atmosphere and oceans developed from first principles, including approximations valid for environmental flows, kinematics, dynamics and thermodynamics of fluid flows as well as introduction to environmental turbulence. Credit is not allowed for both MEA 463 and MEA 700
Prerequisite: MA 241, PY 208
Typically offered in Fall only

MEA 703 Atmospheric Aerosols (3 credit hours)
An understanding of aerosols as primary air pollutants, indoor versus outdoor pollution, transformation processes, prediction of atmospheric concentrations, scavenging of aerosols, transport of air pollutants on a regional scale, discussion of national experiments to characterize and study impact of urban-industrial pollution, tropospheric aerosol and weather, stratospheric aerosol, effect of aerosols on atmospheric warming and cooling and air-quality models.
Prerequisite: (CH 201 or CH 203) and (PY 205 or PY 211), Corequisite: MEA 412
Typically offered in Spring only

MEA 705 Dynamic Meteorology (3 credit hours)
Brief review of classical and physical hydrodynamics; scale analysis of dynamic equations; atmospheric instabilities; dynamics of tropical convections; perturbation theory and approximations for atmospheric wave motions.
Prerequisite: MEA 422
Typically offered in Spring only

MEA 707 Planetary Boundary Layer (3 credit hours)
Review of basic equations and concepts of planetary boundary layers. The closure problem and semi-empirical theories of turbulence, buoyancy effects on mean flow and turbulence, instrumentation and observational platforms for PBL experiments, observed characteristics of atmospheric boundary layers, numerical and physical modeling of PBL and its parameterization in large-scale atmospheric circulation models.
Prerequisite: MEA 455 or MEA 721
Typically offered in Fall and Spring

MEA 708 Atmospheric Turbulence (3 credit hours)
Prerequisite: MAE 550 or MEA 700 or MEA 707
Typically offered in Fall and Spring

MEA 710 Atmospheric Dispersion (3 credit hours)
Prerequisite: MAE 550 or MEA 700 or MEA 510
Typically offered in Fall only

MEA 712 Mesoscale Modeling (3 credit hours)
Modeling mesoscale weather phenomena including midlatitude cyclones, mesoscale convective complexes and squall lines. Application of finite difference, spectral and implicit methods and coordinate transforms to these problems. Utilization of explicit representations of moist processes. Development of parameterizations of convective clouds, planetary boundary layer and moist processes.
Prerequisite: MEA 705
Typically offered in Fall only

MEA 713 Mesoscale Dynamics (3 credit hours)
Prerequisite: MEA 700 and MEA 705
Typically offered in Fall only

MEA 714 Atmospheric Convection (3 credit hours)
Structure, physics and dynamics of convective clouds and cloud systems; fundamental equations for modeling convection; microphysical parameterization schemes; influence of instabilities on convective cloud systems; severe thunderstorms dynamics; tornadogenesis theories; mesoscale convective systems; upscale feedback effects of convection; cumulus parameterization schemes.
Prerequisite: MEA 412, MEA 700, MEA 705
Typically offered in Fall only

MEA 715 Dynamics of Mesoscale Precipitation System (3 credit hours)
Frontogenesis theory; inertial and conditional symmetric instability; mesoscale gravity waves and wave-CISK; conveyor belts; seeder-feeder processes and precipitation generating cells; classification and dynamics of precipitation band types.
Prerequisite: MEA 444
Typically offered in Fall only

MEA 716 Numerical Weather Prediction (3 credit hours)
Parameterization of physical processes in atmospheric modeling, including numerous hands-on experiments to allow evaluation and analysis of process representation in models. Emphasis on experimental design: Using numerical models as a tool with which to test scientific hypotheses. Investigation of data assimilation and ensemble prediction techniques. Journal discussion and student presentations are featured prominently. A semester project allows students to apply knowledge to thesis projects, and synthesize class concepts. Some comfort level with Linux computing environment, shell scripting, and programming languages such as FORTRAN required.
Typically offered in Fall only

MEA 717 Advanced Weather Analysis (3 credit hours)
Evolution of physical and dynamic structure of synoptic and mesoscale storm systems occurring in middle and high latitudes. Recent advances in understanding these storm systems through intensive field experiments and computer modeling. Introduction to contemporary analysis techniques through laboratory exercises shedding light on storm structure, dynamics and scale interaction.
Prerequisite: MEA 444, MEA 705
Typically offered in Fall only
MEA 719 Climate Modeling  (3 credit hours)
Prerequisite: MEA 705
Typically offered in Fall only

MEA 721 Air-Sea Interaction  (3 credit hours)
Review of basic equations and concepts of turbulent transfer in geophysical flows, air-sea interaction processes and their importance to man's activities, theory and observation of wind-generated ocean surface waves, turbulent transfers in planetaryboundary layer of marine atmosphere, oceanic mixed layer, development of thermocline and inversion.
Prerequisite: MEA 422 or MEA 560
Typically offered in Spring only

MEA 735 Fourier Analysis of Geophysical Data  (3 credit hours)
Application of Fourier analysis to interpretation of low-frequency motions in ocean and atmosphere. Review of Fourier method. Filtering of tidal signals. Spectral estimates and calculation of current ellipses. Identification of coherent motions and
Prerequisite: MA 341 and ST 511
Typically offered in Spring only

MEA 741 Synoptic Physical Oceanography  (3 credit hours)
Basic discussion of the techniques and terminology of synoptic physical oceanography; focus on water characteristics and their relationship to currents in the individual oceans; a systematic quantitative description of the character of ocean waters and
Prerequisite: MEA 560
Typically offered in Spring only

MEA 743 Ocean Circulation  (3 credit hours)
Basic study of mechanics of ocean circulation with emphasis on various simple models of circulation systems.
Prerequisite: MEA 700 or PY 411
Typically offered in Fall only

MEA 744 Dynamics of Shelf Circulation  (3 credit hours)
Description and models of dynamic processes on the shelf, including seiches and tides in gulfs, propagation of tides and storm surges, wind-induced coastal upwelling, continental shelf waves and coastally trapped waves. Steady circulation driven by winds, river plumes and density forcing, formation of shelf-break fronts; and influence from deep-ocean currents.
Prerequisite: MEA 700
Typically offered in Fall only

MEA 752 Marine Plankton Ecology  (3 credit hours)
Examination of worldwide relationships between physical-chemical environment and planktonic organisms. Organism descriptions; effects of light, temperature, salinity, density, water motion and chemical constituents on organisms; interactions among different organisms emphasizing competition and predation; community structure, distribution and succession; and mathematics models of distribution, production and interaction.
Prerequisite: BCH 451 and MA 121 and ZO 419
Typically offered in Fall only

MEA 759 Organic Geochemistry  (3 credit hours)
Typically offered in Fall only

MEA 760 Biogeochemistry  (3 credit hours)
Processes involved in the biogeochemical cycling of C, N, S and related biogenic elements. Stable isotopic and other geochemical signatures of biological processes. Introduction to modeling chemical distributions in sediments. The impact of biogeochemical processes on atmospheric chemistry.
Typically offered in Fall only

MEA 762 Marine Geochemistry  (3 credit hours)
Detailed examination of chemical processes occurring in marine environment. Chemical evolution of the oceans, continental and submarine weathering, particle scavenging of reactive elements from water, column, formation of biogenic and metaliferousdeposits, sediment diagenesis and marine geochronology.
Prerequisite: CH 331, MEA 560
Typically offered in Spring only

MEA 763 Isotope Geochemistry  (3 credit hours)
This class offers an interdisciplinary introduction to the principles of isotope chemistry and its application to geological, atmospheric, and biological systems. Key topics include: isotope systematics; isotope measurements and analyses; common radiogenic (U, Ar, Pb, Sr, C, Be) and stable (H, O, C, N, S) isotope systems; applications to geochronology, paleobiology, paleoclimatology, environmental tracking, archeology, and more. This course is aimed at graduate students interested in using isotopes as a tool for examining the natural world.
Restriction: Graduate Standing or Permission of the Instructor
Typically offered in Spring only

MEA 779 Advanced Air Quality  (3 credit hours)
Local, regional and global scale chemical interactions, transport and behavior of trace gases (sulfur carbon, nitrogen, hydrocarbon, and photochemical oxidants) in the atmosphere. covers three primary elements of air quality: anthropogenic and natural emissions of trace gases; interactions of the pollutants in the atmosphere; and monitoring and sampling of gaseous and particulate pollutants.
Prerequisite: (CH 201 or CH 203) and MEA(CE) 479
Typically offered in Spring only
ME 785 Chemical Hydrogeology (3 credit hours)
Prerequisite: (CH 201 or CH 203) and (MEA 585 or CE 584)
Typically offered in Spring only

ME 788 Advanced Structural Geology (3 credit hours)
Principles of rock mechanics and their application in solving geologic problems; finite strain analysis of deformed rocks; advanced techniques of structural analysis; petrofabrics; development of various geologic structures. Emphasis upon application of
Prerequisite: MEA 451
Typically offered in Fall only

ME 789 Topics In Appalachian Geology (3 credit hours)
Examination of geology of areas within Appalachian orogenic belt. Lectures, discussions, reading and review of current literature and consideration of ideas concerning geological evolution of region. Required field trips.
Prerequisite: MEA 440, 450 and 451
Typically offered in Fall only

ME 790 Geotectonics (3 credit hours)
In-depth examination of current ideas in plate tectonic theory. Plate tectonic controls on orogeny, orogenic belts, magmatism and metallogeny.
Prerequisite: MEA 440, 450, 451
Typically offered in Fall only

ME 791 Advanced Special Topics in Marine Science (1-6 credit hours)
Opportunity for advanced undergraduate and graduate students to study timely special problem areas in Marine Science and Engineering
Typically offered in Fall, Spring, and Summer

ME 792 Advanced Special Topics in Earth Sciences (1-6 credit hours)
Special topics in earth sciences, provided to groups or to individuals.
Typically offered in Fall, Spring, and Summer

ME 793 Advanced Special Topics in Atmospheric Science (1-6 credit hours)
Special topics in atmospheric science, provided to groups or to individuals.
Typically offered in Fall, Spring, and Summer

ME 796 Exploration And Engineering Geophysics (3 credit hours)
Geophysical methods as applies to exploring the earth's mineral and energy resources and to investigating subsurface geological structure and physical properties. Principles, measurements, analyses, and interpretations of gravity, magnetic, electric, electromagnetic, seismic methods. Required research paper.
Prerequisite: MEA 470 or PY 208
Typically offered in Spring only

ME 801 Seminar (1 credit hours)
Presentation by each student of one seminar on his/her current research.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

ME 810 Special Topics (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

ME 811 Special Topics in Marine Sciences (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

ME 812 Special Topics in Earth Sciences (1-6 credit hours)
Typically offered in Fall and Spring

ME 813 Special Topics in Atmospheric Sciences (1-6 credit hours)
Typically offered in Fall and Spring

ME 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planing for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

ME 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

ME 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research
Typically offered in Fall, Spring, and Summer

ME 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

ME 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
Materials Science and Engineering (MSE)

MSE 200 Mechanical Properties of Structural Materials (3 credit hours)
An introduction to the atomic and grain structure of structural materials emphasizing the mechanical properties. Effects of mechanical and heat treatments on structure and properties. Fatigue and creep of materials, fracture toughness, mechanical and non-destructive evaluation, effects of environment. Design considerations, characteristics of metals, ceramics, polymers and composites. Not for Materials majors
Prerequisite: Grade of C or better in CH 101
Typically offered in Fall, Spring, and Summer

MSE 201 Structure and Properties of Engineering Materials (3 credit hours)
Introduction to the fundamental physical principles governing the structure and constitution of metallic and nonmetallic materials and the relationships among these principles and the mechanical, physical and chemical properties of engineering materials.
Prerequisite: Grade of C or better in CH 101
Typically offered in Fall, Spring, and Summer

MSE 203/BME 203 Introduction to the Materials Science of Biomaterials (3 credit hours)
This course introduces fundamental physical principles governing the structure, processing, properties and performance of metallic, ceramic and polymeric materials. Relationships are developed defining how mechanical, physical and chemical properties are controlled by microstructure and chemistry. Material failure modes are developed with an emphasis on biocompatibility and the applications/performance of materials in the human body. Basic aspects of material biocompatibility are presented, leading into studies of the current and future applications of biomaterials.
Prerequisite: C- or better in CH 101, CH 102 and PY 205
Typically offered in Fall only

MSE 255 Experimental Methods for Structural Analysis of Materials (2 credit hours)
Principles and application of basic techniques for characterizing the structure of materials at different length scales. Optical microscopy, electron microscopy, scanning probe microscopy, X-ray diffraction and spectroscopic methods applied to metals, ceramics, polymers and semiconducting materials.
Corequisite: MSE 201 or MSE 203 or BME 203
Typically offered in Spring only

MSE 260 Mathematical Methods for Materials Engineers (3 credit hours)
Use of MATLAB programming environment to illustrate and discuss principles and applications of analytical and numerical mathematical methods that are central to materials science and engineering. Data plotting, curve fitting, complex numbers and series, Fourier series and transforms, numerical integration and differentiation, linear algebra and matrix manipulation, initial and boundary value problems, numerical solution to ordinary differential equations and transport simulation through the use of partial differential equations.
Corequisite: MA 242
Typically offered in Spring only

MSE 270 Materials Science and Engineering Seminar (1 credit hour)
This course surveys the field of materials science and engineering and introduces students to contemporary issues. Job and career opportunities at the BS and graduate degree levels are presented. Students are introduced to opportunities for laboratory assistant jobs in the MSE department, summer internships, co-ops and summer research experiences at NCSU and other institutions. Students will learn to prepare effective resumes, technical reports and oral presentations.
Corequisite: MSE 201 or MSE 203 or BME 203
Typically offered in Fall only

MSE 300 Structure of Materials at the Nanoscale (3 credit hours)
This course covers the structure of materials at the nanometer scale. Structure includes the periodic arrangements of atoms and ions in crystalline solids, the amorphous networks of atoms, ions, and molecules in glassy materials, and the molecular structure of polymeric and biological materials. The typical means of characterizing nanostructure are also reviewed. Finally, the course will introduce the structure of novel nanomaterials like nanotubes, buckyballs and self assembled monolayers.
Prerequisites: C or better in (MSE 201 or MSE 203 or BME 203) and MA 242
Typically offered in Fall only

MSE 301 Introduction to Thermodynamics of Materials (3 credit hours)
Review of classical thermodynamics and thermodynamic relationships. Use of statistical methods to describe entropy and other thermodynamic properties. Description of vapor-, liquid-, and solid-phase equilibrium in unary and other multicomponent material systems. Treatment of ideal and nonideal solution behavior in inorganic alloys and organic polymers. Application of gas-phase reaction kinetics and identification of the criteria required for reaction equilibria.
Prerequisite: C or better in (MSE 201 or MSE 203 or BME 203) and MA 242
Typically offered in Fall only

MSE 320 Introduction to Defects in Solids (3 credit hours)
Classification of defects as point, line, surface or volume types. Geometrical and crystallographic aspects of defects. Defects in metallic, ionic and covalently bonded crystal structures. Physical, chemical, electronic and magnetic aspects of defects. Field quantities and forces associated with defects. Novel defects in nanostructured materials and semicrystalline materials.
Prerequisite: C or better in MSE 201 or MSE 203 or BME 203
Typically offered in Fall only

MSE 335 Experimental Methods for Analysis of Material Properties (2 credit hours)
Principles and application of basic techniques for characterizing the properties of materials. Mechanical, thermal, electrical, optical and magnetic property measurements applied to metals, ceramics, polymers and semiconducting materials.
Prerequisite: C- or better in MSE 201
Typically offered in Fall only
MSE 355  Electrical, Magnetic and Optical Properties of Materials  (3 credit hours)
Fundamental treatment of the electronic properties of materials, including the electrical, magnetic and optical characteristics. The role of electrons, band structure, and Brillouin zones on the various classes of materials is discussed from the semiclassical and quantum mechanical viewpoints. Applications of these principles to specific technological devices is also covered.
Prerequisite: PY 208 and MA 341
Typically offered in Spring only

MSE 360  Kinetic Processes in Materials  (3 credit hours)
Types, mechanisms, and kinetics of solid state phase transformations are covered with selected applications to all classes of materials. Mechanisms of diffusion and techniques for diffusion calculations are presented. The role of surface energy and strain in the evolution of structure during transformation is presented. Phenomena at different size scales (atomic, nano, micro) are described relative to the evolution of structure during transformation.
Prerequisite: MA 341 and MSE 301
Typically offered in Spring only

MSE 370  Microstructure of Inorganic Materials  (3 credit hours)
Structure-property relationships in metallic and ceramic materials. Crystal structures of important metallic and ceramic elements, alloys, and compounds. Binary and ternary phase diagrams for notable systems will be presented. Microstructural features to be covered include grain size and distribution, multiphase microstructures, and defects. Examples of important metallic and ceramic systems for structural, electrical, optical and magnetic applications will be given.
Prerequisites: MSE 300, MSE 301, and MSE 320
Typically offered in Spring only

MSE 380  Microstructure of Organic Materials  (3 credit hours)
Covers microstructure and properties of soft materials including polymer molecular weight distributions, amorphous polymers, semicrystalline polymers, copolymers, elastomers, biopolymers, soft tissue, bone and cellular structure. The design and function of implantable biomaterials are also covered.
Prerequisite: CH 220 and MSE 300
Typically offered in Spring only

MSE 409/NE 509/MSE 509/NE 409  Nuclear Materials  (3 credit hours)
Introduces students to properties and selection of materials for nuclear steam supply systems and to radiation effects on materials. Implications of radiation damage to reactor materials and materials problems in nuclear engineering are discussed. Topics include an overview of nuclear steam supply systems, crystal structure and defects, dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials. Students cannot receive credit for both 409 and 509.
Prerequisite: MSE 201
Typically offered in Fall only

MSE 420  Mechanical Properties of Materials  (3 credit hours)
Basic concepts for mechanical properties of materials, elasticity, plasticity, viscoelasticity, rubber elasticity, strengthening mechanisms, creep, fracture and fatigue. Includes metals, ceramics, polymers and composites. Describes mechanical properties for nanostructured materials and biomaterials.
Prerequisite: MSE 370 and MSE 380
Typically offered in Fall only

MSE 423  Introduction to Materials Engineering Design  (1 credit hour)
Materials selection in engineering design involving lecture, cooperative and problem-based learning techniques. Course stresses creative thinking, problem solving methodology, interdependence of design with analysis and evaluation, teamwork and sharpening of communication skills. Real industrial problems are introduced which are analyzed by student teams. This a half-semester course. The classroom lectures end at mid-semester. In the second half of the semester, student teams develop a proposal which is submitted to the industrial sponsors at the end of the semester. The proposal defines future work to be conducted under MSE 470. Senior standing in MSE.
Prerequisite: Senior standing in MSE

MSE 440/MSE 540  Processing of Metallic Materials  (3 credit hours)
Fundamental concepts of solidification and their application to foundry and welding practices; metal forming concepts applied to forging, rolling, extrusion, drawing, and sheet forming operations; machining mechanisms and methods; powder metallurgy; advanced processing methods including rapid solidification and mechanical alloying. Credit for both MSE 440 and MSE 540 is not allowed.
Prerequisite: MSE 360 and MSE 370. Corequisite: MSE 420
Typically offered in Fall only

MSE 445/MSE 545  Ceramic Processing  (3 credit hours)
Ceramic processing of powders includes powder synthesis, characterization, mixing, and size reduction. Theoretical aspects include particle packing, particles in suspension, and some aspects of surface chemistry. Forming methods include compaction, casting, and extrusion. Firing and sintering are examined. Credit for both MSE 445 and MSE 545 is not allowed.
Prerequisite: MSE 370
Typically offered in Fall only

MSE 455  Polymer Technology and Engineering  (3 credit hours)
This course will cover commercial polymers, polymer blends and miscibility, dynamic mechanical behavior, Boltzmann superposition principle, ultimate properties of polymers, polymer rheology and processing, recycling and design and selection of polymeric materials. Guest instructors from industry will give presentations on contemporary topics in polymer technology and engineering. Field trips are required.
Prerequisite: MSE 380
Typically offered in Spring only
**MSE 456/MSE 556 Composite Materials** (3 credit hours)
The course covers the basic principles underlying properties of composite materials as related to the properties of individual constituents and their interactions. Polymer, metal, and ceramic matrix composites are included. Property averaging and micromechanics of composites are covered at an introductory level. Emphasis is placed on design and processing of composite systems to yield desired combinations of properties. Credit for both MSE 456 and MSE 556 is not allowed.

Prerequisite: MSE 420
Typically offered in Spring only

**MSE 460 Microelectronic Materials** (3 credit hours)
Processes and characterization techniques relevant to microelectronic materials science and technology. Boule growth, wafer preparation, oxidation, epitaxial growth, doping techniques, metallization, and device applications of elemental and compound semiconductors. Electrical, structural and chemical characterization of semiconductors is included as well as materials considerations relevant to device fabrication. Credit for both MSE 460 and MSE 560 is not allowed.

Prerequisite: MSE 355
Typically offered in Fall only

**MSE 465/MSE 565 Introduction to Nanomaterials** (3 credit hours)
Introduction to nanoparticles, nanotubes, nanowires, and nanostructured films, emphasizing their synthesis, structural and property characterization, novel physical and chemical properties, applications and contemporary literature.

Prerequisite: MSE 201
Typically offered in Spring only

**MSE 470 Materials Science and Engineering Senior Design Project** (3 credit hours)
Design project in materials science and engineering requiring problem definition and analysis, synthesis, and presentation of a designed solution. Students work in groups with a faculty adviser on problems submitted by local industrial sponsors or emerging research issues that represent the major specialty areas including ceramics, metals, polymers, or electronic materials.

Prerequisite: MSE 423
Typically offered in Spring only

**MSE 480/MSE 580 Materials Forensics and Degradation** (3 credit hours)
Covers principles and prevention of the degradation of materials. The topics will include dissolution of polymer and ceramic materials, electrochemical corrosion, oxidation of metals and polymers, degradation of polymers, friction and wear, degradation of electrical device components, bio-deterioration of materials, and failure analysis. The general practice in failure analysis will be applied to a variety of case studies to illustrate important failure mechanisms. Credit will not be given for both MSE 480 and MSE 580.

Prerequisite: MSE 370 and MSE 380
Typically offered in Spring only

**MSE 485 Biomaterials** (3 credit hours)
Introduction to materials of natural and synthetic origin and brief survey of historic, current, and future applications of materials in medicine. Examination of the classes and properties of degradable and non-degradable materials, interactions of materials with cells and tissues, and fundamentals of biocompatibility including inflammation, encapsulation, and infection. Discussion of biomaterial failure mechanisms, regulation, and related ethical concerns.

Prerequisite: BME 203 and BIO 183
Typically offered in Spring only

**MSE 489/MSE 589/PY 489/PY 589/ECE 489/ECE 589 Solid State Solar and Thermal Energy Harvesting** (3 credit hours)
This course studies the fundamental and recent advances of energy harvesting from two of the most abundant sources, namely solar and thermal energies. The first part of the course focuses on photovoltaic science and technology. The characteristics and design of common types of solar cells is discussed, and the known approaches to increasing solar cell efficiency will be introduced. After the review of the physics of solar cells, we will discuss advanced topics and recent progresses in solar cell technology. The second part of the course is focused on thermoelectric effect. The basic physical properties, Seebeck coefficient, electrical and thermal conductivities, are discussed and analyzed through the Boltzmann transport formalism. Advanced subject such as carrier scattering time approximations in relation to dimensionality and the density of states are studied. Different approaches for further increasing efficiencies are discussed including energy filtering, quantum confinement, size effects, band structure engineering, and phonon confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

**MSE 490 Special Topics in Materials Engineering** (1-4 credit hours)
Offered as needed for the development of new courses in materials engineering, including areas such as metals, ceramics, polymers, or microelectronic materials.

**MSE 495 Materials Engineering Projects** (1-6 credit hours)
Application of engineering principles to a specific materials engineering project by a student or small group of students under supervision of a faculty member. A written report required.

Prerequisite: Junior standing or Senior standing
Typically offered in Fall, Spring, and Summer

**MSE 500 Modern Concepts in Materials Science** (3 credit hours)
Fundamentals of structure, structure modification and properties of materials with emphasis on structure-property relationships and modern theory of solids.

Prerequisite: Graduate standing
Typically offered in Fall and Spring
MSE 509/NE 409/MSE 409/NE 509  **Nuclear Materials**  (3 credit hours)  
Introduces students to properties and selection of materials for nuclear steam supply systems and to radiation effects on materials. Implications of radiation damage to reactor materials and materials problems in nuclear engineering are discussed. Topics include an overview of nuclear steam supply systems, crystal structure and defects, dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials. Students cannot receive credit for both 409 and 509.  
Prerequisite: MSE 201  
Typically offered in Fall only

MSE 531  **Physical Metallurgy**  (3 credit hours)  
Application and design of selected metals and alloys in a theoretical and practical context. Relationships between mechanical behavior, alloy chemistry, microstructure, and processing. Corrosion resistance; fatigue failure; creep; brittle fracture. Design of specific microstructures. Credit for both MAT 431 and MSE 531 is not allowed.  
Prerequisite: MAT 321, MAT 450, Corequisite: MAT 430  
Typically offered in Fall only

MSE 539/MAE 539  **Advanced Materials**  (3 credit hours)  
Introduces production/structure/property/function relation and application of a number of materials mainly for biomedical, mechanical and aerospace applications. Topics include ultra light materials (production, processing and applications of cellular solids), biomaterials (classes and application of materials in medicine and dentistry), composites (classes and application), refractory materials and coatings for high temperature applications, thin film shape memory alloys for micro-electro mechanical systems (MEMS).  
Prerequisite: MSE 201 and MAE 314  
Typically offered in Fall only

MSE 540/MSE 440  **Processing of Metallic Materials**  (3 credit hours)  
Fundamental concepts of solidification and their application to foundry and welding practices; metal forming concepts applied to forging, rolling, extrusion, drawing, and sheet forming operations; machining mechanisms and methods; powder metallurgy; advanced processing methods including rapid solidification and mechanical alloying. Credit for both MSE 440 and MSE 540 is not allowed  
Prerequisite: MSE 360 and MSE 370. Corequisite: MSE 420  
Typically offered in Fall only

MSE 545/MSE 445  **Ceramic Processing**  (3 credit hours)  
Ceramic processing of powders includes powder synthesis, characterization, mixing, and size reduction. Theoretical aspects include particle packing, particles in suspension, and some aspects of surface chemistry. Forming methods include compaction, casting, and extrusion. Firing and sintering are examined. Credit for both MSE 445 and MSE 545 is not allowed.  
Prerequisite: MSE 370  
Typically offered in Fall only

MSE 555  **Polymer Technology and Engineering**  (3 credit hours)  
Classes of commercially important polymers, advanced topics in phase behavior, viscoelasticity, fracture and ultimate properties of polymers; polymer rheology, and processing; design of polymeric materials. Credit for both MSE 455 and MSE 555 is not allowed.  
Prerequisite: MSE 424 or equivalent  
Typically offered in Spring and Summer

MSE 556/MSE 456  **Composite Materials**  (3 credit hours)  
The course covers the basic principles underlying properties of composite materials as related to the properties of individual constituents and their interactions. Polymer, metal and ceramic matrix composites are included. Property averaging and micromechanics of composites are covered at an introductory level. Emphasis is placed on design and processing of composite systems to yield desired combinations of properties. Credit for both MSE 456 and MSE 556 is not allowed.  
Prerequisite: MSE 420  
Typically offered in Spring and Summer

MSE 560  **Microelectronic Materials Science and Technology**  (3 credit hours)  
Processes and characterization techniques relevant to microelectronic materials science and technology. Boule growth, water preparation, oxidation, epitaxial growth, doping techniques, metallization, and device applications of elemental and compound semiconductors. Electrical, structural and chemical characterization of semiconductors as well as materials considerations relevant to device fabrication. Credit for both MAT 460 and MSE 560 is not allowed  
Prerequisite: MAT 331, Corequisite: MAT 431  
Typically offered in Fall only

MSE 561/TC 561  **Organic Chemistry Of Polymers**  (3 credit hours)  
Principles of step reaction and addition polymerizations; copolymerization; emulsion polymerization; ionic polymerization; characterization of polymers; molecular structure and properties.  
Prerequisite: TC 461 and CH 231 or CH 431

MSE 565/MSE 465  **Introduction to Nanomaterials**  (3 credit hours)  
Introduction to nanoparticles, nanotubes, nanowires, and nanostructured films, emphasizing their synthesis, structural and property characterization, novel physical and chemical properties, applications and contemporary literature.  
Prerequisite: MSE 201  
Typically offered in Spring only

MSE 566  **Mechanical Properties of Nanostructured Materials**  (3 credit hours)  
The course covers the mechanical behavior that is unique to nanostructured materials typically nanocrystalline metals and alloys. The various methods for processing nanostructured materials will be presented, emphasizing those that are suitable for mechanical property studies. The thermal stability of nanocrystalline microstructures will be covered and strategies for inhibiting grain growth described. Mechanical testing methods for uniaxial loading, creep, fracture and fatigue will be covered. Testing methods will also be discussed in context with structure-property relations, deformation mechanisms and failure modes.  
Prerequisite: MSE 500 or an instructor approved equivalent.  
Typically offered in Spring only

MSE 575  **Polymer Technology and engineering**  (3 credit hours)  
Classes of commercially important polymers, advanced topics in phase behavior, viscoelasticity, fracture and ultimate properties of polymers; polymer rheology, processing and permeability; design of polymeric materials. Credit for both MAT 475 and MSE 575 is not allowed.  
Prerequisite: MAT 424
MSE 576/MBA 576 Technology Entrepreneurship and Commercialization I (3 credit hours)
First course in a two-course entrepreneurship sequence focusing on opportunities for technology commercialization. Evaluation of commercialization of technologies in the context of new business startups. Emphasis is placed on creating value through technology portfolio evaluation and fundamentals of technology-based new business startups. This includes development of value propositions and strong technology-product-market linkages. The process based approach is appropriate for new business startup as well as entrepreneurship in existing organizations through spinoffs, licensing, or new product development. Credit not allowed for MBA 576 if the student has already taken MBA 570 or MBA 571.

Credit not allowed in MBA 576 if the student has already taken MBA 570 or MBA 571
Typically offered in Fall and Spring

MSE 577/MBA 577 Technology Entrepreneurship and Commercialization II (3 credit hours)
Continuation of evaluation of technologies for commercialization through new business startups. Emphasis is placed on creating value through strong technology-products-markets linkages using the TEC algorithm. Topics include industry and market testing of assumptions, legal forms of new business startups, funding sources and creating a quality, integrative new business startup plan. Credit not allowed in 577 for students who have already taken 570 or 571.

Prerequisite: MBA/MSE 576. Credit not allowed in 577 for students who have already taken 570 or 571.
Typically offered in Spring only

MSE 580/MSE 480 Materials Forensics and Degradation (3 credit hours)
Covers principles and prevention of the degradation of materials. The topics will include dissolution of polymer and ceramic materials, electrochemical corrosion, oxidation of metals and polymers, degradation of polymers, friction and wear, degradation of electrical device components, bio-deterioration of materials, and failure analysis. The general practice in failure analysis will be applied to a variety of case studies to illustrate important failure mechanisms. Credit will not be given for both MSE 480 and MSE 580.

Prerequisite: MSE 370 and MSE 380
Typically offered in Spring and Summer

MSE 589/PY 489/PY 589/ECE 489/ECE 589/MSE 489 Solid State Solar and Thermal Energy Harvesting (3 credit hours)
This course studies the fundamental and recent advances of energy harvesting from two of the most abundant sources, namely solar and thermal energies. The first part of the course focuses on photovoltaic science and technology. The characteristics and design of common types of solar cells is discussed, and the known approaches to increasing solar cell efficiency will be introduced. After the review of the physics of solar cells, we will discuss advanced topics and recent progresses in solar cell technology. The second part of the course is focused on thermoelectric effect. The basic physical properties, Seebeck coefficient, electrical and thermal conductivities, are discussed and analyzed through the Boltzmann transport formalism. Advanced subject such as carrier scattering time approximations in relation to dimensionality and the density of states are studied. Different approaches for further increasing efficiencies are discussed including energy filtering, quantum confinement, size effects, band structure engineering, and phonon confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

MSE 601 Seminar (1 credit hours)
Reports and discussion of special topics in materials science and engineering and allied fields.

Typically offered in Fall and Spring

MSE 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MSE 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Summer only

MSE 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MSE 695 Master's Thesis Research (1-9 credit hours)
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MSE 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only
MSE 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master’s degree and are writing and defending their thesis.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

MSE 702 Defects In Solids (3 credit hours)
Prerequisite: MSE 500
Typically offered in Spring only

MSE 703 Interaction of Electrons with Materials (3 credit hours)
This course reviews basic interaction of electrons with solids through the free electron theory, quantum mechanics and quantum phenomena, and band theory. The course provides a practical foundation for understanding of electrical behavior of metals, semiconductors, dielectrics and non-crystalline materials and how this behavior relates to structure and materials processing. Graduate standing in MSE, CBME, ECE, PY, CH, or consent of the instructor required.
Prerequisite: MSE 500
Typically offered in Fall only

MSE 704 Interaction of Photons with Materials (3 credit hours)
This course will answer basic questions on photon-matter interaction: Why do materials appear the way we see them? How can we change and control that? How can we apply their optical properties in various optical elements and optoelectronic devices? The course provides a practical foundation for working with and developing of materials for modern optoelectronic and photonic technologies. Graduate standing in MSE, CBME, ECE, PY, CH, or consent of the instructor required.
Prerequisite: MSE 703
Typically offered in Spring only

MSE 705 Mechanical Behavior Of Engineering Materials (3 credit hours)
Coverage of both fundamental and engineering aspects of mechanical behavior of materials. Elasticity, plasticity and dislocation theory concepts used to describe phenomenological behavior and micro-mechanical mechanisms. Strengthening mechanisms in crystals, high-temperature deformation, fracture mechanics, fracture toughening mechanisms and cyclic deformation.
Prerequisite: MAT 450, MAT 702
Typically offered in Spring and Summer

MSE 706 Phase Transformations and Kinetics (3 credit hours)
Homogeneous and heterogeneous nucleation, spinodal decomposition, interface and diffusion-controlled growth, formal theory of transformation kinetics, precipitation, coarsening, order-disorder, and martensitic transformations.
Prerequisite: MAT 700, MAT 710, and MSE 500
Typically offered in Spring only

MSE 708 Thermodynamics Of Materials (3 credit hours)
Review of first and second laws of thermodynamics, equilibrium and irreversible processes, open and closed systems, partition functions and particle distribution functions. Applications include extension of thermodynamic potentials to situations where electrical, magnetic and stress fields present, heat capacity of crystals, electron gas in metals, solution models, binary phase diagrams and rubber elasticity in polymers.
Prerequisite: MAT 301 and MSE 500
Typically offered in Fall only

MSE 709 Metastable Materials: Processing, Structure, and Properties (3 credit hours)
The thermodynamics and kinetics of the synthesis and stability of a variety of important metastable materials - those materials that are not in the lowest free energy state for the composition and structure - will be described. The common methods for non-equilibrium processing will be covered. A significant part of the course will be devoted to amorphous materials, including their synthesis, structure, and properties. Other topics will include quasi-crystalline materials, metastable crystalline materials, and shape memory alloys. As background for shape memory alloys, diffusionless phase transformations with emphasis on martensitic transformations will be reviewed.
Prerequisite: MSE 500 or Instructor Consent
Typically offered in Fall only

MSE 710 Elements Of Crystallography and Diffraction (3 credit hours)
Crystal symmetry, lattices and space groups; elementary diffraction by crystalline matter; experimental methods of x-ray diffraction.
Typically offered in Fall only

MSE 712 Scanning Electron Microscopy (3 credit hours)
Electron optics, sources and detectors. Beam specimen interactions, secondary and backscattered electrons, and EDS. Resolution limits, experimental conditions, related techniques, beam-induced damage and materials modifications.
Typically offered in Fall only

MSE 715 Fundamentals Of Transmission Electron Microscopy (4 credit hours)
Electron optics, electron-solid interactions, electron diffraction, image contrast, defect characterization, analytical and high resolution microscopy. Parallel laboratory demonstrations and exercises. Laboratory enrollment limited to twelve, but laboratory may be waived with consent of instructor.
Prerequisite: MAT 710
Typically offered in Spring only

MSE 718 Advanced Transmission Electron Microscopy (3 credit hours)
This course provides the advanced graduate student with a detailed knowledge of transmission electron microscopy covering: advanced topics in electron sources, details of electron optics and aberrations, aberration corrected electron microscopy, modeling and simulating interactions of electrons with the specimen, image processing and analysis, and analytical techniques (EELS and EDX). Graduate standing in MSE, CHE, ECE, PHY, CH required or consent of the instructor.
Prerequisite: MSE 715
Typically offered in Fall only

MSE 721 Nanoscale Simulations and Modeling (3 credit hours)
The course is designed to assist engineering students in learning the fundamentals and cutting-edge nature of various simulations methods. The modeling tools range from accurate first principles quantum-based approaches to multi-scale approaches that combine atomic and continuum modeling. Previous knowledge of simulations is not required. The course is appropriate for graduate students in materials science, engineering, chemistry, physics and biomedical fields.
Typically offered in Fall only
MSE 723  Materials Informatics  (3 credit hours)
The course aims to introduce the emergent field of materials informatics and current approaches that employ informatics and experimental and computational data to accelerate the process of materials optimization, discovery and development. An emphasis will be placed on practical implementation of machine learning techniques to various materials science problems.

Typically offered in Fall only

MSE 731/MAE 731  Materials Processing by Deformation  (3 credit hours)
Presentation of mechanical and metallurgical fundamentals of materials processing by deformation. Principles of metal working, friction, forging, rolling, extrusion, drawing, high energy rate forming, chipless forming techniques, manufacturing system concept in production.

Prerequisite: Six hrs. of solid mechanics and/or materials
Typically offered in Fall only

MSE 741  Principles of Corrosion  (3 credit hours)
Fundamentals of metallic corrosion and passivity. Electro-chemical nature of corrosive attack, basic forms of corrosion, corrosion rate factors, methods of corrosion protection. Laboratory work included.

Prerequisite: MAT 201 and CH 431 or MAT 301

MSE 751  Thin Film and Coating Science and Technology I  (3 credit hours)
Vacuum science and technology including gas kinetics, gas flow calculations, system design and use of various pumps, materials and components. Atomistics of solid surfaces. Nucleation and growth of films and coatings.

Prerequisite: MAT 700
Typically offered in Spring only

MSE 752  Thin Film and Coating Science and Technology II  (3 credit hours)

Prerequisite: MSE 751
Typically offered in Spring only

MSE 757  Radiation Effects on Materials  (3 credit hours)
Interaction of radiation with matter with emphasis on microstructural modification, physical and mechanical effects. Defects generation and annealing, void swelling, irradiation growth and creep, and irradiation induced effects in reactor materials are discussed. Current theories and experimental techniques are discussed.

Typically offered in Spring only

MSE 760  Materials Science in Processing of Semiconductor Devices  (3 credit hours)
Ion implantation and doping for advanced semiconductor devices, thin films and epitaxy, silicides, ohmic contacts and interconnection metallurgy, oxidation and nitration, gettering of impurities and dopant segregation phenomena, electromigration, electronic packaging materials science and advanced device concepts.

Prerequisite: MAT 460 and MSE 500
Typically offered in Fall only

MSE 761/CHE 761  Polymer Blends and Alloys  (3 credit hours)
Thermodynamics, morphological characteristics and properties of multiphase polymer systems composed of homopolymers or copolymers. Interfacial characteristics and modification of multicomponent polymer blends through emulsification and reactive blending. Microphase ordering in block copolymers, and emerging technologies employing these nanostructured materials. Conformational properties and dynamics of macromolecules constrained near an interface.

Prerequisite: CHE 316 or MAT 301
Typically offered in Fall only

MSE 763/TMS 763  Characterization Of Structure Of Fiber Forming Polymers  (3 credit hours)
Theories, experimental evidence and characterization methods of the molecular fine structure of fiber forming polymers in the solid state. Characterization methods include X-ray diffraction, microscopy, infrared, thermal and magnetic resonance.

Prerequisite: Graduate standing
Typically offered in Fall only

MSE 770  Defects, Diffusion and Ion Implantation In Semiconductors  (3 credit hours)
Thermodynamics of vacancies and interstitials, defect complexes, electronic defects, defect annealing processes, self diffusion, dopant and impurity diffusion, substitutional/interstitial diffusion, diffusion in amorphous solids, electro transport, fundamentals of ion-solid interactions, semiconductor doping atomic structure of defects, damage annealing processes, supersaturated alloys, laser annealing, ion beam mixing phenomena, ion implantation and rapid thermal annealing processes, shallow junctions and devices.

Prerequisite: MAT 701
Typically offered in Spring only

MSE 771  Materials Science of Nanoelectronics  (3 credit hours)
Effects of scale less than 100 nm on the electrical properties & processing of all materials (metals, semiconductors, ceramics, polymers and biomaterials). Current status and future prospects for the semiconductor industry summarized by invited scientists and by review and discussion of selected current literature. Student presentations and research proposals are required.

Prerequisite: MSE 500
Typically offered in Fall only

MSE 775  Structure of Semicrystalline Polymers  (3 credit hours)
Structure and organization of semicrystalline polymers, from molecular scale to bulk state, including chain configuration, unit cell geometries, polymer crystallography, single crystals, spherulites, epitaxial crystallization, morphology, crystal defects, annealing and deformation mechanisms. Emphasis on analysis of x-ray diffraction, electron diffraction and electron microscopy data for structural characterization.

Prerequisite: MAT 425
Typically offered in Fall only

MSE 791  Advanced Topics in Materials Science and Engineering  (1-3 credit hours)
Special studies of advanced topics in materials science and engineering.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer
MSE 795  Advanced Materials Experiments  (1-3 credit hours)  
Advanced engineering principles applied to a specific experimental project dealing with materials. A seminar period provided; required written report.  
Prerequisite: Senior standing or Graduate standing  
Typically offered in Fall, Spring, and Summer  

MSE 801  Seminar  (1 credit hours)  
Reports and discussion of special topics in materials science and engineering and allied fields.  
Typically offered in Fall and Spring  

MSE 885  Doctoral Supervised Teaching  (1-3 credit hours)  
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.  
Prerequisite: Doctoral student  
Typically offered in Fall, Spring, and Summer  

EMS 204  Introduction to Mathematics Education  (2 credit hours)  
This course introduces students to the teaching of Mathematics in middle and high schools. Students will become familiar with state mathematics standards and national recommendations for teaching mathematics. The course has a required fieldwork component in local K-12 schools, and students are responsible for their own transportation to and from the schools. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge. This course is restricted to Teacher Education majors.  
Prerequisite: ED 100; Corequisite: ED 204  
Typically offered in Fall and Spring  

EMS 205  Introduction to Teaching Science  (2 credit hours)  
Introduces perspective teachers to the teaching of science in the middle school and high school. Topics include nature of the science learner, common alternative conceptions in science, introduction to science teaching strategies, and the science curriculum in middle and high school. Sophomore status or higher is required. Sophomore status or higher is required.  
Prerequisite: Sophomore standing; Corequisite: ED 204  
Typically offered in Spring only  

EMS 350  Teaching Environmental Education  (3 credit hours)  
This course is designed to provide disciplinary and interdisciplinary overviews of environmental education. Students will learn a range of research-supported practices in environmental education that are effective for youth and adults. Topics include a  
GEP Interdisciplinary Perspectives  
Typically offered in Fall only  

EMS 375  Methods of Teaching Science I  (3 credit hours)  
Classroom, laboratory, and internship experiences for pre-service teachers to effectively prepare, plan and assess learning environments in the middle and secondary science classroom and instructional laboratory. Emphasis placed on knowledge, skills, and dispositions for inquiere-based learning environments.  
Prerequisite: EMS 205, ED 204  
Typically offered in Spring only
EMS 470/EMS 570  Methods and Materials for Teaching Mathematics  (3 credit hours)
Purposes, methods, curricula, and evaluation practices for teaching mathematics in middle and high school levels.

Prerequisite: C or better in EMS 480 and admittance to Teacher Candidacy; Corequisite: EMS 472 OR EMS 474  
Typically offered in Fall only

EMS 471  Student Teaching in Mathematics  (1-12 credit hours)
Supervised experience in a selected middle or secondary school for the semester, to develop and practice the skills and techniques for teaching mathematics. Students are required to provide their own transportation.  
MED, MSM and MSD majors only.

Prerequisite: Admission to professional semester, Completion of EMS 470 with a C or better; Corequisite: EMS 495  
Typically offered in Spring only

EMS 472/EMS 572  Teaching Mathematics Topics in Senior High School  (3 credit hours)
Preparation for teaching mathematics in grades 9-12. This course includes a school-based field experience. Students are required to provide their own transportation.  
MED Majors only.

Prerequisite: EMS 480 passed with a C or better; Corequisite EMS 470  
Typically offered in Fall and Spring

EMS 474  Teaching Mathematics Topics in the Middle Grades  (3 credit hours)
Methods of teaching arithmetic, geometry, algebra, and pre-algebra topics in grades 6-9. Emphasizes approaches that actively involve learners and relate operations on concrete and pictorial representations to mathematical symbols. This course includes a school-based field experience. Students are required to provide their own transportation.  
MSM Majors only.

Prerequisite: EMS 480 passed with a C or better; Co-requisite: EMS 470  
Typically offered in Spring only

EMS 475  Methods of Teaching Science II  (3 credit hours)
Goals, methods, curricula, and evaluation practices in teaching the physical and biological sciences at the middle and secondary school levels. Taught during the fall.

Prerequisite: EMS 375  
Typically offered in Fall only

EMS 476  Student Teaching in Science  (1-12 credit hours)
Supervised experience in a selected middle or secondary school for the semester, to develop and practice the skills and techniques for teaching Science. Students are required to provide their own transportation.  
SED and MSS majors only. Students are required to purchase internships liability insurance to participate in student teaching. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.

Prerequisite: EMS 475; and Corequisite: EMS 495  
Typically offered in Spring only

EMS 480/EMS 580  Teaching Mathematics with Technology  (3 credit hours)
Prepares prospective mathematics teachers to use technology in their classrooms to assist students in formulating and solving math problems in the middle and high school mathematics curricula.  
Prerequisite: EMS 204 with a B- or better; MA 131 or 141  
Typically offered in Fall and Spring

EMS 490  School Mathematics from an Advanced Perspective  (3 credit hours)
This course will serve as a culminating experience for all students majoring in mathematics education and intending to become secondary mathematics teachers. Course content includes functions in both secondary and collegiate mathematics, development of euclidean geometry from euclid's elements, and historical overview of algebra, and other mathematics subject matter, a trigonometry review from both triangle basis and function basis, connections between linear algebra and the high school presentation of matrices, and other topics. For Math Education majors only.

Prerequisite: MA 403 or MA 407, MA 308 or MA 408, MA 205 or MA 305 or MA 405  
Typically offered in Fall and Spring

EMS 495  Senior Seminar in Mathematics and Science Education  (1-3 credit hours)
In-depth investigation of one or more teaching areas in mathematics or science education.

Prerequisite: Advanced Undergraduate standing  
Typically offered in Spring only

EMS 496  Special Topics in Education  (1-3 credit hours)
Individual or group study of special topics in professional education. The topic and mode of study are determined by the faculty member after discussion with the student.

Prerequisite: Junior or senior standing

EMS 505  Methods of Teaching Science I  (3 credit hours)
Graduate students new to science teaching will read current research literature that defines best practices and incorporate these practices to lesson planning that enhances student learning. Classroom, laboratory, and school-based experiences in middle and secondary science classrooms and instructional laboratories will help students to effectively prepare, plan, and assess learning environments. Emphasis placed on the development of knowledge, skills, and dispositions for inquiry-based learning environments. Underlying theoretical framework is constructivism, and experiences will be discussed using current learning theory. PBS or Graduate Standing.

Typically offered in Spring only

EMS 506  Methods of Teaching Science II  (3 credit hours)
Second course in the MAT science series. Students will plan units of instruction for student teaching, and an emphasis is placed on planning for classroom management and student diversity. Current theoretical frameworks are emphasized in the context of practical field experiences. PBS or Graduate Standing.

Typically offered in Fall only
EMS 510 Interactions In the Mathematics Classroom (3 credit hours)
This course focuses on interactions between students and teachers in the mathematics classroom. Topics studied will include: whole class instruction, small group activity, questioning and facilitating classroom discussion. This course will include a field experience in the schools for which students will be required to provide their own transportation. Course restricted to mathematics education students in the MED, MS or MAT programs.

typically offered in spring only

EMS 512 Teaching and Learning Elementary and Middle Grades Mathematics (3 credit hours)
Focus on theory, research, and methodology of teaching and learning mathematics in elementary and middle grades. Emphasizes the development of a foundation for understanding and assessing mathematical growth and learning through historical and psychological sources, research, and reflective practice. Emphasis is placed upon understanding how children come to learn elementary mathematics meaningfully and what this necessarily implies about the way mathematics is taught and how elementary and middle grades education can be improved.

Prerequisite: EMS 471
Typically offered in fall only

EMS 513 Teaching and Learning of Algebraic Thinking (3 credit hours)
Teaching and learning of algebra from a developmental perspective; research-based methods for developing students' algebraic thinking; structure and processes used in algebra. Focus on how students develop algebraic ideas from upper elementary grades to

Prerequisite: EMS 471 or equivalent teaching experience.
Typically offered in fall only

EMS 514 Teaching and Learning of Geometric Thinking (3 credit hours)
Focus will be on the development of geometric thinking in grades K-12 using multiple instructional approaches, including technology, and considered using different theories of learning and frameworks (e.g., Van Hiele, SOLO taxonomy). Topics may include: measurement, similarity, congruence, properties of 2 and 3 dimensional figures, circles, non-Euclidean geometries. Synthetic, analytic and transformational, formal and informal approaches will be highlighted.

Prerequisite: EMS 471 and either MA 308 or MA 408
Typically offered in fall only

EMS 519/ST 519 Teaching and Learning of Statistical Thinking (3 credit hours)
This course is designed to bridge theory and practice on how students develop understandings of key concepts in data analysis, statistics, and probability. Discussion of students' understandings, teaching strategies and the use of manipulatives and technology tools. Topics include distribution, measures of center and spread, sampling, sampling distribution, randomness, and law of large numbers. Must complete a first level graduate statistics course (ST 507, ST 511, or equivalent) before enrolling.

Prerequisite: ST 507 or ST 511
Typically offered in spring only

EMS 521 Advanced Methods in Science Education I (3 credit hours)
Current research literature will guide the development of plans to improve classroom teaching practices. Action research used to evaluate instructional impact of modifications to classroom strategies. What it means to teach science, what it means to teach a diverse population of students and how to develop, interpret, and implement alternative assessment.

Prerequisite: Graduate standing in Science Education
Typically offered in spring only

EMS 522 Advanced Methods in Science Education II (3 credit hours)
Examines science instruction through analysis of curricula, instructional practices, current research on science learning and teaching. Five areas of interest: curriculum, instruction, assessment, diversity, learning environments and technology in science education.

Prerequisite: EMS 521 and graduate standing in Science Education
Typically offered in Spring only

EMS 531 Introduction to Research in Science Education (3 credit hours)
Introduction to techniques and designs specific to and/or in the context of science education research. Analyze and critique findings of other science education researchers in current science education research literature. Perform and interpret quantitative and qualitative analyses commonly used in science education research. Carry out research project focusing on an aspect of science education, communicate research findings in both oral and written form.

Prerequisite: Graduate standing in Science Education
Typically offered in Spring only

EMS 570/EMS 470 Methods and Materials for Teaching Mathematics (3 credit hours)
Purposes, methods, curricula, and evaluation practices for teaching mathematics in middle and high school levels.

Prerequisite: C or better in EMS 480 and admittance to Teacher Candidacy; Corequisite: EMS 472 OR EMS 474
Typically offered in Fall only

EMS 572/EMS 472 Teaching Mathematics Topics in Senior High School (3 credit hours)
Preparation for teaching mathematics in grades 9-12. This course includes a school-based field experience. Students are required to provide their own transportation. MED Majors only.

Prerequisite: EMS 480 passed with a C or better; Corequisite EMS 470
Typically offered in Fall and Spring

EMS 573 Design of Tools and Learning Environments in STEM Education (3 credit hours)
The course aims to develop: familiarity with research related to the teaching and learning of STEM content within technological learning environments, advanced knowledge of the ways technology can support teaching and learning in STEM, and ability to design technology-enabled learning experiences. Course activities are designed to enhance understandings and applications of technological tools within and across STEM disciplines.

Restriction: Graduate standing in STEM Education
Typically offered in Fall and Spring
EMS 575  Foundations Of Science Education  (3 credit hours)
Study and analysis of philosophical, historical, sociological, political and economic factors affecting science education in schools of the U.S. Implications for science education of various learning theories along with models for curriculum development and program planning. Critical analysis of current trends, issues and problems in science education in terms of multiple perspectives.

Prerequisite: EMS 475  
Typically offered in Spring only

EMS 577  Improving Classroom Instruction In Science  (3 credit hours)
Application of major principles of education and psychology to improvement of science teaching in elementary, middle and secondary schools. Emphasis on critical analysis of research and the development of research-based classroom applications. Goals and objectives of science teaching, instructional strategies, development or selection of science materials, evaluation of achievement and elements of a desirable classroom climate.

Prerequisite: EMS 475  
Typically offered in Spring only

EMS 580/EMS 480  Teaching Mathematics with Technology  (3 credit hours)
Prepares prospective mathematics teachers to use technology in their classrooms to assist students in formulating and solving math problems in the middle and high school mathematics curricula.

Prerequisite: EMS 204 with a B- or better; MA 131 or 141  
Typically offered in Fall only

EMS 581  Advanced Applications of Technology in Mathematics Education  (3 credit hours)
Research-based applications of technology tools in secondary and middle school mathematics. Advanced use of various technology tools for learning and teaching mathematics, including design of technology environments, appropriate investigation tasks, and professional development.

Typically offered in Spring only

EMS 592  Special Problems In Mathematics Teaching  (1-6 credit hours)
In-depth investigation of topical problems in mathematics teaching chosen from areas of curriculum, methodology, technology, supervision and research.

Prerequisite: EMS 471  
Typically offered in Fall, Spring, and Summer

EMS 594  Special Problems In Science Teaching  (1-3 credit hours)
In-depth investigation of topics in science education not covered in existing courses. Includes critical analysis of research and may include field work. May be offered on individual basis or as a class.

Prerequisite: EMS 476  
Typically offered in Fall, Spring, and Summer

EMS 621  Special Problems In Mathematics Teaching  (1-6 credit hours)
In-depth investigation of topical problems in mathematics teaching chosen from areas of curriculum, methodology, technology, supervision and research.

Prerequisite: EMS 471  
Typically offered in Summer only

EMS 622  Special Problems In Science Teaching  (1-6 credit hours)
In-depth investigation of topics in science education not covered in existing courses. Includes critical analysis of research and may include field work. May be offered on individual basis or as a class.

Prerequisite: EMS 476  
Typically offered in Fall, Spring, and Summer

EMS 630  Independent Study in EMS  (1-3 credit hours)
Detailed investigation of topics of particular interest to graduate students under faculty direction on a tutorial basis. Determination of credits and content by faculty member in consultation with department head.

Typically offered in Fall, Spring, and Summer

EMS 641  Practicum In Science and Mathematics Education  (1-6 credit hours)
Supervised practicum in appropriate settings both on- and off-campus. Provision for opportunity for development, implementation and evaluation in science and mathematics in clinical environment under faculty supervision.

Prerequisite: EMS 770 or EMS 775  
Typically offered in Fall and Spring

EMS 651  Internship In Mathematics And Science Education  (1-9 credit hours)
Utilizing the participant-observed role, required participation in selected educational situations with emphasis upon development of observational skills, ability to record relevant observations by means of written journals, skills in analyzing experiences identifying critical incidents and projection of events and consequences. Student required to develop possible alternative courses of action in various situations, select one of the alternatives and evaluate consequences of selected course of action.

Prerequisite: Nine hrs. in grad. level courses  
Typically offered in Summer only

EMS 675  Portfolio Development  (1 credit hours)
Techniques of portfolio construction for documenting attainment of advanced competencies in science training. For students in the last or next to last semester of coursework in the Science Education Masters Program.

Typically offered in Fall only

EMS 685  Master’s Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master’s student  
Typically offered in Fall and Spring
EMS 686 Teaching In College (3 credit hours)
Focus on development of competencies to perform fundamental tasks of a college teacher as well as consideration of more long-range tasks such as course development and university responsibilities of a professor. In addition to attending lectures and other types of presentations, students make video tapes of their teaching, develop tests, design introductory courses in their teaching fields and consider current issues related to university and college teaching.

Typically offered in Summer only

EMS 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

EMS 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring and Summer

EMS 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Spring only

EMS 692 Research Projects In Mathematics and Science Education (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of the graduate faculty. The research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.

Prerequisite: ELP 532
Typically offered in Fall, Spring, and Summer

EMS 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Summer

EMS 695 Master’s Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

EMS 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

EMS 699/EOE 699/EAC 699/ECD 699/ECI 699/ELP 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

EMS 703 Teaching Mathematics and Science In Higher Education (3 credit hours)
Examination of collegiate mathematics and science instruction with respect to goals and objectives, design of courses and curricula, innovative programs and facilities, and methods and materials for instruction.

Prerequisite: EMS 770, 621 or 622, Graduate standing
Typically offered in Spring only

EMS 704 Curriculum Development and Evaluation In Science and Mathematics (3 credit hours)
Critical study of elements of curriculum design and theory in mathematics education and science education and examination of evaluation procedures for assessing educational innovations.

Prerequisite: 500-level statistics, PSY 535
Typically offered in Spring only

EMS 705 Education and Supervision Of Teachers Of Mathematics and Science (3 credit hours)
Critical analysis of theories, programs and techniques designed to promote interpersonal interactions leading to more effective teaching of science and mathematics.

Prerequisite: EMS 770 or 621 or 622
Typically offered in Spring only

EMS 711 Research on the Teaching and Learning of Math at Secondary and Early College Levels (3 credit hours)
This course familiarizes students with theories and research related to mathematical thinking, learning and teaching at the secondary and early college levels with a focus on the following topics: function, expressions and equations, geometry, proof, limit, calculus, differential equations, and linear algebra. Students will apply theories to analyze secondary and freshmen/sophomore standing mathematical thinking, synthesize research findings, explain difficulties students experience, and design and conduct research. Restriction: at least 18 hrs of 400-500 level mathematics and a PhD student in Mathematics Education.

Typically offered in Spring only
EMS 712  Teaching Mathematics In Elementary and Junior High School  (3 credit hours)
Comprehensive study of teaching mathematics in elementary and junior high schools. Major emphasis on building skills in teaching arithmetic, elementary algebra and intuitive geometry. Thorough search of literature relative to mathematics curricula conducted, designing and sequencing of learning activities, teaching mathematical concepts and relationships, building skill in computation, reading mathematics, problem solving and measurement.

Prerequisite: EMS 471
Typically offered in Spring and Summer

EMS 730  Trends and Issues in Science Education  (3 credit hours)
Provides an in-depth examination and analysis of literature and research in science education as well as current trends in science education reform. Emphasis is placed on the analysis of theoretical models of inquiry. Course includes the development of

Prerequisite: Graduate standing
Typically offered in Fall only

EMS 731  Fundamentals of Research in Science Education: Qualitative and Quantitative Inqu  (3 credit hours)
Analyze the range of research designs currently utilized by science education researchers. Develop an understanding of the assumptions and frameworks of different types of inquiry in science education. A brief history of research in science education is examined as a means to orient students to the trends that have taken place. Read, comprehend, and critically analyze qualitative and quantitative designs in science education.

Prerequisite: Graduate standing and ST 507 or 511, Corequisite: ST 508 or 512
Typically offered in Spring only

EMS 732  Theoretical and Critical Perspectives of Science Education  (3 credit hours)
Examines current theoretical and critical perspectives of science education. Examines a variety of approaches which re-assess cultural notions of meaning, identity, power, and representation in the sciences and science education. Applies research theory to reform in science education.

Prerequisite: Graduate standing
Typically offered in Fall only

EMS 777  Improving Classroom Instruction in Science  (3 credit hours)
Application of major principles of education and psychology to improvement of science teaching in elementary, middle and secondary schools. Emphasis on critical analysis of research and the development of research-based classroom applications. Goals and objectives of science teaching, instructional strategies, development or selection of science materials, evaluation of achievement and elements of a desirable classroom climate.

Prerequisite: EMS 475
Typically offered in Spring only

EMS 730/EAC 786  Teaching in College  (3 credit hours)
Focus on development of competencies to perform fundamental tasks of a college teacher as well as consideration of more long-range tasks such as course development and university responsibilities of a professor. In addition to attending lectures another types of presentations, students make video tapes of their teaching, develop tests, design introductory courses in their teaching fields and consider current issues related to university and college teaching.

Typically offered in Fall and Summer

EMS 791  Contemporary Research and Critical Issues in STEM Education  (3 credit hours)
This course is designed to provide disciplinary and interdisciplinary overviews of STEM issues and trends that will help graduate students construct their own theoretical foundations and practical understanding of STEM education. In the course, students will discuss a wide range of current issues, movements, and research-supported practices in STEM education not only in K-16 classrooms but also informal education settings. Students will also have opportunities to conceptualize their own framework for quality STEM education connecting research and practice in the field. A main course activity will be reading, analysis, and discussion of selected readings in each topic area. Students will share the responsibility of guiding class discussions, write up reflection and conceptualization, and conduct individual project that relates directly to the main topics explored in the course.

Typically offered in Spring only

EMS 792  Special Problems in Math Teaching  (3-6 credit hours)
In-depth investigation of topical problems in mathematics teaching chosen from areas of curriculum, methodology, technology, supervision and research.

Typically offered in Fall, Spring, and Summer

EMS 794  Special Problems in Science Teaching  (3-6 credit hours)
In-depth investigation of topics in science education not covered in existing courses. Includes critical analysis of research and may include field work. May be offered on individual basis or as a class.

Prerequisite: EMS 476
Typically offered in Fall, Spring, and Summer

EMS 802  Seminar In Mathematics Education  (1-12 credit hours)
In-depth examination and analysis of literature and research in a particular topic(s) in mathematics education.

Prerequisite: Departmental Majors
Typically offered in Fall and Spring
EMS 803 Seminar In Science Education (2 credit hours)
In-depth examination and analysis of literature and research in a particular topic(s) in science education.
Prerequisite: Department Majors
Typically offered in Fall and Spring

EMS 821 Special Problems In Mathematics Teaching (1-6 credit hours)
In-depth investigation of topical problems in mathematics teaching chosen from areas of curriculum, methodology, technology, supervision and research.
Prerequisite: EMS 471
Typically offered in Summer only

EMS 822 Special Problems In Science Teaching (1-6 credit hours)
In-depth investigation of topics in science education not covered in existing courses. Includes critical analysis of research and may include field work. May be offered on individual basis or as a class.
Prerequisite: EMS 476
Typically offered in Fall, Spring, and Summer

EMS 832 Research Applications in Science Education (3 credit hours)
Provides students with the opportunity to design science education research including formulating research questions, designing the methodologies to be used in the study, selecting assessments and protocols, and identifying appropriate analyses. Theoretical frameworks and associated assumptions are identified and critiqued. Develop advanced skills in reviewing different types of science education research and identifying issues of validity and reliability.
Prerequisite: EMS 730, EMS 731, ST 508
Typically offered in Spring only

EMS 841 Practicum In Science and Mathematics Education (1-6 credit hours)
Supervised practicum in appropriate settings both on- and off-campus. Provision for opportunity for development, implementation and evaluation in science and mathematics in clinical environment under faculty supervision.
Prerequisite: EMS 770 or EMS 775
Typically offered in Fall, Spring, and Summer

EMS 851 Internship In Mathematics and Science Education (1-9 credit hours)
Utilizing the participant-observer role, required participation in selected educational situations with emphasis upon development of observational skills, ability to record relevant observations by means of written journals, skills in analyzing experiences identifying critical incidents and projection of events and consequences. Student required to develop possible alternative courses of action in various situations, select one of the alternatives and evaluate consequences of selected course of action.
Prerequisite: Nine hrs. in grad. level courses
Typically offered in Fall, Spring, and Summer

EMS 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

EMS 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

EMS 892 Research Projects In Mathematics and Science Education (1-3 credit hours)
A project or problem in research in education for graduate students, supervised by members of the graduate faculty. The research chosen on basis of individual students' interests and not to be part of thesis or dissertation research.
Prerequisite: ELP 532
Typically offered in Fall, Spring, and Summer

EMS 894 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

EMS 897 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

EMS 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
Math in Agriculture and Related Sciences (MAA)

MAA 102  Mathematics in Agriculture and Related Sciences  (3 credit hours)
Develops the ability to utilize skills and technology to solve problems at a level found in non-mathematics-intensive programs. Topics include applications to percent, ratio and proportions, formulas, algebra and solutions to linear equations and the elements of plane geometry. Applications include, but are not limited to, business, finance and agriculture. Restricted to Agricultural Institute Students only. C-Wall course; Prerequisite for MA 103, Topics in Contemporary Math.

Requisite: Agricultural Institute Only
Typically offered in Fall and Spring

Mathematical Sciences (MSGE)

MSGE 295  Mathematical Sciences Special Topics  (3 credit hours)
Special topics course offering for the general education Mathematical Sciences category.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

Mathematics (MA)

MA 101  Intermediate Algebra  (4 credit hours)
Preparation for MA 103, MA 105, MA 107, MA 111, and MA 114. Reviews main topics from high school Algebra I and Algebra II emphasizing functions and problem solving. Other concepts and skills covered include algebraic operations, factoring, linear equations, graphs, exponents, radicals, complex numbers, quadratic equations, radical equations, inequalities, systems of equations, compound inequalities, absolute value in equations and inequalities. MA 101 may not be counted as credit toward meeting graduation. Credit for MA 101 is not allowed if student has prior credit in any other mathematical course.

Typically offered in Summer only

MA 103/MA 103A  Topics in Contemporary Mathematics  (3 credit hours)
Primarily for students in Humanities and Social Sciences. Illustrations of contemporary uses of mathematics, varying from semester to semester, frequently including sets and logic, counting procedures, probability, modular arithmetic, and game theory.

Prerequisite: MA 101 or equivalent completed in high school
GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 108  Precalculus I  (3 credit hours)
Algebra and basic trigonometry; polynomial, rational, exponential, logarithmic and trigonometric functions and their graphs. Credit for MA 108 does not count toward graduation for students in Engineering, College of Sciences, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, and B.S. degrees in CHASS. Credit is not allowed for both MA 108 and MA 111

Prerequisite: C- or better in MA 101, or a 450 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test.
GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 111 Precalculus Algebra and Trigonometry  (3 credit hours)
Real numbers, functions and their graphs (special attention to polynomial, rational, exponential, logarithmic, and trigonometric functions), analytic trigonometry. Credit in MA 111 does not count toward graduation for students in Engr., College of Sciences., Design, Biological & Ag. Engr. (Science Program), Biological Sci.(all options),Math. Edu., Forestry, & Textiles. Credit is not allowed for both MA 111 and either MA 107 or MA 108.

Prerequisite: C- or better in MA 101
Typically offered in Spring only

MA 105  Mathematics of Finance  (3 credit hours)
Simple and compound interest, annuities and their application to amortization and sinking fund problems, installment buying, calculation of premiums of life annuities and life insurance.

Prerequisite: MA 101 or equivalent completed in high school
GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 107  Precalculus II  (3 credit hours)
Algebra, analytic geometry and trigonometry; polynomial, rational, exponential, logarithmic and trigonometric functions and their graphs. Credit for MA 107 does not count toward graduation for students in Engineering, College of Sciences, Design, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, and B.S. degrees in CHASS. Credit is not allowed for both MA 107 and MA 111

Prerequisite: C- or better in MA 101, or 450 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test.
GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 114  Introduction to Finite Mathematics with Applications  (3 credit hours)
Elementary matrix algebra including arithmetic operations, inverses, and systems of equations; introduction to linear programming including simplex method; sets and counting techniques, elementary probability including conditional probability; Markov chains; applications in the behavioral, managerial and biological sciences. Computer use for completion of assignments.

Prerequisite: MA 101 or equivalent completed in high school
GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer
MA 116 Introduction to Scientific Programming (Math) (3 credit hours)
Computer-based mathematical problem solving and simulation techniques using MATLAB. Emphasizes scientific programming constructs that utilize good practices in code development, including documentation and style. Covers user-defined functions, data abstractions, data visualization and appropriate use of pre-defined functions. Applications are from science and engineering.

Prerequisite: MA 141, and either COS 100 or E 115; Corequisite: MA 241
Typically offered in Fall and Spring

MA 121 Elements of Calculus (3 credit hours)
For students who require only a single semester of calculus. Emphasis on concepts and applications of calculus, along with basic skills. Algebra review, functions, graphs, limits, derivatives, integrals, logarithmic and exponential functions, functions of several variables, applications in management, applications in biological and social sciences. Credit is not allowed in more than one of MA 121, 131, 141. MA 121 may not be substituted for MA 131 or MA 141 as a curricular requirement

Prerequisite: MA 107 or 111 with a C- or better, or 480 on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test, or 2 or better on an AP Calculus exam. Credit is not allowed for both MA 121 and MA 131 or MA 141.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 131 Calculus for Life and Management Sciences A (3 credit hours)
First order finite difference models; derivatives - limits, power rule, graphing, and optimization; exponential and logarithmic functions - growth and decay models; integrals - computation, area, total change; applications in life, management, and social sciences. Credit is not allowed for more than one of MA 121, 131, and 141

Prerequisite: C- or better in MA 107 or MA 111, or 520 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test, or 2 or better on an AP Calculus exam. Credit is not allowed for both MA 131 and MA 121 or MA 141.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 132 Computational Mathematics for Life and Management Sciences (1 credit hours)
Computational aspects of calculus for the life and management sciences; use of spreadsheets and a computer algebra system; applications to data models, differential equation models, and optimization.

Prerequisite: C- or better in MA 121 or MA 131

Typically offered in Fall, Spring, and Summer

MA 141 Calculus I (4 credit hours)
First of three semesters in a calculus sequence for science and engineering majors. Functions, graphs, limits, derivatives, rules of differentiation, definite integrals, fundamental theorem of calculus, applications of derivatives and integrals. Use of computation tools. Credit is not allowed for more than one of MA 141, 131, 121

Prerequisite: MA 111 or MA 108 with grade of C- or better, or 550 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test, or 2 or better on an AP Calculus exam. Credit is not allowed for both MA 141 and MA 121 or MA 131.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 151 Calculus for Elementary Education I (3 credit hours)
Calculus for Elementary Education I is the first semester of a two semester sequence of courses designed for the Elementary Education Program. Topics will include sequences, limit, and derivative. Also, topics related to teaching elementary mathematics will be discussed. Students cannot receive credit for more than one of MA 151, MA 121, MA 131, or MA 141. MA 151 is not an accepted prerequisite for MA 231 and MA 241. This course is restricted to Elementary Education majors only.

Prerequisite: C- or better in MA 107 or MA 111, or 520 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test, or 2 or better on an AP Calculus exam. Credit is not allowed for both MA 131 and MA 121 or MA 141.

GEP Mathematical Sciences
Typically offered in Spring only

MA 152 Calculus for Elementary Education II (3 credit hours)
Calculus for Elementary Education II is the second semester of a two semester sequence of courses designed for the Elementary Education Program. Topics will include derivative, integrals, difference equations, and differential equations. Also, topics related to teaching elementary mathematics will be discussed. This course is restricted to Elementary Education majors only. Students cannot receive credit for both MA 152 and MA 121, MA 131, or MA 141. MA 152 is not an accepted prerequisite for MA 241.

Prerequisite: MA 151

GEP Mathematical Sciences
Typically offered in Fall only

MA 205 Elements of Matrix Computations (3 credit hours)
Complex numbers and Euler's formula. Vectors in 2-D and 3-D, lines, planes, vector products and determinants. Vectors in n-D, matrices and matrix products. Algebraic systems, row operations, inverse matrices and LU factors. Least squares, undetermined systems and null and column spaces. Applications to linear systems of differential equations and/or to visualization and image filters. Emphasis is on by-hand computations, but it is to include applications and computing tools. Students cannot receive credit for more than one of MA 205, MA 305, or MA 405.

Prerequisite: C- in MA 121, 131, or 141

GEP Mathematical Sciences
Typically offered in Fall and Spring

MA 225 Foundations of Advanced Mathematics (3 credit hours)
Introduction to mathematical proof with focus on properties of the real number system. Elementary symbolic logic, mathematical induction, algebra of sets, relations, functions, countability. Algebraic and completeness properties of the reals.

Prerequisite: MA 241

Typically offered in Fall, Spring, and Summer

MA 231 Calculus for Life and Management Sciences B (3 credit hours)
Functions of several variables - partial derivatives, optimization, least squares, Lagrange multiplier method; differential equations - population growth, finance and investment models, systems, numerical methods; MA 121 is not an accepted prerequisite for MA 231.

Prerequisite: MA 131 or MA 141; Credit is not allowed for both MA 231 and MA 241.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer
MA 241  Calculus II  (4 credit hours)
Second of three semesters in a calculus sequence for science and engineering majors. Techniques and applications of integration, elementary differential equations, sequences, series, power series, and Taylor's Theorem. Use of computational tools.
Prerequisite: MA 141 with grade of C- or better or AP Calculus credit. Credit is not allowed for both MA 241 and MA 231.

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

MA 242  Calculus III  (4 credit hours)
Prerequisite: MA 241 with grade of C- or better or AP Calculus credit, or Higher Level IB credit.
Typically offered in Fall, Spring, and Summer

MA 302  Numerical Applications to Differential Equations  (1 credit hours)
Numerical methods for approximating solutions for differential equations, with an emphasis on Runge-Kutta-Fehlberg methods with stepsize control. Applications to population, economic, orbital and mechanical models.
Prerequisite: MA 241
Typically offered in Fall and Spring

MA 303  Linear Analysis  (3 credit hours)
Linear difference equations of first and second order, compound interest and amortization. Matrices and systems of linear equations, eigenvalues, diagonalization, systems of difference and differential equations, transform methods, population problems. Credit not allowed if credit has been obtained for MA 341 or MA 405
Prerequisite: MA 241
Typically offered in Fall and Spring

MA 305  Introductory Linear Algebra and Matrices  (3 credit hours)
The course is an elementary introduction to matrix theory and linear algebra. Emphasis is given to topics that will be useful in other disciplines, including systems of equations, Euclidean vector spaces, determinants, eigenvalues and eigenvectors, linear transformations, similarity, and applications such as numerical solutions of equations, and computer graphics. Compares with MA 405 Introductory Linear Algebra, more emphasis is placed on methods and calculations. Credit is not allowed for both MA 305 and MA 405.
Prerequisite: MA 241 or MA 231 with MA 132
Typically offered in Fall, Spring, and Summer

MA 315/MEA 315  Mathematics Methods in Atmospheric Sciences  (4 credit hours)
For sophomore meteorology and marine science students. A complement to MA 242 designed to prepare students for quantitative atmospheric applications. Topics include an introduction to vectors and vector calculus, atmospheric waves, phase and group velocity, perturbation analysis, fourier decomposition, matrix operations, chaos and predictability. For MY, MMY, and MRM majors only.
Prerequisite: MA 217 or MA 116 or CSC 113; Corequisite: MA 242
Typically offered in Spring only

MA 325  Introduction to Applied Mathematics  (3 credit hours)
Introduces students with multivariable calculus to five different areas of applied mathematics. These areas will be five three-week modules, which lead to higher level courses in the application areas. Topics will vary, and examples of modules are heat and mass transfer, biology and population, probability and finance, acoustic models, cryptography as well as others.
Prerequisite: (MA 231 or MA 242) and (MA 116 or CSC 112 or CSC 114 or CSC 116)
Typically offered in Spring only

MA 331  Differential Equations for the Life Sciences  (3 credit hours)
This course provides students with an understanding of how mathematics and life sciences can stimulate and enrich each other. The course topics include first order differential equations, separable equations, second order systems, vector and matrix systems, eigenvectors/ eigenvalues, graphical and qualitative methods. The methods are motivated with examples from the biological sciences (growth models, kinetics and compartmental models, epidemic models, predator-prey, etc). Computational modeling will be carried out using SimBiology, a MATLAB toolbox based graphical user interface, which which automates and simplifies the process of modeling biological systems. Credit cannot be given for both MA 341 and MA 331.
P: MA 231 or MA 241; X: Credit cannot be given for both MA 341 and MA 331
Typically offered in Fall only

MA 335/LOG 335  Symbolic Logic  (3 credit hours)
Intermediate level introduction to modern symbolic logic focusing on standard first-order logic; topics include proofs, interpretations, applications and basic metalogical results.
Prerequisite: LOG 201 or MA 225 or CSC 226

GEP Mathematical Sciences
Typically offered in Fall only

MA 341  Applied Differential Equations I  (3 credit hours)
Prerequisite: MA 242 or (MA 132 and MA 231)
Typically offered in Fall, Spring, and Summer
MA 351 Introduction to Discrete Mathematical Models (3 credit hours)
Basic concepts of discrete mathematics, including graph theory, Markov chains, game theory, with emphasis on applications; problems and models from areas such as traffic flow, genetics, population growth, economics, and ecosystem analysis.
Prerequisite: MA 224, 225, 231 or 241
Typically offered in Fall only

MA 401 Applied Differential Equations II (3 credit hours)
Wave, heat and Laplace equations. Solutions by separation of variables and expansion in Fourier Series or other appropriate orthogonal sets. Sturm-Liouville problems. Introduction to methods for solving some classical partial differential equations. Use of power series as a tool in solving ordinary differential equations. Credit for both MA 401 and MA 501 will not be given
Prerequisite: MA 341; Credit not allowed for both MA 401 and MA 501
Typically offered in Fall, Spring, and Summer

MA 402 Mathematics of Scientific Computing (3 credit hours)
This course will provide an overview of methods to solve quantitative problems and analyze data. The tools to be introduced are mathematical in nature and have links to Algebra, Analysis, Geometry, Graph Theory, Probability and Topology. Students will acquire an appreciation of (i) the fundamental role played by mathematics in countless applications and (ii) the exciting challenges in mathematical research that lie ahead in the analysis of large data and uncertainties. Students will work on a project for each unit. While this is not a programming class, the students will do some programming through their projects.

P: (MA 341 or MA 405) and programming proficiency (MATLAB, C++, Java, Fortran, or other language)
Typically offered in Fall and Winter

MA 403 Introduction to Modern Algebra (3 credit hours)
Sets and mappings, equivalence relations, rings, integral domains, ordered integral domains, ring of integers. Other topics selected from fields, polynomial rings, real and complex numbers, groups, permutation groups, ideals, and quotient rings. Credit is not allowed for both MA 403 and MA 407
Prerequisite: MA 225
Typically offered in Fall and Spring

MA 405 Introduction to Linear Algebra (3 credit hours)
This course offers a rigorous treatment of linear algebra, including systems of linear equations, matrices, determinants, abstract vector spaces, bases, linear independence, spanning sets, linear transformations, eigenvalues and eigenvectors, similarity, inner product spaces, orthogonality and orthogonal bases, factorization of matrices. Compared with MA 305 Introductory Linear Algebra, more emphasis is placed on theory and proofs. MA 225 is recommended as a prerequisite. Credit is not allowed for both MA 305 and MA 405
Prerequisite: MA 241 (MA 225 recommended); Corequisite: MA 341 is recommended
Typically offered in Fall, Spring, and Summer

MA 407 Introduction to Modern Algebra for Mathematics Majors (3 credit hours)
Elementary number theory, equivalence relations, groups, homomorphisms, cosets, Cayley's Theorem, symmetric groups, rings, polynomial rings, quotient fields, principal ideal domains, Euclidean domains. Credit is not allowed for both MA 403 and MA 407
Prerequisite: MA 225 and MA 405
Typically offered in Fall and Spring

MA 408 Foundations of Euclidean Geometry (3 credit hours)
An examination of Euclidean geometry from a modern perspective. The axiomatic approach with alternative possibilities explored using models.
Prerequisite: MA 225
Typically offered in Fall and Spring

MA 410 Theory of Numbers (3 credit hours)
Arithmetic properties of integers. Congruences, arithmetic functions, diophantine equations. Other topics chosen from quadratic residues, the quadratic reciprocity Law of Gauss, primitive roots, and algebraic number fields.
Prerequisite: One year of calculus
Typically offered in Spring only

MA 412/ST 412 Long-Term Actuarial Models (3 credit hours)
Long-term probability models for risk management systems. Theory and applications of compound interest, probability distributions of failure time random variables, present value models of future contingent cash flows, applications to insurance, health care, credit risk, environmental risk, consumer behavior and warranties.
Prerequisite: MA 241 or MA 231, Corequisite: MA 421, BUS(ST) 350, ST 301, ST 305, ST 311, ST 361, ST 370, ST 371, ST 380 or equivalent
Typically offered in Fall only

MA 413/ST 413 Short-Term Actuarial Models (3 credit hours)
Short-term probability models for risk management systems. Frequency distributions, loss distributions, the individual risk model, the collective risk model, stochastic process models of solvency requirements, applications to insurance and business decisions.
Prerequisite: MA 241 or MA 231, and one of MA 421, ST 301, ST 305, ST 370, ST 371, ST 380, ST 421.
Typically offered in Summer only

MA 414/MA 514/CSC 414/CSC 514 Foundations of Cryptography (3 credit hours)
Cryptography is the study of mathematical techniques for securing digital information, systems and distributed computation against adversarial attacks. In this class you will learn the concepts and the algorithms behind the most used cryptographic protocols: you will learn how to formally define security properties and how to formally prove/disprove that a cryptographic protocol achieves a certain security property. You will also discover that cryptography has a much broader range of applications. It solves absolutely paradoxical problems such as proving knowledge of a secret without ever revealing the secret (zero-knowledge proof), or computing the output of a function without ever knowing the input of the function (secure computation). Finally, we will look closely at one of the recent popular application of cryptography: the blockchain technology. Additionally, graduate students will study some of the topics in greater depth.
Prerequisite: (CSC 226 AND CSC 333) OR MA 225
Typically offered in Fall only
MA 416/CSC 416 **Introduction to Combinatorics** (3 credit hours)
Basic principles of counting; addition and multiplication principles, generating functions, recursive methods, inclusion-exclusion, pigeonhole principle; basic concepts of graph theory: graphs, digraphs, connectedness, trees; additional topics from: Polya theory of counting, Ramsey theory; combinatorial optimization - matching and covering, minimum spanning trees, minimum distance, maximum flow; sieves; mobius inversion; partitions; Gaussian numbers and q-analogues; bijections and involutions; partially ordered sets.
Prerequisite: Grade of C or better in either MA 225 or CSC 226
Typically offered in Spring only

MA 421 **Introduction to Probability** (3 credit hours)
Axioms of probability, conditional probability and independence, basic combinatorics, discrete and continuous random variables, joint densities and mass functions, expectation, central, limit theorem, simple stochastic processes.
Prerequisite: MA 242
Typically offered in Fall, Spring, and Summer

MA 425 **Mathematical Analysis I** (3 credit hours)
Real number system, functions and limits, topology on the real line, continuity, differential and integral calculus for functions of one variable. Infinite series, uniform convergence. Credit is not allowed for both MA 425 and MA 511.
Prerequisite: MA 225 (MA 407 desirable)
Typically offered in Fall and Spring

MA 426 **Mathematical Analysis II** (3 credit hours)
Calculus of several variables, topology in n-dimensions, limits, continuity, differentiability, implicit functions, integration. Credit is not allowed for both MA 426 and MA 512.
Prerequisite: MA 425 and 405
Typically offered in Fall and Spring

MA 427/CSC 427 **Introduction to Numerical Analysis I** (3 credit hours)
Theory and practice of computational procedures including approximation of functions by interpolating polynomials, numerical differentiation and integration, and solution of ordinary differential equations including both initial value and boundary value problems. Computer applications and techniques.
Prerequisite: (MA 341 or MA 301) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or MA 116 or PY 251 or ST 114 or ECE 209)
Typically offered in Fall only

MA 428/CSC 428 **Introduction to Numerical Analysis II** (3 credit hours)
Computational procedures including direct and iterative solution of linear and nonlinear equations, matrices and eigenvalue calculations, function approximation by least squares, smoothing functions, and minimax approximations.
Prerequisite: (MA 305 or MA 405) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or MA 116 or PY 251 or ST 114 or ECE 209)
Typically offered in Spring only

MA 430 **Mathematical Models in the Physical Sciences** (3 credit hours)
Application of mathematical techniques to topics in the physical sciences. Problems from such areas as conservative and dissipative dynamics, calculus of variations, control theory, and crystallography.
Prerequisite: MA 341 and MA 405
Typically offered in Fall only

MA 432 **Mathematical Models in Life and Social Sciences** (3 credit hours)
Topics from differential and difference equations, probability, and matrix algebra applied to formulation and analysis of mathematical models in biological and social science (e.g., population growth).
Prerequisite: MA 341, (MA 305 or MA 405), and programming proficiency;
Corequisite: (MA 421 or ST 371)
Typically offered in Spring only

MA 437 **Applications of Algebra** (3 credit hours)
Error correcting codes, cryptography, crystallography, enumeration techniques, exact solutions of linear equations, and block designs.
Prerequisite: MA 403 or 407, MA 405
Typically offered in Fall and Spring

MA 440 **Game Theory** (3 credit hours)
Game Theory as a language for modeling situations involving conflict and cooperation in the social, behavioral, economic, and biological sciences. Backward induction; dominated strategies; Nash equilibria; games with incomplete information; repeated games; evolutionary dynamics.
Prerequisite: MA 231 or MA 242
Typically offered in Fall only

MA 444 **Problem Solving Strategies for Competitions** (1 credit hours)
Analyze the most common problem-solving techniques and illustrate their use by interesting examples from past Putnam and Virginia Tech math competitions. Problem solving methods are divided into groups and taught by professors of the math department. After the lecture, students practice writing the solutions for the assignment and have informal discussions in the next class.
Typically offered in Fall only

MA 450 **Methods of Applied Mathematics I** (3 credit hours)
Mathematical methods covered include dimensional analysis, asymptotics, continuum modeling and traffic flow analysis. These topics are discussed in the context of applications and real data. This course is independent of MA 451 Methods of Applied Mathematics II.
Prerequisite: MA 341
Typically offered in Fall only

MA 451 **Methods of Applied Mathematics II** (3 credit hours)
The mathematical methods of this course give insight into physical continuum processes such as fluid flow and the deformation of solid elastic materials. Techniques include the modeling and formulation of equations of motion, the use of Lagrangian and Eulerian variables; further topics are: examples of incompressible fluid flow, calculus of variations and applications to optimal control problems. This course is independent of MA 450 Methods of Applied Mathematics I.
Prerequisite: MA 341
Typically offered in Spring only
MA 491 Reading in Honors Mathematics (1-6 credit hours)
A reading (independent study) course available as an elective for students participating in the mathematics honors program.
Prerequisite: Membership in honors program
Typically offered in Fall and Spring

MA 493 Special Topics in Mathematics (1-6 credit hours)
Directed individual study or experimental course offerings.
Typically offered in Fall and Spring

MA 494 Major Paper in Math (1 credit hours)
Introduces students to one or more forms of writing used in scientific and research environments. Students are required to take a companion math course at the 400-level or above, and adapt writing assignment(s) to the topics in the companion course. Instruction covers all phases of the writing process (planning, drafting, revising, and critiquing other people’s work). Emphasis is placed on organizing for needs of a variety of readers; concise, clear expression.
Corequisite: MA class at the 400-level or above
Typically offered in Fall and Spring

MA 499 Independent Research in Mathematics (1-6 credit hours)
Study and research in mathematics. Topics for theoretical, modeling or computational investigation. Consent of Department Head. Honors Program should enroll in MA 491H. At most 6 hours total of MA 499 and 491H credit can be applied toward an undergraduate degree. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

MA 501 Advanced Mathematics for Engineers and Scientists I (3 credit hours)
Survey of mathematical methods for engineers and scientists. Ordinary differential equations and Green’s functions; partial differential equations and separation of variables; special functions, Fourier series. Applications to engineering and science. Not for credit by mathematics majors. Credit for this course and MA 401 is not allowed
Prerequisite: MA 341; credit not allowed for both MA 501 and MA 401
Typically offered in Fall, Spring, and Summer

MA 502 Advanced Mathematics for Engineers and Scientists II (3 credit hours)
Determinants and matrices; line and surface integrals, integral theorems; complex integrals and residues; distribution functions of probability. Not for credit by mathematics majors. Any student receiving credit for MA 502 may receive credit for, at most, one of the following: MA 405, MA 512, MA 513
Prerequisite: MA 341.
Typically offered in Fall, Spring, and Summer

MA 504/OR 504 Introduction to Mathematical Programming (3 credit hours)
Basic concepts of linear, nonlinear and dynamic programming theory. Not for majors in OR at Ph.D. level.
Prerequisite: MA 242, MA 405
Typically offered in Fall only

MA 505/OR 505/ISE 505 Linear Programming (3 credit hours)
Introduction including: applications to economics and engineering; the simplex and interior-point methods; parametric programming and post-optimality analysis; duality matrix games, linear systems solvability theory and linear systems duality theory; polyhedral sets and cones, including their convexity and separation properties and dual representations; equilibrium prices, Lagrange multipliers, subgradients and sensitivity analysis.
Prerequisite: MA 405
Typically offered in Fall only

MA 507 Survey of Real Analysis (3 credit hours)
A broad overview of topics in analysis. Historical development, logical refinement and applications of concepts such as limits, continuity, differentiation and integration. May not be taken for graduate credit by Master’s or Ph.D. students in Mathematics or Applied Mathematics.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

MA 508 Geometry For Secondary Teachers (3 credit hours)
Topics in geometry of concern to secondary teachers in their work and provision for background and enrichment. Various approaches to study of geometry, including vector geometry, transformational geometry and axiomatics. Course may be taken for graduate credit and for certificate renewal by secondary school teachers. Credit towards a graduate degree may be allowed only for students in mathematics education.
Prerequisite: Graduate standing
Typically offered in Spring and Summer

MA 509 Survey of Abstract Algebra (3 credit hours)
A broad overview of topics in abstract algebra. Theory of equations, polynomial rings, rational functions and elementary number theory. May not be taken for graduate credit by Master's or Ph.D. students in Mathematics or Applied Mathematics.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

MA 510 Selected Topics In Mathematics For Secondary Teachers (1-6 credit hours)
Coverage of various topics in mathematics of concern to secondary teachers. Topics selected from areas such as mathematics of finance, probability, statistics, linear programming and theory of games, intuitive topology, recreational math, computers and applications of mathematics. Course may be taken for graduate credit for certification renewal by secondary school teachers. Credit towards a graduate degree may be allowed only for students in mathematics education.
Prerequisite: Graduate standing
Typically offered in Spring and Summer

MA 511 Advanced Calculus I (3 credit hours)
Fundamental theorems on continuous functions; convergence theory of sequences, series and integrals; the Riemann integral. Credit for both MA 425 and MA 511 is not allowed
Prerequisite: MA 341
Typically offered in Fall, Spring, and Summer
MA 512 Advanced Calculus II (3 credit hours)
General theorems of partial differentiation; implicit function theorems; vector calculus in 3-space; line and surface integrals; classical integral theorems. Credit will not be given for both MA 426 and MA 512.
Prerequisite: MA 341
Typically offered in Fall, Spring, and Summer

MA 513 Introduction To Complex Variables (3 credit hours)
Operations with complex numbers, derivatives, analytic functions, integrals, definitions and properties of elementary functions, multivalued functions, power series, residue theory and applications, conformal mapping.
Prerequisite: MA 242
Typically offered in Fall and Spring

MA 514/CSC 414/CSC 514/MA 414 Foundations of Cryptography (3 credit hours)
Cryptography is the study of mathematical techniques for securing digital information, systems and distributed computation against adversarial attacks. In this class you will learn the concepts and the algorithms behind the most used cryptographic protocols: you will learn how to formally define security properties and how to formally prove/disprove that a cryptographic protocol achieves a certain security property. You will also discover that cryptography has a much broader range of applications. It solves absolutely paradoxical problems such as proving knowledge of a secret without ever revealing the secret (zero-knowledge proof), or computing the output of a function without ever knowing the input of the function (secure computation). Finally, we will look closely at one of the recent popular application of cryptography: the blockchain technology. Additionally, graduate students will study some of the topics in greater depth.
Prerequisite: (CSC 226 AND CSC 333) OR MA 225
Typically offered in Fall only

MA 515 Analysis I (3 credit hours)
Prerequisite: MA 426
Typically offered in Fall and Spring

MA 518 Geometry of Curves and Surfaces (3 credit hours)
Geometry of curves and surfaces in space; Arclength, torsion, and curvature of curves; Tangent spaces, shape operators, and curvatures of surfaces; metrics, covariant derivatives, geodesics, and holonomy. Applications in the physical sciences and/or projects using computer algebra.
Prerequisite: MA 242 and MA 405
Typically offered in Spring only

MA 520 Linear Algebra (3 credit hours)
Prerequisite: MA 405
Typically offered in Fall and Spring

MA 521 Abstract Algebra I (3 credit hours)
Groups, quotient groups, group actions, Sylow's Theorems. Rings, ideals and quotient rings, factorization, principal ideal domains. Fields, field extensions, Galois theory.
Prerequisite: MA 405 and MA 407
Typically offered in Fall only

MA 522 Computer Algebra (3 credit hours)
Basic techniques and algorithms of computer algebra. Integer arithmetic, primality tests and factorization of integers, polynomial arithmetic, polynomial factorization, Groebner bases, integration in finite terms.
Prerequisite: MA 407 or MA 521 and MA 405 or MA 520
Typically offered in Fall only

MA 523 Linear Transformations and Matrix Theory (3 credit hours)
Vector spaces, linear transformations and matrices, orthogonality, orthogonal transformations with emphasis on rotations and reflections, matrix norms, projectors, least squares, generalized inverses, definite matrices, singular values.
Prerequisite: MA 405
Typically offered in Fall and Spring

MA 524 Combinatorics I (3 credit hours)
Enumerative combinatorics, including placements of balls in bins, the twelvedfold way, inclusion/exclusion, sign-reversing involutions and lattice path enumeration. Partially ordered sets, lattices, distributive lattices, Moebius functions, and rational generating functions.
Prerequisite: MA 405
Typically offered in Fall and Spring

MA 526 Algebraic Geometry (3 credit hours)
Abstract theory of solutions of systems of polynomial equations. Topics covered: ideals and affine varieties, the Nullstellensatz, irreducible varieties and primary decomposition, morphisms and rational maps, computational aspects including Groebner bases and elimination theory, projective varieties and homogeneous ideals, Grassmannians, graded modules, the Hilbert function, Bezout's theorem.
Prerequisite: MA 521
Typically offered in Fall only

MA 528/ECG 528/MBA 528/FIM 528 Options and Derivatives Pricing (3 credit hours)
The course covers (i) structure and operation of derivative markets, (ii) valuation of derivatives, (iii) hedging of derivatives, and (iv) applications of derivatives in areas of risk management and financial engineering. Models and pricing techniques include Black-Scholes model, binomial trees, Monte-Carlo simulation. Specific topics include simple no-arbitrage pricing relations for futures/forward contracts; put-call parity relationship; delta, gamma, and vega hedging; implied volatility and statistical properties; dynamic hedging strategies; interest-rate risk, pricing of fixed-income product; credit risk, pricing of defaultable securities.
Prerequisites: MA 341 and MA 405 and MA 421
Typically offered in Fall only
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MA 555 Introduction to Manifold Theory (3 credit hours)
An introduction to smooth manifolds. Topics include: topological and smooth manifolds, smooth maps and differentials, vector fields and flows, Lie derivatives, vector bundles, tensors, differential forms, exterior calculus, and integration on manifolds.
Prerequisite: MA 405 and MA 426
Typically offered in Fall only

MA 561 Set Theory and Foundations Of Mathematics (3 credit hours)
Logic and axiomatic approach, the Zermelo-Fraenkel axioms and other systems, algebra of sets and order relations, equivalents of the Axiom of Choice, one-to-one correspondences, cardinal and ordinal numbers, the Continuum Hypothesis.
Prerequisite: MA 407
Typically offered in Spring only

MA 565/OR 565/CSC 565 Graph Theory (3 credit hours)
Prerequisite: CSC 226 or MA 351.
Typically offered in Spring only

MA 573/BMA 573 Mathematical Modeling of Physical and Biological Processes I (3 credit hours)
Introduction to model development for physical and biological applications. Mathematical and statistical aspects of parameter estimation. Compartmental analysis and conservation laws, heat transfer, and population and disease models. Analytic and numerical solution techniques and experimental validation of models. Knowledge of high-level programming languages required.
Prerequisite: MA 341 and knowledge of high-level programming language.
Typically offered in Fall only

MA 574/BMA 574 Mathematical Modeling of Physical and Biological Processes II (3 credit hours)
Model development, using Newtonian and Hamiltonian principles, for acoustic and fluid applications, and structural systems including membranes, rods, beams, and shells. Fundamental aspects of electromagnetic theory. Analytic and numerical solution techniques and experimental validation of models.
Prerequisite: MA/BMA 573
Typically offered in Fall only

MA 580/CSC 580 Numerical Analysis I (3 credit hours)
Algorithm behavior and applicability. Effect of roundoff errors, systems of linear equations and direct methods, least squares via Givens and Householder transformations, stationary and Krylov iterative methods, the conjugate gradient and GMRES methods, convergence of method.
Prerequisite: MA 405; MA 425 or MA 511; high-level computer language
Typically offered in Fall and Spring

MA 583/CSC 583 Introduction to Parallel Computing (3 credit hours)
Introduction to basic parallel architectures, algorithms and programming paradigms; message passing collectives and communicators; parallel matrix products, domain decomposition with direct and iterative methods for linear systems; analysis of efficiency, complexity and errors; applications such as 2D heat and mass transfer.
Prerequisite: CSC 302 or MA 402 or MA/CSC 428 or MA/CSC 580
Typically offered in Spring only

MA 584 Numerical Solution of Partial Differential Equations--Finite Difference Methods (3 credit hours)
Survey of finite difference methods for partial differential equations including elliptic, parabolic and hyperbolic PDE's. Consideration of both linear and nonlinear problems. Theoretical foundations described; however, emphasis on algorithm design and implementation.
Prerequisite: MA 501; knowledge of a high level programming language
Typically offered in Fall only

MA 587 Numerical Solution of Partial Differential Equations--Finite Element Method (3 credit hours)
Introduction to finite element method. Applications to both linear and nonlinear elliptic and parabolic partial differential equations. Theoretical foundations described; however, emphasis on algorithm design and implementation.
Prerequisite: MA 501; knowledge of a high level programming language
Typically offered in Spring only

MA 591 Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

MA 676 Master's Project (3 credit hours)
Investigation of some topic in mathematics to a deeper and broader extent than typically done in a classroom situation. For the applied mathematics student the topic usually consists of a realistic application of mathematics to student's minor area. A wr
Typically offered in Fall, Spring, and Summer

MA 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring

MA 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
MA 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall and Spring

MA 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MA 695 Master's Thesis Research (1-9 credit hours)
Thesis Research
Prerequisite: Master's student
Typically offered in Fall and Spring

MA 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

MA 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits Arranged
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MA 706/OR 706/ST 706 Nonlinear Programming (3 credit hours)
An advanced mathematical treatment of analytical and algorithmic aspects of finite dimensional nonlinear programming. Including an examination of structure and effectiveness of computational methods for unconstrained and constrained minimization. Special
Prerequisite: OR/IE/MA 505 and MA 425
Typically offered in Spring only

MA 708/OR 708/ISE 708 Integer Programming (3 credit hours)
General integer programming problems and principal methods of solving them. Emphasis on intuitive presentation of ideas underlying various algorithms rather than detailed description of computer codes. Students have some "hands on" computing experience.
Prerequisite: MA 405, OR (MA,IE) 505, Corequisite: Some familiarity with computers (e.g., CSC 112)
Typically offered in Spring only

MA 715 Analysis II (3 credit hours)
Prerequisite: MA 515
Typically offered in Spring only

MA 716 Advanced Functional Analysis (3 credit hours)
Advanced topics in functional analysis such as linear topological spaces; Banach algebra, spectral theory and abstract measure theory and integration.
Prerequisite: MA 715
Typically offered in Fall only

MA 719/OR 719 Vector Space Methods in System Optimization (3 credit hours)
Introduction to algebraic and functional analytic concepts used in system modeling and optimization: vector space, linear mappings, spectral decomposition, adjoints, orthogonal projection, quality, fixed points and differentials. Emphasis on geometric insight. Topics include least square optimization of linear systems, minimum norm problems in Banach space, linearization in Hilbert space, iterative solution of system equations and optimization problems. Broad range of applications in operations research and system engineering including control theory, mathematical programming, econometrics, statistical estimation, circuit theory and numerical analysis.
Prerequisite: MA 405, 511
Typically offered in Fall only

MA 720 Lie Algebras (3 credit hours)
Prerequisite: MA 520
Typically offered in Spring only

MA 721 Abstract Algebra II (3 credit hours)
Field extensions, Galois theory, modules, tensor products, exterior products.
Prerequisite: MA 521
Typically offered in Spring only

MA 722 Computer Algebra II (3 credit hours)
Effective algorithms for symbolic matrices, commutative algebra, real and complex algebraic geometry, and differential and difference equations. Emphasis is on the algorithmic aspects.
Prerequisite: MA 522
Typically offered in Spring only

MA 723 Theory of Matrices and Applications (3 credit hours)
Canonical forms, functions of matrices, variational methods, perturbation theory, numerical methods, nonnegative matrices, applications to differential equations, Markov chains.
Prerequisite: MA 520 or 523
Typically offered in Spring only

MA 724 Combinatorics II (3 credit hours)
Polytopes (V-polytopes and H-polytopes). Fourier-Motzkin elimination, Farkas Lemma, face numbers of polytopes, graphs of polytopes, linear programming for geometries, Balinski’s Theorem, Steinitz’ Theorem, Schlegel diagrams, polyhedral complexes, shellability, and face rings.
Prerequisite: MA 524
Typically offered in Spring only
MA 725 Lie Algebra Representation Theory (3 credit hours)
Prerequisite: MA 720
Typically offered in Fall only

MA 731/OR 731/E 731 Dynamic Systems and Multivariable Control II (3 credit hours)
Prerequisite: OR(E,MA) 531
Typically offered in Spring only

MA 732 Ordinary Differential Equations II (3 credit hours)
Existence-uniqueness theory, periodic solutions, invariant manifolds, bifurcations, Fredholm's alternative.
Prerequisite: MA 532, Corequisite: MA 515
Typically offered in Spring only

MA 734 Partial Differential Equations (3 credit hours)
Prerequisite: MA 534, Corequisite: MA 515
Typically offered in Spring only

MA 746/ST 746 Introduction To Stochastic Processes (3 credit hours)
Markov chains and Markov processes, Poisson process, birth and death processes, queuing theory, renewal theory, stationary processes, Brownian motion.
Prerequisite: MA 405 and MA(ST) 546 or ST 521
Typically offered in Spring only

MA 747/ST 747 Probability and Stochastic Processes II (3 credit hours)
Fundamental mathematical results of probabilistic measure theory needed for advanced applications in stochastic processes. Probability measures, sigma-algebras, random variables, Lebesgue integration, expectation and conditional expectations w.r.t. sigma algebras, characteristic functions, notions of convergence of sequences of random variables, weak convergence of measures, Gaussian systems, Poisson processes, mixing properties, discrete-time martingales, continuous-time markov chains.
Prerequisite: MA(ST) 546
Typically offered in Spring only

MA 748/ST 748 Stochastic Differential Equations (3 credit hours)
Prerequisite: MA(ST) 747
Typically offered in Fall only

MA 753 Algebraic Topology (3 credit hours)
Homotopy, fundamental group, covering spaces, classification of surfaces, homology and cohomology.
Prerequisite: MA 551 or MA 555
Typically offered in Spring only

MA 755 Introduction to Riemannian Geometry (3 credit hours)
An introduction to smooth manifolds with metric. Topics include: Riemannian metric and generalizations, connections, covariant derivatives, parallel translation, Riemannian (or Levi-Civita) connection, geodesics and distance, curvature tensor, Bianchi identities, Ricci and scalar curvatures, isometric embeddings, Riemannian submanifolds, hypersurfaces, Gauss Bonnet Theorem; applications and connections to other fields.
Prerequisite: MA 555
Typically offered in Spring only

MA 766/OR 766/ISE 766 Network Flows (3 credit hours)
Study of problems of flows in networks. These problems include the determination of shortest chain, maximal flow and minimal cost flow in networks. Relationship between network flows and linear programming developed as well as problems with nonlinear cost functions, multi-commodity flows and problem of network synthesis.
Prerequisite: OR(IE,MA) 505
Typically offered in Spring only

MA 771/ST 771/BMA 771 Biomathematics I (3 credit hours)
Role of theory construction and model building in development of experimental science. Historical development of mathematical theories and models for growth of one-species populations (logistic and offshoots), including considerations of age distributions (matrix models, Leslie and Lopez; continuous theory, renewal equation). Some of the more elementary theories on the growth of organisms (von Bertalanffy and others; allometric theories; cultures grown in a chemostat). Mathematical theories oftwo and more species systems (predator-prey, competition, symbiosis; leading up to present-day research) and discussion of some similar models for chemical kinetics. Much emphasis on scrutiny of biological concepts as well as of mathematical structure of models in order to uncover both weak and strong points of models discussed. Mathematical treatment of differential equations in models stressing qualitative and graphical aspects, as well as certain aspects of discretization. Difference equation models.
Prerequisite: Advanced calculus, reasonable background in biology
Typically offered in Fall only
MA 772/ST 772/BMA 772 Biomathematics II (3 credit hours)
Continuation of topics of BMA 771. Some more advanced mathematical techniques concerning nonlinear differential equations of types encountered in BMA 771: several concepts of stability, asymptotic directions, Liapunov functions; different time-scales. Comparison of deterministic and stochastic models for several biological problems including birth and death processes. Discussion of various other applications of mathematics to biology, some recent research.
Prerequisite: BMA 771, elementary probability theory
Typically offered in Spring only

MA 773/OR 773/ST 773/BMA 773 Stochastic Modeling (3 credit hours)
Prerequisite: BMA 772 or ST (MA) 746
Typically offered in Spring only

MA 774/BMA 774/OR 774 Partial Differential Equation Modeling in Biology (3 credit hours)
Prerequisite: BMA 771 or MA/OR 731; BMA 772 or MA 401 or MA 501
Typically offered in Spring only

MA 780/CSC 780 Numerical Analysis II (3 credit hours)
Approximation and interpolation, Fast Fourier Transform, numerical differentiation and integration, numerical solution of initial value problems for ordinary differential equations.
Prerequisite: MA 580
Typically offered in Spring only

MA 784 Nonlinear Equations and Unconstrained Optimization (3 credit hours)
Prerequisite: MA 580
Typically offered in Spring only

MA 785 Numerical Solution of Ordinary Differential Equations (3 credit hours)
Numerical methods for initial value problems including predictor-corrector, Runge-Kutta, hybrid and extrapolation methods; stiff systems; shooting methods for two-point boundary value problems; weak, absolute and relative stability results.
Prerequisite: MA 511 or 512
Typically offered in Spring only

MA 788 Numerical Nonlinear Partial Differential Equations (3 credit hours)
Nonlinear discrete equations; Newton and monotone methods for nonlinear equations; computational algorithms and applications; finite difference method-convergence, stability and error estimates; multiplicity of solutions and bifurcation; asymptotic behavior of solutions; and coupled systems of equations.
Prerequisite: MA 405 or 520 and MA 501 or 534; knowledge of a high level programming language
Typically offered in Spring only

MA 790/ISE 790 Advanced Special Topics System Optimization (1-6 credit hours)
Advanced topics in some phase of system optimization using traditional course format. Identification of various specific topics and prerequisites for each section from term to term.
Typically offered in Fall and Spring

MA 791 Special Topics In Real Analysis (1-6 credit hours)
Typically offered in Fall and Spring

MA 792 Special Topics In Algebra (1-6 credit hours)
Typically offered in Fall and Spring

MA 793 Special Topics In Differential Equations (1-6 credit hours)

MA 796 Special Topics In Combinatorial Analysis (1-6 credit hours)

MA 797 Special Topics In Applied Mathematics (1-6 credit hours)

MA 798 Special Topics In Numerical Analysis (1-6 credit hours)

MA 810 Special Topics (1-6 credit hours)
Typically offered in Fall and Spring

MA 812/ISE 812 Special Topics in Mathematical Programming (1-6 credit hours)
Study of special advanced topics in area of mathematical programming. Discussion of new techniques and current research in this area. The faculty responsible for this course select areas to be covered during semester according to their preference and interest. This course not necessarily taught by an individual faculty member but can, on occasion, be joint effort of several faculty members from this university as well as visiting faculty from other institutions. To date, a course of Theory of Networks and another on Integer Programming offered under the umbrella of this course. Anticipation that these two topics will be repeated in future together with other topics.
Prerequisite: IE(MA,OR) 505
Typically offered in Spring only

MA 816/ISE 816 Advanced Special Topics Sys Opt (1-6 credit hours)
Advanced topics in some phase of system optimization. Identification of various specific topics and prerequisite for each section from term to term.
Typically offered in Fall and Spring

MA 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring
MA 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

MA 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

MA 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall and Spring

MA 896  Summer Dissertation Research  (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

MA 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

MAE 200  Introduction to Mechanical Engineering Design  (1 credit hour)
Introduction to mechanical engineering and its application in professional practice. Includes mechanical engineering vocabulary, measurement concepts, safety training, demonstration of basic machine components and systems, dissection of mechanical engineering devices, simple drawing and sketching, 3d printing, technical communication, design, creation of Online Portfolio. (5-week course)

Restriction: Sophomore standing in Mechanical Engineering
Typically offered in Fall only

MAE 201  Engineering Thermodynamics I  (3 credit hours)
Introduction to the concept of energy and the laws governing the transfers and transformations of energy. Emphasis on thermodynamic properties and the First and Second Law analysis of systems and control volumes. Integration of these concepts into the application of energy balances for systems.
Prerequisite: MA 242, PY 208 or 202
Typically offered in Fall, Spring, and Summer

MAE 206  Engineering Statics  (3 credit hours)
Basic concepts of forces in equilibrium. Distributed forces, frictional forces. Inertial properties. Application to machines, structures, and systems. Credit is not allowed for both MAE 206 and CE 214.
Prerequisite: C or better in both MA 241 and PY 205
Typically offered in Fall, Spring, and Summer

MAE 208  Engineering Dynamics  (3 credit hours)
Kinematics and kinetics of particles in rectangular, cylindrical, and curvilinear coordinate systems; energy and momentum methods for particles; kinetics of systems of particles; kinematics and kinetics of rigid bodies in two and three dimensions; motion relative to rotating coordinate systems.
Prerequisite: MA 242 and C- or better in MAE 206 or CE 214
Typically offered in Fall, Spring, and Summer

MAE 214  Solid Mechanics  (3 credit hours)
Prerequisites: MA 242 and C- or better in (MAE 206 or CE 214)
Typically offered in Fall, Spring, and Summer

MAE 250  Introduction to Aerospace Engineering  (1 credit hour)
The objective of this course is to introduce students to the fundamental concepts associated with aerospace engineering. This will be done through lectures focused on fluid flow, structures, dynamics, and complex system design. Students will also engage in hands-on mini-projects that will provide a design experience. Final efforts will culminate in a design portfolio project. 14AE BS Majors only.
Typically offered in Fall only

MAE 251  Aerospace Vehicle Performance  (3 credit hours)
Introduction to the problem of performance analysis in aerospace engineering. Aircraft performance in gliding, climbing, level, and turning flight. Calculation of vehicle take-off and landing distance, range and endurance. Elementary performance design problems. Introduction to space flight.
Prerequisite: Cumulative GPA 2.0 or higher and a grade of C or better in both MA 241 and PY 205; Corequisite: CSC 113
Typically offered in Fall only

MAE 252  Aerodynamics I  (3 credit hours)
Fundamentals of perfect fluid theory with applications to incompressible flows over airfoils, wings, and flight vehicle configurations.
Prerequisites: MA 242 and C- or better in MAE 251
Typically offered in Spring only

MAE 253  Experimental Aerodynamics I  (1 credit hour)
Subsonic wind tunnel, instrumentation, data acquisition techniques, technical report preparation. Experiments involve pressure and force/moment measurements of various aerospace vehicle components with supplemental flow visualization.
Corequisites: MA 252
Typically offered in Spring only

MAE 302  Engineering Thermodynamics II  (3 credit hours)
Continuation of Engineering Thermodynamics I with emphasis on the analysis of power and refrigeration cycles and the application of basic principles to engineering problems with systems involving mixtures of ideal gases, psychrometrics, nonideal gases, chemical reactions, combustion, chemical equilibrium cycle analysis, and one-dimensional compressible flow.
Prerequisites: CSC 113, C- or better in MAE 201
Typically offered in Fall, Spring, and Summer
MAE 305 Mechanical Engineering Laboratory I (1 credit hours)
Theory and practice of measurement and experimental data collection.
Laboratory evaluation and demonstration of components of the
generalized measurement system and their effects on the final
result. Applications of basic methods of data analysis as well as basic
instrumentation for sensing, conditioning and displaying experimental
qualities. (Instruction and practice in technical report writing.)
Typically offered in Fall, Spring, and Summer

MAE 306 Mechanical Engineering Laboratory II (1 credit hours)
Continuation of MAE 305 into specific types of measurements. Students
evaluate and compare different types of instrumentation for measuring
the same physical quantity on the basis of cost, time required, accuracy,
etc. (Oral and written presentation of technical material).
Prerequisite: MAE 305
Typically offered in Fall, Spring, and Summer

MAE 308 Fluid Mechanics (3 credit hours)
Development of the basic equations of fluid mechanics in general and
specialized form. Application to a variety of topics including fluid statics;
inviscid, incompressible fluid flow; design of Fluid dynamic system.
Prerequisite: MA 242 and C- or better in MAE 208
Typically offered in Fall, Spring, and Summer

MAE 310 Heat Transfer Fundamentals (3 credit hours)
Analysis of steady state and transient one and multidimensional heat
conduction employing both analytical methods and numerical techniques.
Integration of principles and concepts of thermodynamics and fluid
mechanics to the development of practical conv
Prerequisite: MA 341 and C- or better in MAE 201
Typically offered in Fall, Spring, and Summer

MAE 315 Dynamics of Machines (3 credit hours)
Application of dynamics to the analysis and design of machine and
mechanical components. Motions resulting from applied loads, and the
forces required to produce specified motions. Introduction to mechanical
vibration, free and forced response of discrete and continuous systems.
Prerequisite: MA 341 and C- or better in MAE 208
Typically offered in Fall, Spring, and Summer

MAE 316 Strength of Mechanical Components (3 credit hours)
Analysis and design of mechanical components based on deflection,
material, static strength and fatigue requirements. Typical components
include beams, shafts, pressure vessels and bolted and welded joints.
Classical and modern analysis and design techniques. Computer
analysis using the finite element method. Material and manufacturing
considerations in design.
Prerequisite: C- or better in MAE 214 or CE 313
Typically offered in Fall, Spring, and Summer

MAE 342 Introduction to Automotive Engineering (3 credit hours)
Fundamental aspects of automotive engineering. Examines various
automotive systems (engine, brakes, suspension etc.) as well as their
interactions in such areas as safety and performance. Current practices
and development for the future.
Prerequisite: MAE 206, MAE 208, MAE 301, MAE 308, MAE 315
Typically offered in Spring only

MAE 351 Aerodynamics II (3 credit hours)
Concepts of thermodynamics, compressible fluid flow, and shock waves
with application to computing the aerodynamic characteristics of airfoils,
wings and flight configurations at high speed.
Prerequisites: MAE 252 and C- or better in MAE 201
Typically offered in Spring only

MAE 352 Experimental Aerodynamics II (1 credit hours)
Advanced stability and control experiments in the subsonic wind tunnel
and external compressible flow experiments in the supersonic wind
tunnel.
Prerequisite: MA 253, Corequisite: MAE 351
Typically offered in Spring only

MAE 361 Dynamics & Controls (3 credit hours)
Dynamics and linear feedback control of aerospace and mechanical
systems. Concepts from linear system theory, kinematics, particle
dynamics, first- and second-order systems, system dynamics, vibrations,
and computational techniques. Feedback control by root-locus,
Nyquist, Bode plots, servo-mechanisms, gain and phase margin, and
compensation. Control system design emphasized.
Prerequisite: MA 341 and C- or better in MAE 208
Typically offered in Fall only

MAE 371 Aerospace Structures I (3 credit hours)
Determination of appropriate analysis techniques for Aerospace
Structures. Introduction of governing equations and selected solutions for
typical structures. Use of these concepts in the design of a representative
structural component.
Prerequisite: C- or better in MAE 214 or CE 313
Typically offered in Fall only

MAE 372 Aerospace Vehicle Structures Lab (1 credit hours)
Demonstration and application of the concepts that have been presented
in MAE 371 and MAE 472. Fabrication techniques and the design and
construction of a structural component will be emphasized.
Corequisite: MAE 371
Typically offered in Fall only

MAE 403 Air Conditioning (3 credit hours)
Design of a complete air conditioning system for a building. Introduction,
Design Objectives - Building Description, Review of Psychrometrics
and Air Conditioning Processes, Cooling and Heating Load Calculation,
Space Air diffusion, Duct Lay-out and Design, Equipment Selection, Pipe
Sizing, Life-cycle Cost Analysis.
Prerequisite: MAE 302, MAE 310, MAE 308
Typically offered in Spring only

MAE 405 Controls Lab (1 credit hours)
Laboratory experiments demonstrate the essential features of classical
and modern control theory for single-input and single-output systems.
Corequisite: MAE 435
Typically offered in Fall, Spring, and Summer
MAE 406 Energy Conservation in Industry  (3 credit hours)
Application of energy conservation principles to a broad range of industrial situations with emphasis on typical equipment encountered as well as the effect of recent environmental regulations. Topics covered include: steam generators, pollution control, work minimization, heat recovery, steam traps, industrial ventilation, electrical energy management, and economics. Field trip to conduct tests and evaluate operation at three NCSU steam plants.

Prerequisite: MAE 302, MAE 310
Typically offered in Fall only

MAE 407 Steam and Gas Turbines  (3 credit hours)
Fundamental analysis of the theory and design of turbomachinery flow passages; control and performance of turbomachinery; gas-turbine engine processes.

Prerequisite: MAE 302 and (MAE 308 or MAE 252)
Typically offered in Spring only

MAE 408 Internal Combustion Engine Fundamentals  (3 credit hours)

Prerequisite: MAE 302
Typically offered in Fall only

MAE 410 Modern Manufacturing Processes  (3 credit hours)
Introduction to modern manufacturing processes and technologies. Topics to be covered include traditional machining, laser and electrochemical machining, electro-discharge machining, geometric dimensioning & tolerancing, tolerance chart, statistical process control, metal forming, metal casting, rapid prototyping, welding, micro-fabrication, hybrid processes, and computer aided manufacturing. To relate theory taught in class with practice, the course includes mini projects on machining, rapid prototyping, and material testing.

Prerequisite: MAE 316 or MAE 371
Typically offered in Fall only

MAE 412 Design of Thermal System  (3 credit hours)
Applications of thermodynamics, fluid mechanics, and heat transfer to thermal systems with an emphasis on system design and optimization. Design of heat exchangers. Analysis of engineering economics, including time value of money, present and future worth, payback period, internal rates of return, and cost benefit analysis. Review of component model for pipes, pumps, fans, compressors, turbines, evaporators, condensers and refrigerators. Simulation methods for finding the operating point for thermal systems. Design of thermal systems through methods of optimization.

Prerequisite: MAE 302, MAE 308, MAE 310
Typically offered in Fall and Spring

MAE 413 Design of Mechanical Systems  (3 credit hours)
Integration of the physical sciences, mathematics, and engineering to solve real-world mechanical engineering design problems. Design of mechanical elements including: fasteners, welds, springs, bearings, gears, belts, brakes, clutches, flywheels, shafts. Emphasis on open-ended problems which contain superfluous information and/or insufficient data. Solution techniques focus on problem definition, reduction to a solvable system, and development of a design response. Team based projects. Formal written communication of results.

Prerequisite: MAE 315 and MAE 316
Typically offered in Fall only

MAE 415 Mechanical Engineering Design I  (3 credit hours)
The first course in the sequence of a two-semester capstone senior design project. Teamwork, independent learning and communication skills are emphasized. Team of students practice engineering design process through: problem definition, research, brainstorming, optimization, critical review and analysis. Lectures focus on conceptual design, embodiment design, and quality. Communication skills are developed through reports and presentations.

Prerequisite: MAE 315, MAE 316, MAE 302, MAE 308 and MAE 310
Typically offered in Fall only

MAE 416 Mechanical Engineering Design  (4 credit hours)
Teamwork, independent learning and communication skills are emphasized in this capstone course. Teams of students experience mechanical engineering design through: problem definition, investigation, brainstorming, focus, critical review, design, analysis, prototype construction and testing. Design for manufacture is encouraged throughout the process by having students build their own prototypes. Communication skills are developed through reports and presentations.

Corequisite: MAE 415 or MAE 412
Typically offered in Fall and Spring

MAE 420/MAE 520 Dynamic Analysis of Human Movement  (3 credit hours)
Topics in movement biomechanics and computational analyses of movement, including muscle physiology and mechanics, advanced muscle modeling, neural control of muscle and motor control theories, and dynamic simulation and optimization. Discussion of fundamental research underpinnings and clinical and sports applications.

P: MAE208 or equivalent
Typically offered in Spring only

MAE 421 Design of Solar Thermal Systems  (3 credit hours)

Prerequisite: MAE 302, MAE 310
Typically offered in Spring only
MAE 426/MAE 526 Fundamentals of Product Design (3 credit hours)
Many think of design as more of an art than a science. However, the growing body of research in the engineering design community teaches us ways to navigate the design of consumer products using interdisciplinary design tools and rational decision making. This course introduces students to scientific design techniques that are more effective than “ad hoc” tactics. By exploring how engineering principles integrate with “real world” design challenges, students will learn to solve product design problems that encompass heterogeneous markets, multiple disciplines, and large-scale complex systems.
Prerequisite: MA 241
Typically offered in Spring only

MAE 430 Applied Finite Element Analysis (3 credit hours)
Finite element modeling techniques for solving real-world engineering problems are discussed. Theory of finite element discretization is highlighted follow by software implementation, emphasis is given on accurate prescription of boundary conditions that represent actual physical systems, modeling exercises and projects include solid structural problems, heat transfer, structural vibrations, fluid dynamics and contact problems, modeling is carried out using commercial software packages.
Prerequisite: MA 201 and (MAE 316 or MAE 371)
Typically offered in Spring only

MAE 435 Principles of Automatic Control (3 credit hours)
Prerequisites: MAE 315 or MAE 361
Typically offered in Fall, Spring, and Summer

MAE 440 Non-Destructive Testing and Evaluation (3 credit hours)
NDT/NDE is a 3-credit elective course covering the general defect and damage types in materials and structures, principles of NDT/NDE techniques, and NDT/NDE applications. Associated lab modules (3 weeks) provide hands-on opportunities to students on often used NDT/NDE methods including magnetic particle, ultrasonics, and eddy current methods. A final project team will work on research and industrial NDT/NDE solutions.
Junior or Senior standing in the College of Engineering
Typically offered in Fall only

MAE 451 Experimental Aerodynamics III (1 credit hour)
Laboratory experiments in internal compressible flow and boundary layers in conjunction with MAE 458. Topics include nozzle flows, constant area duct flows, component/overall performance of a gas turbine, and boundary layer analysis.
Prerequisite: MAE 352, Corequisite: MAE 458
Typically offered in Fall only

MAE 452 Aerodynamics of V/STOL Vehicles (3 credit hours)
Typically offered in Fall only

MAE 455 Boundary Layer Theory (3 credit hours)
Introduction to the Navier-Stokes Equations and boundary layer approximations for incompressible flow. Calculation techniques for laminar and turbulent boundary layer parameters which affect lift, drag, and heat transfer on aerospace vehicles. Discussions of compressible flows.
Prerequisite: MAE 252 or MAE 308
Typically offered in Fall only

MAE 456 Computational Methods in Aerodynamics (3 credit hours)
Introduction to computational methods for solving exact fluid equations. Emphasis on development of the fundamentals of finite difference methods and their application to viscous and inviscid flows.
Prerequisite: MAE 252
Typically offered in Fall only

MAE 457 Flight Vehicle Stability and Control (3 credit hours)
Longitudinal, directional and lateral static stability and control of aerospace vehicles. Linearized dynamic analysis of the motion of a six degree-of-freedom flight vehicle in response to control inputs and disturbance through use of the transfer function concept. Control of static and dynamic behavior by vehicle design (stability derivatives) and/or flight control systems.
Prerequisite: MAE 252 and (MAE 361 or MAE 315)
Typically offered in Spring only

MAE 458 Propulsion (3 credit hours)
One-dimensional, internal, compressible flow including: isentropic flow, normal shocks, flow with friction and simple heat addition. Applications to air-breathing aircraft propulsion systems. Performance, analysis and design of components and overall performance of air-breathing engines.
Prerequisite: MAE 351
Typically offered in Fall only

MAE 459 Rocket Propulsion (3 credit hours)
Study of chemical rockets. This includes nozzle theory, flight performance, thermochemical calculations, and component and system analysis and design.
Prerequisite: MAE 351 or MAE 302
Typically offered in Fall only

MAE 467 Introduction to Space Flight (3 credit hours)
Fundamental aspects of space flight including launch vehicle performance and design, spacecraft characteristics, two-body orbital mechanics, earth satellites, interplanetary trajectories, atmospheric entry, and atmospheric heating.
Prerequisites: MAE 361 or MAE 315
Typically offered in Spring only

MAE 472 Aerospace Structures II (3 credit hours)
A continuation of MAE 371; deflection of structures, indeterminate structures, minimum weight design fatigue analysis and use of matrix methods in structural analysis. Selection of materials for aircraft construction based on mechanical, physical, and chemical properties.
Prerequisite: MAE 371
Typically offered in Spring only
MAE 480 Aerospace Vehicle Design I (3 credit hours)
A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

Prerequisites: (MAE 457 or MAE 467) and MAE 252 and MAE 371; Restrictions: Senior standing and Aerospace Engineering Majors

Typically offered in Fall only

MAE 481 Aerospace Vehicle Design II (3 credit hours)
A continuation of MAE 480. Designs are refined and vehicles constructed and instrumented by students. A flight test program is designed and carried out in cooperation with MAE 525 students.

Prerequisite: MAE 480
Typically offered in Spring only

MAE 482/ECE 482 Engineering Entrepreneurship and New Product Development I (3 credit hours)
Applications of engineering, mathematics, basic sciences, finance, and business to the design and development of prototype engineering products. This course requires a complete written report and an end-of-course presentation. This is the first course in a two-semester sequence. Students taking this course will implement their designed prototype in ECE 483: Senior Design Project in Electrical Engineering and Computer Engineering II—Engineering Entrepreneurs. Departmental approval required.

Typically offered in Fall only

MAE 483/ECE 483 Engineering Entrepreneurship and New Product Development II (3 credit hours)
Applications of engineering, science, management and entrepreneurship to the design, development and prototyping of new product ideas. Based on their own new product ideas, or those of others, students form and lead entrepreneurship teams (eTeams) to prototype these ideas. The students run their eTeams as 'virtual' startup companies where the seniors take on the executive roles. Joining them are students from other grade levels and disciplines throughout the university that agree to participate as eTeam members. Departmental approval required.

Prerequisite: ECE 482
Typically offered in Fall and Spring

MAE 484 Engineering Entrepreneurship Senior Design Lab (1 credit hour)
This is the lab for MAE 483. Applications of engineering, science, management, and entrepreneurship to the design, development, and prototyping of new product ideas. Based on their own product ideas, or those of others, students form and lead entrepreneurship teams (eTeams) to prototype these ideas. The students run their eTeams as 'virtual' startup companies where the seniors take on the executive roles. Joining them are students from other grade levels and disciplines throughout the University that agree to participate as eTeam members. Departmental approval required.

Prerequisite: MAE/ECE 482; C: MAE/ECE 483
Typically offered in Spring only

MAE 495 Special Topics in Mechanical and Aerospace Engineering (1-3 credit hours)
Offered as needed to present new or special MAE subject matter.

MAE 496 Undergraduate Project Work in Mechanical and Aerospace Engineering (1-6 credit hours)
Individual or small group project in engineering, comprising the design of an equipment or system stemming from a mutual student-faculty interest; a substantial final report (project) containing calculations, drawings and specifications must be produced. Alternatively, individual or small group undergraduate research evolving from a mutual student-faculty interest; a conference or scientific journal paper must be submitted for publication. Departmental approval required

Prerequisite: Completion of all required MAE-300 level courses, Corequisite: MAE 415 or MAE 478
Typically offered in Fall, Spring, and Summer

MAE 501 Advanced Engineering Thermodynamics (3 credit hours)
Classical thermodynamics of a general reactive system; conservation of energy and principles of increase of entropy; fundamental relation of thermodynamics; Legendre transformations; phase transitions and critical phenomena; equilibrium and stability cr

Prerequisite: MAE 302; MA 401 or MA 511
Typically offered in Spring only

MAE 504 Fluid Dynamics Of Combustion I (3 credit hours)
Gas-phase thermochemistry including chemical equilibrium and introductory chemical kinetics. Homogeneous reaction phenomena. Subsonic and supersonic combustion waves in premixed reactants (deflagration and detonation). Effects of turbulence. Introductio

Prerequisite: MAE 201 or MA 252 or MA 308
Typically offered in Fall only

MAE 505 Heat Transfer Theory and Applications (3 credit hours)
Development of basic equations for steady and transient heat and mass transfer processes. Emphasis on application of basic equations to engineering problems in areas of conduction, convection, mass transfer and thermal radiation.

Prerequisite: MAE 310
Typically offered in Fall only

MAE 511 Advanced Dynamics with Applications to Aerospace Systems (3 credit hours)
Basic topics in advanced dynamics and with applications to aerospace systems. Rotating coordinate systems, Euler angles, three-dimensional kinematics and kinetics, angular momentum methods and an introduction to analytical mechanics. Examples are concentrated in the area of aerospace vehicles, but the methods learned will be applicable to land-based vehicles and any engineering system undergoing rigid body rotation, e.g. wind turbines, biomechanical systems, machine tools, robotic systems, etc.

Prerequisite: (MAE 208 or PY 205) and MA 242 and (MA 301 or MA 341)
Typically offered in Fall only

MAE 513 Principles of Structural Vibration (3 credit hours)
Principles of structural vibration beginning from single and multi-degree of freedom systems and extending to distributed systems. Forced system response, vibration of strings, bars, shafts and beams and an introduction to approximate methods.

Prerequisite: MAE 315
Typically offered in Fall only
MAE 515 Advanced Automotive Vehicle Dynamics (3 credit hours)
This course covers advanced materials related to mathematical models and designs in automotive vehicles as multiple degrees of freedom systems for dynamic behaviors in acceleration, braking, rollover, aerodynamics, suspensions, tire, and drive train.

Prerequisite: MAE 208 or MAE 315 or MAE 472 or equivalent; or consent of the instructor
Typically offered in Spring only

MAE 517 Advanced Precision Manufacturing for Products, Systems and Processes (3 credit hours)
This is a graduate level course designed for graduate students and undergraduate seniors. This course examines precision issues for products, manufacturing machines, processes, and instruments. Modern manufacturing technologies are distinct in their multifarious nature in product sizes, materials, energy forms, theories, and information types; however, the key to their success relies on the management of precision. This course discusses issues critical to both existing precision manufacturing and future sub-micron/nano technology. Important topics include fundamental mechanical accuracies; manufacturing systems and processes; geometric dimensioning and tolerancing; process planning, tolerance charts, and statistical process control; principles of accuracy, repeatability, and resolution; error assessment and calibration; error budget; reversal principles; joint design and stiffness consideration; precision sensing and control; precision laser material processing.

Prerequisite: MAE 496 or MAE 415 or equivalent or instructor permission
Typically offered in Fall only

MAE 518 Acoustic Radiation I (3 credit hours)
Introduction to principles of acoustic radiation from vibrating bodies and their related fields. The radiation of simple sources, propagation of sound waves in confined spaces and transmission through different media.

Prerequisite: MA 301 and MAE 308 or MAE 356
Typically offered in Fall and Spring

MAE 520/MAE 420 Dynamic Analysis of Human Movement (3 credit hours)
Topics in movement biomechanics and computational analyses of movement, including muscle physiology and mechanics, advanced muscle modeling, neural control of muscle and motor control theories, and dynamic simulation and optimization. Discussion of fundamental research underpinnings and clinical and sports applications.

P: MAE208 or equivalent
Typically offered in Fall and Spring

MAE 521 Linear Control and Design For Mimo Systems (3 credit hours)
Linear Multivariable control and design for multibody engineering systems (robotics) and aircraft controls and navigation. Emphasis on multi-input and multi-output (MIMO) system analysis and design using frequency-based approach. Controllability and observability, transmission zeroes and pole-zero cancellation, eigenstructures, singular value decomposition in frequency domain, stability and performance robustness of MIMO systems.

Prerequisite: MAE 435, MA 341

MAE 522 Non Linear System Analysis and Control (3 credit hours)
Nonlinear system analysis, Lyapunov stability theory, absolute stability, feedback linearization, sliding mode control, backstepping control technique, as well as various advanced nonlinear control methods.

Prerequisite: MAE 521 or equivalent

MAE 525 Advanced Flight Vehicle Stability and Control (3 credit hours)
Preliminary analysis and design of flight control systems to include autopilots and stability augmentation systems. Study of effects of inertial cross-coupling and nonrigid bodies on vehicle dynamics.

Prerequisite: MA 457
Typically offered in Fall only

MAE 526/MAE 426 Fundamentals of Product Design (3 credit hours)
Many think of design as more of an art than a science. However, the growing body of research in the engineering design community teaches us ways to navigate the design of consumer products using interdisciplinary design tools and rational decision making. This course introduces students to scientific design techniques that are more effective than “ad hoc” tactics. By exploring how engineering principles integrate with “real world” design challenges, students will learn to solve product design problems that encompass heterogeneous markets, multiple disciplines, and large-scale complex systems.

Prerequisite: MA 241
Typically offered in Spring and Summer

MAE 528 Experimental Flight Testing (3 credit hours)
Application of engineering methods to experimental flight testing of fixed-wing aircraft for determination of performance and handling qualities of aircraft. Risk minimization techniques are included in the formulation of a flight test plan. Collect

Prerequisite: Graduate standing, Aerospace Engineering Majors, MAE 525
Typically offered in Spring only

MAE 531 Engineering Design Optimization (3 credit hours)
Nonlinear optimization techniques with applications in various aspects of engineering design. Terminology, problem formulation, single and multiple design variables, constraints, classical and heuristic approaches, single and multiojective problems, response surface modeling, and tradeoffs in complex engineering systems. Numerical optimization algorithms and implementation of these optimization techniques.

Graduate standing in engineering recommended.

Prerequisite: Graduate standing in Engineering is recommended.
Typically offered in Fall only

MAE 532 Smart Structures and Micro-Transducers (3 credit hours)
This course is designed for graduate students who wish to learn fundamentals and applications of smart structures and micro transducers. The course focuses on materials, structures, design, fabrication, and characterization of micro transducers. It also covers the recent progress in applications of micro transducers in aerospace, biomedical, civil, electrical and mechanical engineering.

Prerequisite: MAE 314, MAE 315, or equivalent.
Typically offered in Spring only
MAE 533  Finite Element Analysis I  (3 credit hours)

Prerequisite: MAE 316 or MAE 472
Typically offered in Fall only

MAE 534/FB 534  Mechatronics Design  (3 credit hours)
Principles of Mechatronics Design, review of logic gates, microprocessor architecture, sensors and actuators, A/D and D/A conversion techniques, real-time multi-tasking programming concepts, direct digital control implementation. "Hands-on" experience through several laboratory assignments and final team project.

Prerequisite: Structured Programming Experience, Senior/Graduate Standing in WPS/MAE.
Typically offered in Fall and Spring

MAE 535/ECE 535  Design of Electromechanical Systems  (3 credit hours)
A practical introduction to electromechanical systems with emphasis on modeling, analysis, design, and control techniques. Provides theory and practical tools for the design of electric machines (standard motors, linear actuators, magnetic bearings, etc). Involves some self-directed laboratory work and culminates in an industrial design project. Topics include Maxwell's equations, electromechanical energy conversion, finite element analysis, design and control techniques.

Prerequisite: MA 341
Typically offered in Spring and Summer

MAE 536  Micro/Nano Electromechanical Systems  (3 credit hours)
Fundamentals and applications of micro/nano sensors and actuators. Emphasis upon MEMS/NEMS design, microfabrication techniques, and case studies of MEMS devices. Nanomaterials and NEMS devices also covered. Students have opportunity to learn commercial software packages on design and simulation of MEMS and hear from experts from leading MEMS companies through guest lectures. Previous knowledge of MEMS and nanotechnology is not required. The course is restricted to advanced undergrads and graduate students in engineering, materials science, physics and biomedical fields.

Typically offered in Fall only

MAE 537  Mechanics Of Composite Structures  (3 credit hours)
Manufacturing techniques with emphasis on selection of those producing most favorable end result. Classical plate theory, materials properties and failure theories. Micromechanics, repair, plate solutions and elasticity solutions covered as required to meet special interests of students.

Prerequisite: MAE 316 or MAE 472
Typically offered in Spring only

MAE 538  Smart Structures and Materials  (3 credit hours)
An application-oriented introduction to smart structures and materials with examples from mechanical, aerospace and biomedical engineering. Experimentally observed phenomena, micromechanisms, and models for material behavior. Team work developing simulation tools for typical applications. Validating results experimentally using PC-based data acquisition systems.

Prerequisite: MAE 415 or MAE 472
Typically offered in Spring only

MAE 539/MSE 539  Advanced Materials  (3 credit hours)
Introduces production/structure/property/function relation and application of a number of materials mainly for biomedical, mechanical and aerospace applications. Topics include ultra light materials (production, processing and applications of cellular solids), biomaterials (classes and application of materials in medicine and dentistry), composites (classes and application), refractory materials and coatings for high temperature applications, thin film shape memory alloys for micro-electro mechanical systems (MEMS).

Prerequisite: MSE 201 and MAE 314
Typically offered in Fall only

MAE 540  Advanced Air Conditioning Design  (3 credit hours)

Prerequisite: MAE 403, 404
Typically offered in Spring only

MAE 541  Advanced Solid Mechanics I  (3 credit hours)
Development of principles of advanced strength of materials and elasticity theory leading to solution of practical engineering problems concerned with stress and deformation analysis. Tensor analysis, coordinate transformations, alternative measures of strain, elastic constitutive equations, stress measures, formulation and solution of two and three dimensional elasticity problems. Examples include advanced beam theory for shear deformation and large deformation, contact mechanics, stress concentration, pressure vessels and compound cylinders, thermal stress analysis, and stresses in layered microelectronic devices.

Prerequisite: MAE 316
Typically offered in Fall only

MAE 543  Fracture Mechanics  (3 credit hours)
Concept of elastic stress intensity factor, Griffith energy balance, determination of the elastic field at a sharp crack tip via eigenfunction expansion methods, J integrals analysis, experimental determination of fracture toughness, fatigue crack growth, elastic-plastic crack tip fields. Emphasis on modern numerical methods for determination of stress intensity factors, critical crack sizes and fatigue crack propagation rate predictions.

Prerequisite: MAE 316
Typically offered in Spring and Summer
MAE 544 Real Time Robotics (3 credit hours)
Real-time programming for servo control using an embedded controller. Software and hardware interfacing for control of a D.C. servo device. Introduction of multi-tasking to establish concurrent control of several processes, transforming servo loop into a process executing concurrently on single board computer. Provision for hands-on development systems and software emulators.
Prerequisite: Pascal, C, FORTRAN or Assembly language experience
Typically offered in Spring only

MAE 545 Metrology For Precision Manufacturing (3 credit hours)
Foundations of dimensional metrology and error analysis as applied to accuracy and repeatability in machine design. Plane, length, angle, and roundness metrology. Design of precision systems, Abbe’ principle, error analysis, measurement, and compensation. Precision instruments and operating principles. Hands-on experience with measurement instruments and techniques.
Prerequisite: Senior standing in MAE or BS in other curriculum
Typically offered in Spring only

MAE 546 Photonic Sensor Applications in Structure (3 credit hours)
Use of optical fiber and other photonic device based sensors to measure strain, temperature and other measurands in aerospace, mechanical, civil and biomedical applications. An introduction to optical waveguide analysis will be provided at the beginning of the course.
Prerequisite: MAE 371 or MAE 316
Typically offered in Fall only

MAE 550 Foundations Of Fluid Dynamics (3 credit hours)
Review of basic thermodynamics pertinent to gas dynamics. Detailed development of general equations governing fluid motion in both differential and integral forms. Simplification of the equations to those for specialized flow regimes. Similarity paramet
Prerequisite: MAE 201 or MAE 252 or MAE 308
Typically offered in Fall and Summer

MAE 551 Airfoil Theory (3 credit hours)
Development of fundamental aerodynamic theory. Emphasis upon mathematical analysis and derivation of equations of motion, airfoil theory and comparison with experimental results. Introduction to super sonic flow theory.
Prerequisite: MAE 252

MAE 552 Introduction to Experimental Fluid Dynamics and Measurement Systems (3 credit hours)
This course educates graduate students in the design of experiments and basis for model testing and scaling laws; uncertainty and error analysis in selecting measurement systems for experiments; qualitative and quantitative technologies for obtaining measurements; analysis, post-processing and visualization techniques of data.
Prerequisite: MAE 308 and MAE 451 or equivalent
Typically offered in Spring only

MAE 553 Compressible Fluid Flow (3 credit hours)
Equations of motion in supersonic flow; unsteady wave motion, velocity potential equation; linearized flow; conical flow. Slender body theory. Methods of characteristics. Shockwave/ boundary layer interactions.
Prerequisite: MAE 351 or MAE 550
Typically offered in Spring only

MAE 554 Hypersonic Aerodynamics (3 credit hours)
Fundamentals of inviscid and viscous hypersonic flowfields. Classical and modern techniques for calculating shock wave shapes, expansions, surface pressures, heat transfer and skin friction. Applications to high speed aircraft, rockets and spacecraft.
Prerequisite: MAE 553

MAE 555 Applications of Acoustic and Elastic Wave Propagation (3 credit hours)
This course covers the principles for acoustic and elastic propagation in fluids and solids. Diffraction theory is developed for finite sources. The notions of wavepacket, dispersion and waveguiding are reviewed. The fundamentals of the theory of elasticity and elastic propagation in solids are introduced, based on tensor analysis. Time reversal of acoustic waves is presented, as well as applications to underwater acoustics, medical imaging and therapy, nondestructive testing, elasticity imaging.
Typically offered in Spring only

MAE 558 Microfluidics and Nanofluidics (3 credit hours)
Macro scale fluid mechanics, heat and mass transfer. Theories of microfluidics and nanofluidics. Applications in mechanical, biomedical, and chemical engineering. Discussions of journal articles and modern fluid dynamics projects. Expert guest lectures on advanced micro/nanotechnology topics.
Prerequisite: MAE 310 and MAE 427
Typically offered in Spring only

MAE 560 Computational Fluid Mechanics and Heat Transfer (3 credit hours)
Introduction to integration of the governing partial differential equations of fluid flow and heat transfer by numerical finite difference and finite volume means. Methods for parabolic, hyperbolic and elliptical equations and application to model equations. Error analysis and physical considerations.
Prerequisite: MAE 501 or MAE 512, MAE 550 or MAE 557, proficiency in the FORTRAN programming language is required
Typically offered in Fall only

MAE 561 Wing Theory (3 credit hours)
Discussion of inviscid flow fields over wings in subsonic flow. Vortex lattice methods, lifting surface theories and panel methods developed for wings with attached flow and leading-edge separation. Calculation of aerodynamic characteristics and determination of effects of planform and airfoil shapes.
Prerequisite: MAE 551

MAE 562 Physical Gas Dynamics (3 credit hours)
Prerequisite: MAE 550
Typically offered in Fall only
MAE 573  Hydrodynamic Stability and Transition  (3 credit hours)
Conceptual framework and development of hydrodynamic stability theory. Application of the theory to two-dimensional incompressible and compressible subsonic, transonic, supersonic and hypersonic flows. Results for three-dimensional flows. Introduction of mechanisms of transition and discussion of transition models in numerical methods.
Prerequisite: MAE 550
Typically offered in Spring only

MAE 575  Advanced Propulsion Systems  (3 credit hours)
The course will focus on non-turbomachinery, air-breathing hypersonic aeropropulsion applications. Specific propulsion systems to be covered include ramjets and scramjets, pulsed detonation engines, and combined cycle engines, with historical perspective.
Prerequisite: Both MAE 458 and MAE 459 or both MAE 302 and MAE 308

MAE 577/NE 577  Multiscale Two-phase Flow Simulations  (3 credit hours)
Modeling and simulation of two-phase flows using interface tracking approach and ensemble averaging approaches. Model validation and verification based on interface-tracking data, boiling models. Nuclear reactor applications. The course focuses on interface tracking methods understanding as applied to bubbly flow simulations. Students will develop a simplified solver to track 2D bubbles/droplets throughout the course homework assignments and will learn how to apply this approach for better understanding of multi-phase flow as part of the course project.
Typically offered in Fall only

MAE 586  Project Work In Mechanical Engineering  (1-6 credit hours)
Individual or small group investigation of a problem stemming from a mutual student-faculty interest. Emphasis on providing a situation for exploiting student curiosity.
Typically offered in Fall, Spring, and Summer

MAE 589  Special Topics In Mechanical Engineering  (1-6 credit hours)
Faculty and student discussions of special topics in mechanical engineering.
Prerequisite: Advanced Undergraduate standing or Graduate standing
Typically offered in Fall and Spring

MAE 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MAE 688  Non-Thesis Masters Continuous Registration - Half Time Registration  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Spring only

MAE 689  Non-Thesis Master Continuous Registration - Full Time Registration  (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MAE 690  Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall and Spring

MAE 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall and Spring

MAE 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research
Prerequisite: Master's student
Typically offered in Summer only

MAE 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MAE 699  Master's Thesis Preparation  (1-9 credit hours)
Individual research in the field of mechanical engineering.
Prerequisite: Graduate standing in Mechanical Engineering, Consent of Adviser
Typically offered in Fall, Spring, and Summer

MAE 702  Statistical Thermodynamics  (3 credit hours)
Analysis and establishment of conclusions of classical thermodynamics from the microscopic viewpoint. Topics include: ensemble methods, partition functions, translational, rotational and vibrational energy modes of an ideal gas, chemical equilibrium, imperfect gases, dense fluids, critical-point theories, mean free path concepts, Boltzmann equation, hydrodynamic equations from kinetic theory and properties of disordered composite media.
Prerequisite: MAE 501
Typically offered in Spring only
MAE 703 Direct Energy Conversion (3 credit hours)
The course is intended to be an introduction to fundamentals of energy transport and energy conversion concepts from nano to macro scales. The course will cover the state of energy carriers (photons, electrons, and phonons) and their transport characteristics. A focus will be on material properties that dictate energy related processes. The foundational concepts will then be applied to direct energy conversion devices including thermoelectrics and photovoltaics. Finally, the course will cover system analysis of solid-state energy conversion applications.

Typically offered in Spring only

MAE 704 Fluid Dynamics of Combustion II (3 credit hours)

Prerequisite: MAE 504
Typically offered in Spring only

MAE 707 Advanced Conductive Heat Transfer (3 credit hours)

Prerequisite: MAE 505 or MA 501
Typically offered in Spring only

MAE 708 Advanced Convective Heat Transfer (3 credit hours)
Advanced topics in steady and transient, natural and forced convective heat transfer for laminar and turbulent flow through conduits and over surfaces. Mass transfer in laminar and turbulent flow. Inclusion of topics on compressible flow with heat and mass transfer.

Prerequisite: MAE 550
Typically offered in Spring only

MAE 709 Advanced Radiative Heat Transfer (3 credit hours)
Comprehensive and unified treatment of basic theories; exact and approximate methods of solution of radiative heat transfer and the interaction of radiation with conductive and convective modes of heat transfer in participating and non-participating media.

Prerequisite: MAE 505
Typically offered in Spring only

MAE 718 Acoustic Radiation II (3 credit hours)
Advanced treatment of the theory of sound generation and transmission. Topics include: techniques for solution of the wave equation, radiation from spheres, cylinders and plates, sound propagation in ducts, scattering.

Prerequisite: MAE 518
Typically offered in Spring only

MAE 721 Robust Control with Convex Methods (3 credit hours)
This course emphasizes on control design techniques which result in closed-loop systems that are insensitive to modeling errors and which achieve a prespecified level of performance. Robustness margins against model uncertainty. Robust control design techniques based on linear matrix inequalities. Topics include uncertainty modeling, robust stability and performance, H_inf control, convex optimization technique (LMI), multi-analysis and synthesis, computer-aided analysis and control design.

Prerequisite: Graduate standing in Engineering and Applied Mathematics, MAE 521 or ECE 716
Typically offered in Spring only

MAE 725 Geophysical Fluid Mechanics (3 credit hours)
The principles of fluid mechanics applied to geophysical systems. Special emphasis placed on those features of these systems, such as almost rigid rotation and stable stratification, which produce unique and important effects. The effects of almost rigid rotations on homogeneous and stratified flows examined in detail.

Prerequisite: MAE 725 or equivalent
Typically offered in Spring only

MAE 726 Advanced Geophysical Fluid Mechanics (3 credit hours)
Principles of fluid mechanics applied to geophysical systems. Special emphasis on role of stable stratification on the flows in these systems. Detailed study of generation, interaction, propagation and dissipation of internal gravity waves. Study of other geophysically important flows.

Prerequisite: MAE 725 or equivalent
Typically offered in Spring only

MAE 730 Modem Plasticity (3 credit hours)
Classical theories of plasticity and solutions pertaining to rate-independent and -dependent deformations modes in metals, geomaterials and concrete. Ductile failure modes, i.e., shear-strain localization and other failure modes associated with large deformation modes. Inelastic wave propagation, crystalline constitutive formulations and computational aspects of quasi-static and dynamic plasticity.

Prerequisite: Grad. course in elasticity or strength of materials
Typically offered in Fall only

MAE 731/MSE 731 Materials Processing by Deformation (3 credit hours)
Presentation of mechanical and metallurgical fundamentals of materials processing by deformation. Principles of metal working, friction, forging, rolling, extrusion, drawing, high energy rate forming, chipless forming techniques, manufacturing system concept in production.

Prerequisite: Six hrs. of solid mechanics and/or materials
Typically offered in Fall only

MAE 734 Finite Element Analysis II (3 credit hours)
Advanced treatment of finite element analysis for non-linear mechanics problems, including most recent developments in efficient solution procedures. Plate bending and shell elements, computational plasticity and viscoplastic materials, large deformation formulations, initial stability and buckling, structural vibrations, incompressible elasticity, contact problems, flow in incompressible media, weighted residuals and field problems. Development of efficient algorithms for practical application.

Prerequisite: MAE 533
Typically offered in Spring only
MAE 742 Mechanical Design for Automated Assembly (3 credit hours)
Mechanical design principles important in high volume production using modern automated assembly technology. Production and component design for ease of assembly as dictated by part handling, feeding, orientation, insertion and fastening requirements. Existing product evaluation and redesign for improved assemblage.
Prerequisite: Graduate standing or PBS status in Engineering
Typically offered in Fall only

MAE 766 Computational Fluid Dynamics (3 credit hours)
Advanced computational methods for integrating, by use of finite differences, and finite volume discretizations, non-linear governing equations of fluid flow; the Euler equations and the Navier-Stokes equations. Topics from current literature.
Prerequisite: MAE 560; proficiency in the FORTRAN programming language is required
Typically offered in Spring only

MAE 770 Computation of Reacting Flows (3 credit hours)
Prerequisite: MAE 560, MAE 766
Typically offered in Spring only

MAE 776 Turbulence (3 credit hours)
Development of basic concepts and governing equations for turbulence and turbulent field motion. Formulations of various correlation tensors and energy spectra for isotropic and nonisotropic turbulence. Introduction to turbulent transport processes, free turbulence, and wall turbulence.
Prerequisite: MAE 550
Typically offered in Spring only

MAE 777 Structural Health Monitoring (3 credit hours)
The course will provide the students with in-depth knowledge of technologies in structural health monitoring using smart materials as sensing and actuating elements to interrogate the structures. Damage detection techniques such as wave, impedance, and vibration-based damage detection techniques will be discussed and applied to different types of structures. Advanced signal processing techniques such as wavelet, neural network, principal component analysis will be used to make the damage more quantifiable.
Prerequisite: MAE 541 or MAE 513 or equivalent
Typically offered in Spring only

MAE 789 Advanced Topics In Mechanical Engineering (1-3 credit hours)
Faculty and graduate student discussions of advanced topics in contemporary mechanical engineering.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

MAE 801 Mechanical Engineering Seminar (1 credit hours)
Faculty and graduate student discussions centered around current research problems and advanced engineering theories.
Typically offered in Fall and Spring

MAE 830 Doctoral Independent Study (1-3 credit hours)
Individual investigation of advanced topics under the direction of member(s) of the graduate faculty.
Typically offered in Spring only

MAE 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

MAE 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

MAE 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

MAE 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

MAE 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

MAE 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Typically offered in Fall, Spring, and Summer

Mechanical Engineering Systems (MES)

MES 200 Introduction to Mechanical Engineering Systems (2 credit hours)
This course introduces students to mechanical engineering systems and its application in real-world problem solving. Using Excel and MATLAB, students will structure and solve problems. Through hands-on activities, students will become familiar with basic mechanical components, tools and machines. Students will be introduced to professionalism in engineering and develop a personal professional development plan. This course requires a field trip to a local business and students will be required to provide or arrange for their own transportation. Course contains a required laboratory component.
Corequisite: MAE 206
Typically offered in Fall only
MES 201 Mechanical Engineering Systems Lab I (2 credit hours)
Course provides an introduction to the theory and practice of manual and computer assisted laboratory measurement techniques, data analysis, design of experiments and technical report writing. Students learn to successfully conduct and document an engineering experiment. This course requires a field trip to a local business and students will be required to provide or arrange for their own transportation.

Prerequisite: MAE 206
Typically offered in Spring only

MES 300 Systems Engineering (4 credit hours)
This course provides an introduction to the theory and practice of formal systems engineering. Students are exposed to systems thinking, systems modeling and performing engineering design within a formal systems engineering framework. They will perform requirements definition and analysis, system architecting, test and integration plan development, economic evaluation of alternatives, and formal technical reviews. Requires Junior standing.

Prerequisite: MES 200 and C or better in MAE 206
Typically offered in Fall only

MES 301 Mechanical Engineering Systems Lab II (2 credit hours)
This is the first course in a series of three upper level laboratory courses MES 301, 302, and 400. In each course, students apply the measurement and experimental techniques learned in MES 201 to explore, experience and verify key theoretical mechanical engineering concepts. MES 301 focuses on the fields of fluid mechanics, dynamics of machines, digital design, and electrical engineering. Course requires a field trip to a local business and students will be required to provide or arrange for their own transportation.

Prerequisite: MES 201; Corequisite: MAE 308 and MAE 315
Typically offered in Fall only

MES 302 Mechanical Engineering Systems Lab III (2 credit hours)
This is the second course in a series of three upper level laboratory courses. MES 302 focuses on the fields of fluid mechanics, dynamic systems controls, and instrumentation. Students also experience engineering design by designing, building and testing an instrumentation device for engineering measurements. Course requires a field trip to a local business and students will be required to provide or arrange for their own transportation.

Prerequisite: MES 301; Corequisite: MAE 435
Typically offered in Spring only

MES 305 Mechanical Engineering Systems Lab I (1 credit hours)
Course provides an introduction to the theory and practice of manual and computer assisted laboratory measurement techniques, data analysis, design of experiments and technical report writing. Students learn to successfully conduct and document an engineering experiment. For MES Majors only.

Prerequisite: MSE 201 and MAE 206
Typically offered in Spring only

MES 400 Mechanical Engineering Systems Lab IV (2 credit hours)
This is the final course in a series of three upper level laboratory courses. MES 400 focuses on the fields of fluid mechanics, heat transfer, digital design, and solid mechanics. Students also finish the design experience started in MES 302. Course requires a field trip to a local business and students will be required to provide or arrange for their own transportation.

Prerequisite: MES 302; Corequisite: MAE 310
Typically offered in Fall only

MES 401 MES Capstone Design I (3 credit hours)
This course is first of a two-semester engineering design and manufacturing experience which is the culmination of the MES student’s undergraduate education experience. In teams, students design, cost, and build a working prototype to solve a real-world engineering problem supplied by an industry partner. Students follow a systems engineering approach to manage their project through a requirements definition review, a preliminary design review, and the completion of detailed design. Students develop communication skills through reports and presentations and gain insight into engineering design through guest lectures. Students must provide any transportation needed for this class.

Prerequisite: MES 300 and MAE 316; Corequisite: MAE 310 and MAE 415
Typically offered in Fall only

MES 402 MES Capstone Design II (4 credit hours)
This course is second in a two semester engineering design and manufacturing experience which is the culmination of the MES student's undergraduate education experience. In teams, students solve a real-world engineering problem supplied by an industry partner. In the two courses, students follow a formal systems engineering approach to manage their project through the following reviews: System Requirements, Conceptual Design, Preliminary Design, and Critical Design. Students develop written and verbal communication skills and gain insight into engineering design practices through guest lectures from local engineers. Students must provide any transportation needed for this class.

Prerequisite: MES 401
Typically offered in Spring only

MES 403 MES Capstone Design II (3 credit hours)
This course sequence is the second in the senior capstone engineering design experience. This capstone experience is the culmination of the MES student's undergraduate education experience. Working in teams, students perform engineering design to solve a real-world engineering problem supplied by an industry partner. In MES 401 & MES 403, students follow a formal systems engineering approach to manage their design project through the completion of a System Requirements Review, a Conceptual Design Review, a Preliminary Design Review, a Detailed Design Review, and a Critical Design Review. Students develop written and verbal communication skills through reports and presentations. Students also gain insight into engineering design practices through guest lectures from local engineers. Course requires travel to sponsor and students are required to provide or arrange for their own transportation.

Prerequisite: MES 401
Typically offered in Spring only
MES 405 Mechanical Engineering Systems Lab II (2 credit hours)
In this course, students apply the measurement and experimental techniques learned in MES 305 to explore, experience and verify key theoretical concepts from the fields of thermal science, fluid mechanics, solid mechanics, and dynamics and controls. Students learn to successfully design, conduct, analyze, document and present a statistically sound engineering experiment. For MES students only.
Prerequisite: MES 305 and MAE 314 and MAE 308; Corequisite: MAE 435 and MAE 310
Typically offered in Fall only

Medical Textiles (MT)

MT 105 Introduction to Medical Textiles (3 credit hours)
Introduction to the structures and methods of production of polymers, fibers, yarns and fabrics used in medical applications. Survey of the performance requirements of current medical textiles and healthcare products used in health centers, as surgical implants and as consumer products. Overview of the structure, organization and integration of the medical textile, medical device and pharmaceutical industries within the healthcare sector. Credit not allowed if previous credit for TT 105

Typically offered in Fall and Spring

MT 323 Introduction to Theory and Practice of Medical Fiber and Yarn Formation (3 credit hours)
Introduction to the manufacture of fibers and filament yarns used in medical textiles. It includes the flow behavior of polymeric materials as it relates to fiber formation. It also includes the application of fiber forming theories to synthetic and biopolymers.
Prerequisite: (PY 211 or (PY 205 and PY 206)) and (PCC 203 or CH 221 or CH 225 or TE 200)
Typically offered in Fall and Spring

MT 366 Biotextile Product Development (3 credit hours)
Overview of the product development process for medical textiles and implantable biotextile devices. FDA classification system for medical and healthcare products. Review steps in identification of healthcare needs, market size and demand, product specifications and design, prototype fabrication and sterilization, in vitro testing of mechanical, chemical, surface and biological properties, in vivo animal testing, regulatory issues, consumer and clinical trials and explant analysis. Examples of medical textiles for personal hygiene, wound care, external support, orthopedic, general surgery, dental and tissue engineering applications. The student will be introduced to the process of new product development as it applies to medical textiles and biotextiles.
Prerequisite: (TT 105 or MT 105 or PCC 105), (TE 200 or CH 223 or 227), and TT 327; Co-requisite: TT 305, TT 341, and TT 351
Typically offered in Spring only

MT 381 Medical Textile and the Regulatory Environment (3 credit hours)
The course will focus on the legal and regulatory environment as it impacts the design, manufacture, marketing and distribution of medical textiles and healthcare products. Fundamentals of legal theory, contract law, intellectual property, licensing, product liability and the Food and Drug Administration will be covered, providing the student with the ability to recognize and understand the legal issues involved with the medical textile supply chain.
Prerequisite: Junior standing.
Typically offered in Fall and Spring

MT 432 Biotextiles Evaluation (3 credit hours)
Evaluation of the performance of biotextiles and medical polymers in biological and microbiological environments, with an emphasis on in vitro and in vivo techniques for testing the biocompatibility and biostability of implantable biomedical products. Related issues will deal with quality assurance systems, inspection and sampling plans, ISO certification, good manufacturing practices, reference materials and organisms, and the use of accelerated tests and animal trials so as to meet regulatory requirements.
Prerequisite: TT 327 or MT 323 and BIO 183; Corequisite: MT 366 or TE 466
Typically offered in Fall only

MT 471/PCC 471 The Chemistry of Synthetic and Natural Bipolymers (3 credit hours)
Introduction to natural and synthetic biopolymers used for biomedical applications. Goals and challenges of biomaterials selection for biomedical engineering. Polymer concepts of polymerization and characterization. Sources/synthesis, chemical and physical properties and degradation mechanisms are described. Polymer classes include: polysaccharides, proteins, polyesters, polyurethanes, polyanhydrides and polyethers.
Prerequisite: CH 220 or 221 or 225
Typically offered in Spring only

Microbiology (MB)

MB 101/BCH 101 Introduction to Microbiology and Biochemistry Laboratory Practices (3 credit hours)
Curricular bridge between high school and college for high school and transitional students. A "hands on" introduction to fundamentals in Microbiology and Biochemistry. Bacterial isolation, identification and growth using aseptic technique, microscopy, and metabolic analysis. Experiments with DNA isolation and analysis, protein isolation, and purification, and enzyme kinetics. Lectures and readings on background, theory and applications of these techniques. Field trips to university and industry research laboratories. This course is part of the Summer College in Biotechnology and Life Sciences (SCIBLS) as well as other pre-college, transitional and early-college programs and is offered as 4 week intensive course. Applicants should have completed high school courses in biology and chemistry. Students must have completed no more than 30 credit hours. Departmental approval is required for current NCSU students.

Typically offered in Summer only
MB 103 Introductory Topics in Microbiology (1 credit hours)
Introduction to scope and objectives of university education. Emphasis on microbiology. Career opportunities, computers, university resources.

*Typically offered in Fall only*

MB 180 Introduction to Microbial Bioprocessing (3 credit hours)
Curricular bridge between high school and college for high school and transitional students. Fundamental cell biology concepts pertaining to biomanufacturing. Students gain an understanding of the basic principles of microbiology, culture preparation, physiology, and genetics of microbial cell cultures. Team-based decisions, collaborations and consideration of multiple perspectives are emphasized. Practical experience in laboratory and course techniques used in biomanufacturing. Transportation will be provided for field trips. This course is part of the Summer College in Biotechnology and Life Sciences (SCIBLS), as well as other pre-college, transitional and early-college programs. Suitable for students with less than 30 credit hours.

*Typically offered in Summer only*

MB 200 The Fourth Horseman: Plagues that Changed the World (3 credit hours)
An integrated and in-depth study of select microbial pathogens and their influence on history, public health, and human affairs. Five major pathogens will be examined to identify causative agents of disease, modes of transmission, prevention, and treatment. These pathogens will be framed in the power of plagues to shape human history and their impact on public health.

**GEP Interdisciplinary Perspectives, GEP Natural Sciences**
*Typically offered in Fall, Spring, and Summer*

MB 210/BIT 210 Phage Hunters (3 credit hours)
This course offers first-year students an opportunity for mentored research. Students will apply the scientific method to make novel discoveries. Students will isolate and characterize naturally-occurring bacteriophage (viruses that infect bacteria, but not humans) from the environment. They will present their data to each other, and the genome of one phage will be sequenced. Students have the option to continue in a second semester to annotate that genome, culminating in a submission to genbank and a poster presentation. Students in the course are part of the National Genome Research Initiative funded by The Howard Hughes Medical Institute. Student should have had a high school biology course before taking this course.

**GEP Natural Sciences**
*Typically offered in Fall only*

MB 211/BIT 211 Phage Genomics (2 credit hours)
This course offers first-year students an opportunity for mentored research. Students will apply the scientific method to make novel discoveries. Students will build on the work they began in BIT/MB 210: The novel phage isolated in the previous semester will undergo genome sequencing over winter break, and in this course students will learn to analyze and annotate the genome sequence. This semester will culminate in a submission to genbank and a poster presentation. Students in the course are part of the national genome research initiative funded by the Howard Hughes Medical Institute.

Prerequisite: BIT(MB) 210
**GEP Natural Sciences**
*Typically offered in Spring only*

MB 351 General Microbiology (3 credit hours)
Rigorous introduction to basic principles of microbiology for students in biological and agricultural sciences and for all students planning to take further courses in microbiology.

Prerequisite: One Biology course (BIO 181, BIO 183, ZO 150 or ZO 160) and one Organic Chemistry course (CH 221 or CH 220)

**GEP Natural Sciences**
*Typically offered in Fall, Spring, and Summer*

MB 352 General Microbiology Laboratory (1 credit hours)
Laboratory experience in general microbiology. Aseptic technique, isolation and identification of bacteria, staining and microscopy. Enumeration of bacteria and viruses. Students who have completed either MB (BEC) 320 or MB 354 may not take this course for credit.

Corequisite: MB 351
*Typically offered in Fall and Spring*

MB 354 Inquiry-Guided Microbiology Lab (1 credit hours)
Inquiry-guided laboratory experience in general microbiology, for microbiology majors and honors students, and those desiring a more rigorous exposure to this topic. Aseptic technique, isolation and identification of bacteria, staining and microscopy, and Koch's postulates. Restricted to microbiology majors and honor's students. Others require departmental permission. Credit is not allowed for both MB 354 and either Mb 320 or MB 352.

Corequisite: MB 351
*Typically offered in Fall and Spring*

MB 360 Scientific Inquiry in Microbiology: At the Bench (3 credit hours)
Scientific questions, controls and variables, designing, preparing for and carrying out experiments, keeping a notebook, interpreting results, and presenting their findings: i.e. the pragmatic things a student must know in order to work efficiently in a research lab regardless of the discipline. Prior or current enrollment in MB 352 or MB 354 is recommended.

Prerequisite:CH 101 and BIO 183 (both with a C- or better)
*Typically offered in Fall only*

MB 405/FS 505/MB 505/FS 405 Food Microbiology (3 credit hours)
Microorganisms of importance in foods and their metabolic activities. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes. Credit will not be given for both FS/MB 405 and FS/MB 505.

Prerequisite: MB 351
*Typically offered in Spring only*

MB 406/FS 506/MB 506/FS 406 Food Microbiology Lab (1 credit hours)
Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.

Prerequisite: MB 351 and Corequisite: FS 405 or FS 505
*Typically offered in Spring only*
MB 411 Medical Microbiology (3 credit hours)
Comprehensive study of microbial pathogenesis and mammalian host resistance. Diagnosis, prevention, and therapy of common human diseases of microbial origin.

Prerequisite: MB 351
Typically offered in Fall and Spring

MB 412 Medical Microbiology Laboratory (1 credit hours)
Laboratory experience to complement MB 411. Techniques of detection, growth and identification of bacteria and viruses relevant in clinical microbiology laboratories. Good laboratory practices (GLP) and safety stressed.

Prerequisite: MB 352 or MB 354 and Corequisite: MB 411
Typically offered in Fall only

MB 414 Microbial Metabolic Regulation (3 credit hours)
An integrative perspective on bacterial physiology and metabolism through an analysis of metabolic regulatory functions.

Prerequisite: MB 351 and either BCH 351 or 451
Typically offered in Fall only

MB 420/MB 520 Fundamentals of Microbial Cell Biotransformations (2 credit hours)
This is a half-semester course. Basic microbial cell culture theory and practice: cell physiology, mass balances, and metabolic control as seen in a dynamic bioreactor process to be scalable, consistent, and robust. The lab portion of the course provides students with hands-on experience in culture techniques using bioreactors. Students who have completed MB(BEC) 520 may not take BEC (MB) 420 for credit.

Prerequisite: MB 352 OR Corequisite of BEC(MB) 320
Typically offered in Fall only

MB 435/MB 535 Bacterial Pathogenesis (3 credit hours)
Focuses on basic principles of bacterial pathogenesis, including mechanisms utilized by these microbes to attach/adhere, internalize or invade, and disseminate through their animal hosts. Bacterial strategies to subvert host defenses and persist within their animal hosts defense mechanisms, and virulence gene regulation will also be discussed. Students cannot get credit for both MB 435 and MB 535. Graduate status required for MB 535.

Prerequisite: MB 411, Graduate standing
Typically offered in Spring only

MB 441 Immunology (3 credit hours)
Introduction to principles of molecular immunology. Overview of immune system development and function, and discussions of ongoing scientific research regarding immune regulation.

P: C- or better in (MB 351 or BCH 351 or BCH 451 or BIO 414 or PB 414 or BIO 421)
Typically offered in Fall and Spring

MB 451 Microbial Diversity (3 credit hours)
Molecular, biochemical, and evolutionary diversity of the microbial world, including Bacteria, Archaea, and Eukaryotes. Evolutionary perspective on microbial relationships, molecular methods of study and classical and modern biotechnological methods utilizing this genetic diversity to explore the microbial world and use the resulting insight to meet the needs of our own species.

Prerequisite: MB 411 and (GN 311 or BCH 351 or BCH 451)
Typically offered in Spring only

MB 452 Microbial Diversity Lab (2 credit hours)
This lab course is project-oriented. Students perform a series of classical enrichments and isolations, starting from environmental samples collected by the students themselves. Some of these isolations serve as the starting materials for a series of modern molecular biology experiments, in which students purify DNA, amplify ribosomal DNA by PCR, and have a portion of this gene sequenced. This sequence information is the starting point for the term project, a detailed molecular phylogenetic analysis of the isolated organisms. Students will be required to provide their own transportation during non-scheduled class time for local field sample collection.

Prerequisite: MB 412; Corequisite: MB 451
Typically offered in Fall only

MB 455 Microbial Biotechnology (3 credit hours)
Introduction to industrial microbiology with focus on biotechnology including developments employing recombinant nucleic acid and monoclonal antibody techniques. Bioremediation, industrial enzymes, transgenic plants, biopesticides, medical diagnostics, recombinant vaccines production of important secondary metabolites, and other topics. Field trips to local biotechnology companies.

Prerequisite: MB 351 and GN 311
Typically offered in Spring only

MB 461 Molecular Virology (3 credit hours)
Introduction to principles of molecular virology. Overview of classification and nomenclature, virus structure, interaction of viruses with cells, organisms (immunology, pathology), and populations (epidemiology). Detailed case studies from major groups of viruses; picornaviruses, togaviruses, orthomyxoviruses, retroviruses, polyomaviruses, and herpesviruses.

Prerequisite: MB 351, MB 411
Typically offered in Spring only

MB 470 Emerging and Re-emerging Infectious Diseases (3 credit hours)
Human behavior plays a big part in the emergence and reemergence of infectious diseases. Humanity encroaches consistently into previously uninhabited parts of the planet increasing the risk of exposure to novel pathogens that have the potential to jump

Prerequisite: MB 351
Typically offered in Spring only
MB 479/MB 579 Microbial Symbiosis & Microbiomes (3 credit hours)
Microbial symbioses affect all life on earth. A recent surge of research has identified the critical role of microbial symbionts in maintaining host health and well-being, for example by mediating the breakdown of food for host nutrition, priming the immune system and directly fighting off pathogenic bacteria, and triggering key physiological outcomes associated with behavior and development. This course explores core topics in the study of microbial symbioses, including partner recognition and communication, adaptations to host association, the role of symbiosis in genome evolution and ecology, and the effects of microbial symbiosis on host health. Lectures and discussions will draw heavily from the primary literature in the field of microbiome/symbiosis research, focusing on the most recent discoveries, key methodological advancements, and on diverse associations ranging from marine symbioses to the human microbiome.
Prerequisite: MB 351 General Microbiology
Typically offered in Fall only

MB 480 Current Issues in Microbiology (1 credit hours)
Library research on current topics in all areas of microbiology. Presentation of research results orally and in the form of a major term paper.
Prerequisite: SMB majors or minors, Senior standing, and MB 351
Typically offered in Fall and Spring

MB 492 External Learning Experience (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

MB 501/PP 501/PB 501 Biology of Plant Pathogens (3 credit hours)
Biology of microbes that cause plant diseases. The ecology, genetics, physiology, taxonomy, and mechanisms of parasitism, pathogenicity and virulence of bacteria (and other prokaryotes), fungi (and oomycetes), nematodes, and viruses that cause plant diseases. Prepares graduate students for advanced courses in plant pathology, host-parasite interactions, and provides a knowledge base for students in other disciplines involved with plant pathogens or who seek to broaden their knowledge of microbes.
Prerequisite: PP 315, or PP 318, or an introductory course in microbiology
Typically offered in Fall only

MB 505/FS 405/MB 405/FS 505 Food Microbiology (3 credit hours)
Microorganisms of importance in foods and their metabolic activities. Source of microbial contamination during food production, processing and storage. Microbial spoilage; foods as vectors of human pathogens. Physical and chemical destruction of microorganisms in foods and the kinetics involved. Conversions of raw foods by microorganisms into food products. Microbiological standards for regulatory and trade purposes. Credit will not be given for both FS/MB 405 and FS/MB 505.
Prerequisite: MB 351
Typically offered in Spring only

MB 506/FS 406/MB 406/FS 506 Food Microbiology Lab (1 credit hours)
Laboratory experience to complement FS/MB 405. Skills in detecting and quantitating microorganisms and their toxins in foods. Application of colony and direct microscopic counts, most probable numbers, enzyme immunoassays, nucleic acid probes and computer modeling are used to understand the numbers and types of microorganisms or microbial end products in foods. Laboratory safety and oral and written reports are emphasized.
Prerequisite: MB 351 and Corequisite: FS 405 or FS 505
Typically offered in Spring only

MB 520/MB 420 Fundamentals of Microbial Cell Biotransformations (2 credit hours)
This is a half-semester course. Basic microbial cell theory and practice: cell physiology, mass balances, and metabolic control as seen in a dynamic bioreactor process to be scalable, consistent, and robust. The lab portion of the course provides students with hands-on experience in culture techniques using bioreactors. Students who have completed MB(BEC) 520 may not take BEC (MB) 420 for credit.
Prerequisite: MB 352 OR Corequisite of BEC(MB) 320
Typically offered in Fall only

MB 532/SSC 532 Soil Microbiology (4 credit hours)
Soil as a medium for microbial growth, the relation of microbes to important mineral transformations in soil, the importance of biological equilibrium and significance of soil microbes to environmental quality.
Prerequisite: MB 351, CH 220

MB 535/MB 435 Bacterial Pathogenesis (3 credit hours)
Focuses on basic principles of bacterial pathogenesis, including mechanisms utilized by these microbes to attach/adhere, internalize or invade, and disseminate through their animal hosts. Bacterial strategies to subvert host defenses and persist within their animal hosts defense mechanisms, and virulence gene regulation will also be discussed. Students cannot get credit for both MB 435 and MB 535. Graduate status required for MB 535.
Prerequisite: MB 411, Graduate standing
Typically offered in Spring only

MB 555 Microbial Biotechnology (3 credit hours)
Overview of industrial microbiology focusing on current biotechnology methods (bacteria, yeast, fungi) employing rDNA, optimization of heterologous gene expression, microbial metabolic pathway engineering, metabolomics, protein engineering and recombinant antibodies. Genetic and pathway engineering strategies for developing new microbes to screen for new therapeutic compounds or overproduce: primary metabolites, antibiotics, biotherapeutic proteins, industrially useful enzymes, medical diagnostics, recombinant vaccines, biopolymers. Utilization of biofilms, methods to immobilize biocatalysts, and microbial kinetics are also covered. Field trip to local biotechnology company. Students cannot receive credit for both 455 and 555.
Prerequisite: Undergraduate microbiology, genetics, and biochemistry course: MB351, BCH 351, and GN 311
Typically offered in Spring only
MB 575/PP 575/PB 575 Introduction to Mycology (4 credit hours)
Prerequisite: BS 125 or BS 181 and 183 or BO 200 or PP 315 or PP 318
Typically offered in Fall only

MB 579/MB 479 Microbial Symbiosis & Microbiomes (3 credit hours)
Microbial symbioses affect all life on earth. A recent surge of research has identified the critical role of microbial symbionts in maintaining host health and well-being, for example by mediating the breakdown of food for host nutrition, priming the immune system and directly fighting off pathogenic bacteria, and triggering key physiological outcomes associated with behavior and development. This course explores core topics in the study of microbial symbioses, including partner recognition and communication, adaptations to host association, the role of symbiosis in genome evolution and ecology, and the effects of microbial symbiosis on host health. Lectures and discussions will draw heavily from the primary literature in the field of microbiome/symbiosis research, focusing on the most recent discoveries, key methodological advancements, and on diverse associations ranging from marine symbioses to the human microbiome.
Prerequisite: MB 351 General Microbiology
Typically offered in Fall only

MB 585 Industry Case Studies in Microbial Biotechnology (3 credit hours)
Project-based course directly working with biotechnology and pharmaceutical companies. Students work in teams on a company-specific project. Projects range from developing business or marketing plans for new products; writing Small Business Innovation Research (SBIR) grants or white papers; creating procedures, protocols, and/or process improvements for a company-specific process; and studying intellectual property issues. Written and oral communication skills as well as teamwork, flexibility, and ambiguity management are emphasized. Restricted to MBT students.
Typically offered in Fall and Spring

MB 590 Topical Problems (1-3 credit hours)
Informal group discussion of prepared topics assigned by instructor.
Prerequisite: Graduate standing

MB 601 Seminar (1 credit hour)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

MB 610 Special Topics Microbiology (1-6 credit hours)
The study of special problems and selected topics of current interest in microbiology and related fields.
Typically offered in Fall, Spring, and Summer

MB 620 Special Problems (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in microbiology.
Typically offered in Fall, Spring, and Summer

MB 624 Topical Problems (1-3 credit hours)
Prerequisite: Graduate standing
Typically offered in Spring only

MB 670 Laboratory Research Methods (1-3 credit hours)
Directed research of microbiology graduate students in departmental laboratories prior to selecting thesis research topic. Selection of a minimum of three laboratories for research experience lasting 3 to 5 weeks. Acquisition of research methods relevant.
Typically offered in Fall only

MB 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MB 686 Teaching Experience (1 credit hours)
Faculty mentoring in didactic and methodological aspects of teaching, including instructional technology as well as design and grading of assessment instruments. Provision of individual performance evaluations to encourage enhancement of teaching skills. Microbiology graduate students only.
Prerequisite: Microbiology Graduate student
Typically offered in Fall, Spring, and Summer

MB 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.
Prerequisite: Master's student
Typically offered in Spring and Summer

MB 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree except preparing for and taking the final master's exam. Students may register for this course a maximum of one semester.
Prerequisite: Master's student
Typically offered in Spring and Summer

MB 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

MB 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
MB 695 Master’s Thesis Research (1-9 credit hours)
Thesis research.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

MB 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master’s student
Typically offered in Summer only

MB 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master’s degree and are writing and defending their theses.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

MB 714 Microbial Metabolic Regulation (3 credit hours)
An integrative perspective on bacterial physiology and metabolism through analysis of metabolic regulatory functions.
Prerequisite: MB 351 and either BCH 351 or 451
Typically offered in Fall only

MB 715/PP 715 Applied Evolutionary Analysis of Population Genetic Data (3 credit hours)
This course will introduce nonparametric and model-based methods for making inferences on population processes (mutation, migration, drift, recombination, and selection). The goal is to provide a conceptual overview of these methods and hands-on training on how to implement and interpret the results. Sample data sets in computer laboratories will integrate summary statistic, cladistic, coalescent, and bayesian approaches to examine population processes in different pathosystems with specific emphasis on eukaryotic microbes, viruses and bacteria.

MB 718 Introductory Virology (3 credit hours)
Introduction to principles of virology including: classification and nomenclature, epidemiology, structure, genome replication, gene expression strategies and cellular infection cycle. Major groups of viruses including those with DNA genomes and positive-sense or negative-sense RNA genomes.
Prerequisite: BCH 451 or GN 411 or MB 351
Typically offered in Fall only

MB 725/FS 725 Fermentation Microbiology (3 credit hours)
Fermentation bioprocessing and characteristics, function and ecology of responsible microorganisms. Fermentative activities, growth responses and culture interactions related to metabolism, physiology and genetics of lactic acid bacteria and selected yeasts and molds. Current developments in starter culture technology and genetics; application to food and industrial fermentations.
Prerequisite: BCH 451, MB 351
Typically offered in Spring only

MB 730/PP 730/PB 730/GN 730 Fungal Genetics and Physiology (3 credit hours)
Basic concepts of genetics and physiology of fungi, with emphasis on saprophytic and plant pathogenic mycelial fungi. Current literature on evolution, cell structure, growth and development, gene expression, metabolism, sexual and asexual reproduction and incompatibility systems. Laboratory exercises on mutant isolation, sexual and parsexual analysis, genetic transformation, and RFLP and isozyme analysis.
Prerequisite: BCH 451, BO 775, GN 311 or PP 501
Typically offered in Spring only

MB 751/IMM 751 Immunology (3 credit hours)
Introduction to mechanisms of immunity in man and animals. Emphasis on interactions between cells of the immune system in production of immune responses and the molecules in control of these interactions.
Prerequisite: BCH 451, GN 411, MB 351
Typically offered in Spring only

MB 758/GN 758 Microbial Genetics & Genomics (3 credit hours)
Structure and function in microbial genetics, with emphasis on microbial genome organization, stable maintenance and evolution. DNA mutation and repair pathways, transcriptional and translational regulation, DNA replication and recombination and characterization of recombinant DNA molecules. Applications of genetic and genomic analysis methods to microbial processes, including strain construction, genome manipulation, and enhancement of gene expression.
Prerequisite: BCH 451 or GN 311
Typically offered in Spring only

MB 774/PB 774 Phycology (3 credit hours)
Introduction to taxonomy, morphology, reproduction and ecological importance of organisms which may be included in the algae. Attention to local freshwater flow and physiology of selected species in relation to algal blooms, water quality and nutrient loading in aquatic habitats.
Typically offered in Spring only

MB 783/CBS 783/IMM 783 Advanced Immunology (3 credit hours)
In depth study of the basic cellular and molecular mechanisms of immunity, including antigen processing and presentation, T cell development, initiation of the immune response, effector mechanisms, and immunological memory. The course is designed for advanced graduate students who wish to focus on the current concepts in immunology.
Prerequisite: MB (IMM) 751
Typically offered in Fall only

MB 790 Topical Problems (1-3 credit hours)
Typically offered in Fall, Spring, and Summer

MB 801 Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

MB 810 Special Topics Microbiology (1-6 credit hours)
The study of special problems and selected topics of current interest in microbiology and related fields.
Typically offered in Fall, Spring, and Summer
MB 820  Special Problems  (1-6 credit hours)
Selection of a subject by each student on which to do research and write a technical report on the results. The individual may choose a subject pertaining to his or her particular interest in any area of study in microbiology.

Typically offered in Spring and Summer

MB 824  Topical Problems  (1-3 credit hours)
Prerequisite: Graduate standing

Typically offered in Spring only

MB 870  Doctoral Lab Rotations  (1-3 credit hours)
Directed research of microbiology graduate students in departmental laboratories prior to selecting thesis research topic. Selection of a minimum of three laboratories for research experience lasting 3 to 5 weeks. Acquisition of research methods relevant

Typically offered in Fall only

MB 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

MB 886  Teaching Experience  (1 credit hours)
Faculty mentoring in didactic and methodological aspects of teaching, including instructional technology as well as design and grading of assessment instruments. Provision of individual performance evaluations to encourage enhancement of teaching skills. Microbiology graduate students only.

Typically offered in Fall, Spring, and Summer

MB 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

MB 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

MB 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

MB 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student

Typically offered in Summer only

MB 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

Military Science (MS)

MS 101  Introduction to Leadership and Values I  (1 credit hours)
This course introduces students to fundamental components of service as an officer in the United State Army. Initial lessons form building blocks of progressive lessons in values, fitness, leadership and officership. Classroom instruction includes "life skills" including physical and mental fitness, communication theory, and interpersonal relationships. Upon completion, students will be prepared to receive more complex leadership instruction.

Prerequisite: Freshman standing or Sophomore standing

Typically offered in Fall only

MS 102  Basic Military Leadership  (1 credit hours)
Familiarizes students with the fundamentals of map reading, land navigation techniques, small unit tactics and leadership, personal goal setting, Army Leadership and values, ethical decision making as well as Army basics.

Typically offered in Spring only

MS 201  Intermediate Leadership Theory I  (2 credit hours)
Instruction is orientated on communication and leadership theory using practical exercise to apply communications and leadership concepts. Critical "life skills" and their relevance to success in the Army are stressed. Upon completion of this course, students will understand fundamental principles of leadership, and be prepared to intensity practical application in subsequent coursework.

Typically offered in Fall only

MS 202  Intermediate Leadership Theory II  (2 credit hours)
This course focuses on the purpose, roles, and obligations of commissioned officers. Coursework will include origins of Army institutional values and practical application in decision making and leadership. Upon completion of this course, students will possess and understanding of leadership and officership, demonstrate the ability to apply these skills, and be prepared for the Advanced Military Science Program.

Prerequisite: MS 101

Typically offered in Spring only

MS 295  Special Topics in Military Leadership  (3 credit hours)
Intensive supervised study in applied military leadership and management in an organization or historically applied scenario. Departmental approval required.

Typically offered in Fall and Spring
Typically offered in Fall, Spring, and Summer
Prerequisite: Graduate standing

**MDS 595** Multidisciplinary Studies (MDS) (1-6 credit hours)
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

## Music (MUS)

**MUS 103 Theory and Musicianship I** (3 credit hours)
This course is a continuation of MUS 120 (Introduction to Music Theory). Topics include rhythm and meter, modes and non-diatonic scales, harmonic analysis, cadences, non-harmonic tones, and phrase structure. Students may be required to provide their own transportation and to cover the cost of an on- or off-campus musical event not to exceed $20.
Prerequisite: C- or better in MUS 120 or Rudiments Placement Test. This course may not be audited, and music minors may not take this class for S/U credit.
Prerequisite: C- or better in MUS 120 or Rudiments Placement Test; Co-requisite: Students must take MUS 103 either prior to or concurrently with MUS 104

**GEP Visual and Performing Arts**
Typically offered in Fall and Spring

**MUS 104 Theory and Musicianship Lab I** (1 credit hour)
Introduction to the art of music in Western society, for the general student. Focuses on the western art music tradition, including stylistic periods from medieval to post-modern. Begins with the study of basic musical elements, formal principles and compositional techniques. This course may require students to provide their own transportation to and cover the cost of an on- or off-campus event not to exceed $20.
Prerequisite: MUS 120 or aural skills placement test; Co-requisite: Students must take MUS 103 either prior to or concurrently with MUS 104
Typically offered in Fall and Spring

**MUS 105 Introduction to Music in Western Society** (3 credit hours)
Introduction to the art of music in Western society, for the general student. Focuses on the western art music tradition, including stylistic periods from medieval to post-modern. Begins with the study of basic musical elements, formal principles and compositional techniques. This course may require students to provide their own transportation to and cover the cost of an on- or off-campus event.

**GEP Global Knowledge, GEP Visual and Performing Arts**
Typically offered in Fall and Spring

**MUS 107 Class Piano I** (1 credit hour)
Introduction to playing the piano by learning the basics of music notation, five-finger scales, and beginner’s repertoire based on hand position.
Typically offered in Fall and Spring

**MUS 112 Men’s Choir** (1 credit hour)
Rehearsal and performance of choral repertoire for men’s voices. Includes instruction in individual vocal techniques, rehearsal protocols, and discussion of historical and musical significance of repertoire. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide their own transportation to a local performance venue.
Typically offered in Fall and Spring

**MUS 113 Women’s Choir** (1 credit hour)
Rehearsal and performance choral repertoire for women’s voices. Includes instruction in individual vocal techniques, rehearsal protocols, and discussion of historical and musical significance of repertoire. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide their own transportation to a local performance venue. Audition required. May be repeated up to 10 semesters.
Typically offered in Fall and Spring
MUS 114 Chamber Singers (1 credit hours)
Rehearsal and performance of choral repertoire for small vocal ensemble. Includes instruction in individual vocal techniques, rehearsal protocols, and discussion of historical and musical significance of repertoire. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide their own transportation to a local performance venue. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 115 State Chorale (1 credit hours)
Rehearsal and performance of advanced choral repertoire from all eras. Includes instruction in individual vocal techniques, rehearsal protocols, and discussion of historical and musical significance of repertoire. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide their own transportation to a local performance venue. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 116 African American Choral Ensemble (1 credit hours)
Students study and perform vocal music of the African diaspora, including spirituals, folk forms, traditional and contemporary gospel, and formally-composed choral works by composers of African descent. This course includes instruction in individual vocal techniques, rehearsal protocols, and discussion of the historical and musical significance of assigned repertoire. There may be a charge for concert dress not to exceed $100, and students may be asked to provide individual transportation to off-campus performances. This course may be taken for up to 10 semesters for credit. An audition is required.

Typically offered in Fall and Spring

MUS 120 Introduction to Music Theory (3 credit hours)
Introduction to Music Theory is designed for students with minimal or no music theory background and covers the fundamentals of music, including note reading in treble and bass clefs, rhythm, meter, scales, key signatures, intervals, triads, and basic keyboard skills. This course prepares students for entry into Music Theory I (MUS 103) and Aural Skills I (MUS 104), although students may elect to test out by means of a placement test. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event. Audition is not permitted. Prerequisites: None.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

MUS 121 Raleigh Civic Symphony (1 credit hours)
Rehearsal and performance of significant repertoire for symphonic orchestra from the 18th-21st centuries, including individual practice techniques, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide individual transportation to an off-campus local performance.

Typically offered in Fall and Spring

MUS 122 Raleigh Civic Chamber Orchestra (1 credit hours)
Rehearsal and performance of significant repertoire for chamber orchestra from the 17th-21st centuries, including individual practice techniques, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Possible charge for concert dress. Students may be asked to provide individual transportation to an off-campus local performance. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 131 Marching Band (1 credit hours)
Rehearsal and performance of repertoire for marching band. Study of drill and instrumental techniques, memorization, and repertoire of varying styles for large ensemble. May be repeated for credit. There is a band uniform charge; transportation to performances will be provided. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall only

MUS 132 Varsity Band (1 credit hours)
Rehearsal and performance of repertoire for varsity or athletic band. Study of instrumental techniques and repertoire of varying styles for large ensemble. May be repeated for credit. There is a band uniform charge; transportation to performances will be provided. Audition required. May be repeated up to 10 semesters.

Prerequisite: Audition required
Typically offered in Spring only

MUS 133 British Brass Band (1 credit hours)
British Brass Band provides an ensemble performing experience in a wide range of musical styles in the British Brass Band musical medium. Music is selected to provide a challenging opportunity for musical growth. Students must provide their own transportation to performances.

Typically offered in Fall only

MUS 140 Jazz Improvisation (1 credit hours)
Study of basic and advanced techniques for jazz improvisation, including in-class performance and study of historical models. May be repeated for credit up to ten semesters. Audition required.

Typically offered in Fall only
MUS 141 Jazz Combo II (1 credit hours)
Rehearsal and performance of basic to advanced repertoire for small jazz ensemble, including individual practice techniques, improvisation, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Students may be asked to provide individual transportation to an off-campus local performance. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 142 Jazz Ensemble II (1 credit hours)
Rehearsal and performance of basic to advanced repertoire for jazz ensemble, including individual practice techniques, improvisation, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Students may be asked to provide individual transportation to an off-campus local performance. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 143 Jazz Combo I (1 credit hours)
Rehearsal and performance of advanced repertoire for small jazz ensemble, including individual practice techniques, improvisation, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Students may be asked to provide individual transportation to an off-campus local performance. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 144 Jazz Ensemble I (1 credit hours)
Rehearsal and performance of advanced repertoire for jazz ensemble, including individual practice techniques, improvisation, rehearsal protocols, discussion of historical and musical significance of repertoire, and public performances. May be repeated for credit. Students may be asked to provide individual transportation to an off-campus local performance. Audition required. May be repeated up to 10 semesters.

Typically offered in Fall and Spring

MUS 150 Vocal Techniques (1 credit hours)
Development and practice of vocal techniques suitable to solo and ensemble singing in a variety of musical styles, both historical and contemporary.

Typically offered in Fall and Spring

MUS 152 Beginning Bag piping (1 credit hours)
Instruction in bag piping, including individual practice techniques and traditional performance practices. Prepares students for advancement into the NC State Pipes and Drums Band. Students will be required to purchase a bagpipe chanter and to provide individual transportation to off-campus performances. The ability to read music is not required upon entry. This course may be taken up to 6 semesters for credit.

Typically offered in Fall and Spring

MUS 153 Theory and Musicianship II (3 credit hours)
This course is a continuation of the principles taught in MUS 103. Topics include part-writing in four voices, harmonic progression, harmonic rhythm, seventh chords, secondary functions, modulation, and simple binary and ternary forms. This course may not be audited, and music minors may not take this class for S/U credit.

Prerequisites: Music Theory Placement Test or C- or better in Theory and Musicianship I (MUS 103); Corequisite: MUS 154 either after or simultaneously with MUS 153

Typically offered in Spring only

MUS 154 Theory and Musicianship Lab II (1 credit hours)
Continuation of the principles taught in MUS 104. Emphasis is placed on sight-singing and melodic dictation involving all diatonic intervals, diatonic triads and 7th chords in open positions, harmonic progressions, counterpoint in two voices, and computer-based music learning.

Prerequisite: MUS 104 or Aural Skills Placement Test; Corequisite: MUS 153 either before or simultaneously with MUS 154

Typically offered in Spring only

MUS 180 Introduction to Musical Experiences (3 credit hours)
Examination of western musical materials, forms, styles and history through the primary musical experiences of composing, performing, and listening. Course designed for students with no formal musical training.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

MUS 181 Exploring Music Theory (3 credit hours)
Exploring music theory provides the student insight into Basic theoretical elements of music from Western civilization, which are fundamental to analysis and creation of musical compositions. The course will cover tonality, rhythm, intervals, triads, composition of melodies, harmonic progressions, and lead sheets. This course will enrich the student who performs, sings, composes, and enjoys listening to music.

Prerequisite: Ability to read music
GEP Visual and Performing Arts
Typically offered in Fall and Spring

MUS 190 Preparatory Applied Music Lessons (1 credit hours)
This course offers individual instruction in voice or instrumental performance that includes the development of basic technique as well as the advancement of artistry, musicianship, and repertoire. An end-of-semester evaluation serves as a measure of progress for continuation of applied study. A lesson charge of $300.00 is assessed at the beginning of each semester. Students may be required to provide their own transportation to and cover the minimal cost of an on- or off-campus event. This course may be taken for up to 8 semesters for credit.

Prerequisite: Department Approval

Typically offered in Fall and Spring
MUS 193  Applied Music Lessons I  (1 credit hours)
Designed for the first two semesters of a four-semester program of study, this course offers individual instruction in voice or instrumental performance that includes the development of basic technique as well as the advancement of artistry, musicianship, and repertoire. An end-of-semester performance jury serves as a measure of progress for continuation of applied study. A lesson charge of $300.00 is assessed at the beginning of each semester. Students may be required to provide their own transportation to and cover the minimal cost of an on- or off-campus event.

Requisite: Music Minors Only
Typically offered in Fall and Spring

MUS 200  Understanding Music: Global Perspectives  (3 credit hours)
Understanding Music is a semester-long exploration of music's materials, contexts, and purposes. We will consider music as a global phenomenon and commonality of human social experience. Through videos, readings and listening to both recorded and live music from diverse world regions, we will examine the occasions and purposes of making music and listening. We will explore the ways in which traditions, values, belief systems, and patterns of social change are encoded and made manifest in musical practices. The ability to read music is not expected. This course can fulfill either the Interdisciplinary Perspectives (IP) or Visual & Performing Arts (VPA) GEP requirements, and the Global Knowledge (GK) co-requisite requirement.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

MUS 201  Introduction to Music Literature I  (3 credit hours)
Survey of Western art music from antiquity to the mid-18th century, with an emphasis on the characteristic forms and styles of the Medieval, Renaissance, and Baroque eras. This course examines the major composers and representative works in light of social, political, and cultural influences. The ability to read music is required.

GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall only

MUS 202  Introduction to Music Literature II  (3 credit hours)
Survey of Western art music from the mid-18th century to the present, with an emphasis on the characteristic forms and styles of the late Baroque, Classical, Romantic, and Contemporary eras. This course examines the major composers and representative works in light of social, political, and cultural influences. The ability to read music is required. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event.

GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall only

MUS 203A  Theory and Musicianship III  (3 credit hours)
As a continuation of MUS 153 (Theory and Musicianship II), this course examines compositional processes in chromatic harmony and musical form. Students acquire fluency in the written comprehension of these processes through analysis, problem solving, and notation. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus musical event not to exceed $20.

Prerequisite: MUS 153 (Theory and Musicianship II); Corequisite: MUS 204 either after or simultaneously with MUS 203
Typically offered in Fall only

MUS 204A  Theory and Musicianship Lab III  (1 credit hours)
As a continuation of MUS 154 (Theory and Musicianship Lab II), this course examines compositional processes in chromatic harmony and musical form. Students acquire fluency in the aural comprehension of these processes through rhythmic, melodic, and harmonic dictation; contextual listening and identification; composition; sight-singing; and rhythm-reading. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus musical event not to exceed $20.

Prerequisite: MUS 154 (Theory and Musicianship Lab II); Corequisite: MUS 203 either before or simultaneously with MUS 204
Typically offered in Fall only

MUS 206  America's Music  (3 credit hours)
Historical survey of music in the United States, including classical and popular, secular and religious, vocal and instrumental music genres and styles from the 18th to 21st centuries, studied in the context of relevant social and cultural issues. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Spring only

MUS 207  Class Piano II  (1 credit hours)
The study and performance of intermediate piano repertoire.

Prerequisite: MUS 107
Typically offered in Fall and Spring

MUS 208  Piano Pedagogy  (2 credit hours)
This course is designed to prepare students to teach piano at the elementary level. Topics discussed are the history of piano pedagogy; principles of pedagogy; age- and level-based learning types; technical, artistic and performance problems; music pedagogy as career; reference and teaching materials; and introduction in MIDI technology. Requirement for music minors in the piano performance emphasis. Prerequisite: MUS 390, 207, or instructor's consent.

Prerequisite: MUS 390 or MUS 207; C: MUS 390
Typically offered in Spring only

MUS 210  Introduction to Popular Music: 1950s-1970s  (3 credit hours)
This course examines the stylistic evolution and cultural impact of popular music in the United States from the 1950s through the 1970s. Musical styles discussed include American and British rock, R&B, country, folk, soul, funk, reggae, disco, and punk. No prior musical knowledge is necessary. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event. This course fulfills GEP requirements in Visual and Performing Arts.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Fall and Summer
MUS 211  Introduction to Popular Music: 1980s-Present  (3 credit hours)
The course examines the stylistic development and cultural impact of popular music in the United States from the 1980s to the present. Musical styles discussed include mainstream and alternative rock, metal, pop, country, contemporary R&B, rap, hip-hop, dance music, and electronica. No prior musical knowledge is necessary. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event. This course fulfills GEP requirements in Visual and Performing Arts.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Fall and Spring

MUS 230/AFS 230  Introduction to African-American Music  (3 credit hours)
Comprehensive survey of African-American music in the United States from Colonial times to the present, with emphasis on its unique features and contributions to American culture.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Fall only

MUS 240  Introduction to the Music Industry  (3 credit hours)
This course provides an introduction to the commercial music industry, including its history and development in the context of multiple popular and traditional genres in the United States. Introduction to the Music Industry will increase a student's understanding of common business practices and related knowledge concerning the music industry. It will also assist those students considering further study of the music industry to effectively maintain a professional music career. Students may be required to provide their own transportation to and cover the cost of on- and off-campus events.

GEP Visual and Performing Arts
Typically offered in Fall and Spring

MUS 253  Theory and Musicianship IV  (3 credit hours)
As a continuation of MUS 203 (Theory and Musicianship III), this course examines compositional processes in 20th- and 21st-century music. Students acquire fluency in the written comprehension of these processes through analysis, problem solving, and notation. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus musical event not to exceed $20.

Prerequisite: MUS 203A (Theory and Musicianship III); Corequisites: MUS 254 either after or simultaneously with MUS 253
Typically offered in Spring only

MUS 254  Theory and Musicianship Lab IV  (1 credit hour)
As a continuation of MUS 204 (Theory and Musicianship Lab III), this course examines compositional processes in 20th- and 21st-century music. Students acquire fluency in the aural comprehension of these processes through rhythmic, melodic, and harmonic dictation; contextual listening and identification; composition; sight-singing; and rhythm-reading. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus musical event not to exceed $20.

Prerequisite: MUS 203A (Theory and Musicianship III); Corequisite: MUS 253 either before or simultaneously with MUS 254
Typically offered in Spring only

MUS 260/AFS 260  History of Jazz  (3 credit hours)
History of jazz and the contributions of major artists. Emphasis of the various styles that have contributed to this American art form. Investigation of structural forms in the jazz idiom.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Spring and Summer

MUS 270  Songwriting using Digital Audio Workstations  (2 credit hours)
A class specifically for songwriters, musicians, beat makers, sample manipulators and scratch artists using digital audio workstations (DAWs) as composition tools. This course will also introduce basic audio engineering, gain structure, and signal flow from interface to DAW. The goal is to explore the broader DAW platform as a tool in the songwriting process. Students will explore editing, looping, effects, equalization, plugins and rack hardware. No specific prior mathematics, engineering, or computer training required. Students may be asked to provide their own transportation to and cover the cost of an on- or off-campus event.

GEP Visual and Performing Arts, GEP Visual and Performing Arts
Typically offered in Fall and Spring

MUS 293  Applied Music Lessons II  (1 credit hours)
Designed for the second two semesters of a four-semester program of study, this course offers individual instruction in voice or instrumental performance that includes the development of basic technique as well as the advancement of artistry, musicianship, and repertoire. An end-of-semester performance jury serves as a measure of progress for continuation of applied study. A lesson charge of $300.00 is assessed at the beginning of each semester. Students may be required to provide their own transportation to and cover the minimal cost of an on- or off-campus event. Prerequisite: Music Minors only; two semesters of MUS 193 or departmental approval.

Requisite: Music Minors Only and Two Semesters of MUS 193 or Departmental Approval
Typically offered in Fall and Spring

MUS 295  Special Topics in Music  (1-3 credit hours)
Special Topics in Music

MUS 300  Chamber Music Performance  (1 credit hours)
Performance of chamber music. Emphasis on chamber literature from the sixteen through the twentieth centuries written for a wide variety of combinations ranging from string quartets to pieces written for specific instruments and voices.

Prerequisite: Satisfactorily passing audition
Typically offered in Fall and Spring

MUS 305  Music Composition  (3 credit hours)
Study and creation of musical works. Emphasis on writing original music and works imitative of conventional and contemporary musical styles. Students may have to provide their own transportation to an on- or off-campus event and to cover the cost of the...

Prerequisite: MUS 103 or consent of instructor
GEP Visual and Performing Arts
Typically offered in Fall and Spring
MUS 306/ARS 306  Music Composition with Computers  (3 credit hours)
Survey of the theory and history of computer music, compositional algorithms, digital synthesis techniques, composition of at least one computer music work -- a computer-assisted composition for traditional instruments, a piece for computer music on tape, a real-time piece, or a piece that combines tape and instrument(s). Prerequisite: Some knowledge of music or computer science (e.g. CSC 200) GEP Visual and Performing Arts Typically offered in Fall only

MUS 310  Music of the 17th and 18th Centuries  (3 credit hours)
Evolution of European music from 1600 to 1820, with emphasis on characteristics of Baroque and Classical form and style. Examination of major composers and representative works in light of social, political and cultural influences. Students may be required to attend an on- or off-campus event at their own cost and to provide their own transportation.

GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall and Spring

MUS 315  Music of the 19th Century  (3 credit hours)
A survey of 19th century European music, including analysis of its texts, forms and composers, and its relations to other art forms of the period. This course fulfills GEP categories in Visual and Performing Arts and Global Knowledge. Students may be required to attend an on- or off-campus musical event at their own cost and to provide their own means of transportation.

GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall and Spring

MUS 320  Music of the 20th Century  (3 credit hours)
This course is a study of Western Art Music from 1900 to the present, emphasizing significant composers, repertoire, and compositional procedures and trends, including traditional, atonal, serial, aleatoric, electronic and computer music. The ability to read music is not required. Students may be required to attend and cover the cost of an on-campus event. This course fulfills GEP categories in Visual and Performing Arts and Global Knowledge.

GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall only

MUS 330  Survey of Musical Theater  (3 credit hours)
Survey of staged musical works spanning four centuries. Emphasis on large-scale dramatic works in the genres of opera, operetta, and musical. Designed for students with musical and/or theatrical experience. Students may be required to provide their own transportation to and cover the cost of an on- or off-campus event.

GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall only

MUS 350  Music of Asia  (3 credit hours)
Examination of music from a variety of Asian traditions including India and Pakistan, Japan and Korea, Thailand and Indonesia. Emphasis place on philosophical, social and religious contexts from which music emerges and in which it is experienced by native performers and listeners. No previous formal training in music is required.

GEP Global Knowledge, GEP Visual and Performing Arts Typically offered in Fall only

MUS 360/WGS 360  Women In Music  (3 credit hours)
The role of women in music as patrons, teachers, composers, and performers, placing them within the social, economic, and political framework to which they belong. Emphasis on Western Art Music and the role of women in popular music. No previous formal training in music is required.

GEP U.S. Diversity, GEP Visual and Performing Arts Typically offered in Spring only

MUS 370  Intermediate Songwriting using Digital Audio Workstations  (2 credit hours)
This class is designed for intermediate songwriters, musicians, beat makers, sample manipulators, and scratch artists using digital audio workstations (DAWs) as composition tools. Intended as a continuation of MUS 270, this course provides intermediate audio engineering and applied technical knowledge, such as equalization, compression, digital signal processing and mixing. Weekly assignments demonstrate command of the sonic and technical aspects of digital audio as well as the craft of songwriting. Students may be asked to provide their own transportation to and cover the minimal cost of an on- or off-campus event. Prerequisite: MUS 270 or departmental approval.

Prerequisite: MUS 270 or Departmental approval Typically offered in Fall and Spring

MUS 393  Recital  (1 credit hour)
The recital is the capstone for students in the Music Minor performance concentration. Students receive weekly individual instruction culminating in a public solo recital. Students also receive instruction in organizing the recital. A lesson charge of $300.00 is assessed at the beginning of the semester. Pending departmental approval, this course may be taken for up to two semesters for credit. Students may be required to provide their own transportation to and cover the minimal cost of an on- or off-campus event. Prerequisite: two semesters of MUS 293 or departmental approval.

Prerequisite: two semesters of MUS 293 or departmental approval Typically offered in Fall and Spring

MUS 495  Special Topics in Music  (3 credit hours)
Examination of selected topics in music.

Typically offered in Fall and Spring

MUS 498  Independent Study in Music  (1-3 credit hours)
Directed independent study of selected topics for students with specialized interests in music and/or advanced musical ability. Credit and content determined by faculty member in consultation with Director of Music. Individualized/Independent Study and

Natural Resources (NR)

NR 219  Natural Resource Markets  (3 credit hours)
A brief overview of financial markets relevant to natural resources and real assets. An introduction to traditional and non-traditional markets including timber markets, carbon and bioenergy markets, conservation banking, and wetland and stream mitigation credits. Investment analysis criteria and market and non-market valuation of natural resources.

GEP Social Sciences Typically offered in Spring only
NR 293 Independent Study in Natural Resources (1-6 credit hours)
Independent Study for Natural Resources students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Stan
Typically offered in Fall, Spring, and Summer

NR 294 Independent Study in Natural Resources (1-6 credit hours)
Independent Study for Natural Resources students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Stan
Typically offered in Fall, Spring, and Summer

NR 295 Special Topics in Natural Resources (1-3 credit hours)
Special Topics in Natural Resources at the 200 level for offering of courses on an experimental basis.
Typically offered in Fall, Spring, and Summer

NR 300 Natural Resource Measurements (4 credit hours)
Theory and practice of measuring, analyzing, and describing the characteristics of natural ecosystems. Surveying and mapping, inventory of vegetation, soils, wildlife habitat, and hydrology. Sampling, data analysis, and presentation of data. Use of geographic information systems to store, analyze, and present environmental data. Intensive instruction and practice in communication of technical information
Prerequisite: (PB 360 or BIO 360) and ST 311
Typically offered in Spring only

NR 301 Practicum for Professional Development I (1 credit hours)
Instruction in professional report writing and presentation, resume preparation and interview skills, professional ethics and practices, job searching skills; review and critique of professional seminars and documents from NR 501 students; preparation for summer work experience.
Prerequisite: Junior standing, NR Majors
Typically offered in Fall only

NR 303/IDS 303 Humans and the Environment (3 credit hours)
Interactions among human populations in the biophysical system and the environment. Emphasis on current issues, ecological principles and their relationships to basic biophysical processes; considers food, population dynamics, public land and common resources, renewable natural resources, pollution, water resources, energy and non-renewable resources.
GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

NR 350 International Sustainable Resource Use (4 credit hours)
Study of sustainable use of natural resources in a global economy with consideration of consumption choices, sustainable production issues, conservation of various managed landscapes, and cross cultural perspectives. Specific topics vary somewhat by even year and study location. Travel in North America in even years and to Sweden in odd years. Domestic or international travel overnight. Depending upon travel location, possible additional expense for passport, health certificate, insurance and domestic or international travel.
Prerequisite: Sophomore standing
Typically offered in Summer only

NR 360 Internship Experience (3 credit hours)
Internship experience with a natural resource agency or company. Most internships require working and living off-campus. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be c
Prerequisite: NR 301 and Junior standing
Typically offered in Fall, Spring, and Summer

NR 400/NR 500 Natural Resource Management (4 credit hours)
Theory and practice of integrated natural resource management. Quantitative optimization, economics of multiple-use, compounding and discounting, optimal rotations, linear programming. Public and private management case studies and team projects.
Prerequisite: Senior standing in NR or ES or ETM or FOM or FWCB
Typically offered in Spring only

NR 406 Conservation of Biological Diversity (3 credit hours)
Population biology concepts fundamental to understanding the properties of the objects of conservation. Genetic diversity in agriculture, forestry, and animal breeding; the ethical and international policy issues in preservation and management.
Prerequisite: Junior standing
GEP Interdisciplinary Perspectives
Typically offered in Fall only

NR 420/FOR 520/NR 520/SOR 420 Watershed and Wetlands Hydrology (4 credit hours)
Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required. Credit will not be given for both FOR(NR)420 and FOR(NR)520.
Prerequisite: SSC 200 and (FOR 260 or PB 360 or AEC 360)
Typically offered in Fall only

NR 421/NR 521 Wetland Assessment, Delineation and Regulation (3 credit hours)
Wetland definitions and systems of classification and functional assessment; methods for assessing ecological functions of wetlands; identification and delineation of jurisdictional wetlands in accordance with US Army Corps of Engineers procedures; appl
Prerequisite: SSC 200, (PB 360 or BIO 360), and (FOR 339 or PB 405)
Typically offered in Spring only

NR 460/NR 560 Renewable Natural Resource Management and Policy (3 credit hours)
The interaction of legal principles and governmental institutions in the development and implementation of natural resource policy and management. Legal principles, constitutional provisions and the location and organization of governmental programs. Examples from both historic and current case studies.
Prerequisite: Junior standing.
GEP Social Sciences
Typically offered in Fall only
NR 484  Environmental Impact Assessment (4 credit hours)
Impact assessment principles, practices, and their evolution. Lectures and field practicums concerning problems addressed by environmental assessment practitioners. Practical implications of current regulatory requirements, especially endangered species and wetlands.

Prerequisite: Senior standing
Typically offered in Fall only

NR 491/FOR 491  Special Topics in Forestry and Related Natural Resources (1-4 credit hours)
Independent (or group) study or research of a forestry related topic with a faculty supervisor of the student's choice. Also courses offered on a trial basis.

Typically offered in Fall only

NR 493  Independent Study in Natural Resources (1-6 credit hours)
Independent Study for Natural Resources students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses".

Typically offered in Fall and Spring

NR 494  Independent Study in Natural Resources (1-6 credit hours)
Independent Study for Natural Resources students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses".

Typically offered in Fall, Spring, and Summer

NR 500/NR 400  Natural Resource Management (4 credit hours)
Theory and practice of integrated natural resource management. Quantitative optimization, economics of multiple-use, compounding and discounting, optimal rotations, linear programming. Public and private management case studies and team projects.

Prerequisite: Senior standing in NR or ES or ETM or FOM or FWCB
Typically offered in Spring only

NR 510  Military Land Sustainability (3 credit hours)
An introduction and overview of the factors that influence natural resource conservation and management on Department of Defense lands within a temporal, geographic, and environmental context and perspective. Students will gain knowledge of natural resource management and military land sustainability by reviewing (1) military land uses and training/test requirements, (2) major policies/laws impacting training/testing activities on DoD lands, and (3) planning approaches to military sustainability.

Typically offered in Fall only

NR 511  Managing Natural Resources in an Arena of Conflict (3 credit hours)
Public policy issues, such as management of natural resources, are pervasive with conflicts. Surpassing political, jurisdictional, institutional, and geographic boundaries, natural resources and environmental issues can represent multiple dimensions of uncertainties and complexities. Effective management of public issues then is an important task (and topic) for natural resource professionals who are often required to develop management strategies to resolve or at best, reduce the level of the conflict. This course examines theories and approaches for managing natural resource conflict, with emphasis on the field of public or alternative dispute resolution (ADR) and its spectrum of collaborative approaches. Undergraduate degree or instructor approval required.

Typically offered in Fall only

NR 512  Land Use Policy & Management (3 credit hours)
Graduate course reviewing the history, formation and implementation of major natural resource laws and policies that impact land uses. This course will provide an overview of federal laws and policies that affect decision making by land managers. Weekly lectures will be followed by student presentations of a selected case study of their choosing in the final weeks of the course. Current natural resource / land management (including forestry, air, water, wildlife, climate change and energy) programs and institutions are discussed, analyzed and related to current land use and management policy challenges.

Restriction: undergraduate degree or instructor approval
Typically offered in Spring only

NR 520/FOR 420/NR 420/FOR 520  Watershed and Wetlands Hydrology (4 credit hours)
Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, erosion, and water quality processes in natural and managed watersheds; wetlands hydrology; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest agriculture, and urban ecosystems; watershed restoration. Emphasis field study of watersheds and hydrologic measurements. Two weekend field trips are required. Credit will not be given for both FOR(NR)420 and FOR(NR)520.

Prerequisite: SSC 200 and (FOR 260 or PB 360 or AEC 360)
Typically offered in Fall only

NR 521/NR 421  Wetland Assessment, Delineation and Regulation (3 credit hours)
Wetland definitions and systems of classification and functional assessment; methods for assessing ecological functions of wetlands; identification and delineation of jurisdictional wetlands in accordance with US Army Corps of Engineers procedures; appl

Prerequisite: SSC 200, (PB 360 or BIO 360), and (FOR 339 or PB 405)
Typically offered in Fall only

NR 548  Historical Environments (3 credit hours)
Course examines how we know and what we know about historical environments. Compares and contrasts contributions by various disciplines and interdisciplinary approaches to historical ecology and environmental history. Readings drawn from science, social science and humanities literature. Individual investigation projects required.

Typically offered in Spring only
NR 554  Introduction to Data Analysis in Natural Resources  (3 credit hours)
Data examination, cleaning, summary and visualization, statistical analyses options using various procedures of the SAS software and R with an emphasis on natural resource applications. Interpretation of statistical analyses outputs. Discussions of individual data problems. Hands-on use of computers and the SAS and R software.
Pre or Co-requisite of ST512
Typically offered in Spring only

NR 560/NR 460  Renewable Natural Resource Management and Policy  (3 credit hours)
The interaction of legal principles and governmental institutions in the development and implementation of natural resource policy and management. Legal principles, constitutional provisions and the location and organization of governmental programs. Examples from both historic and current case studies.
Prerequisite: Junior standing.

Typically offered in Fall only

NR 571  Current Issues in Natural Resource Policy  (3 credit hours)
Seminar providing an overview of current natural resource issues for the world and the U.S. Population, sustainable development, food and agriculture, forests, rangelands, biodiversity, energy resources, water resources, atmosphere and climate, international policies and instructions.
Typically offered in Fall only

NR 595  Special Topics in Natural Resources  (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore natural resources related topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems, or research not related to thesis. Also used to develop and test new 500-level courses.
Typically offered in Fall and Spring

NR 601  Graduate Seminar  (1 credit hours)
Weekly seminar in which students registered for course present the results of research and special projects. Invitation to all graduate students and faculty in department to attend and join discussion.
Typically offered in Fall and Spring

NR 610  Special Topics in Natural Resources  (1-6 credit hours)
Individual students or groups of students, under direction of a faculty member, may explore natural resources related topics of special interest not covered by existing courses. Format may consist of readings and independent study, problems, or research not related to thesis. Also used to develop and test new 500-level courses.
Typically offered in Fall and Spring

NR 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NR 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NR 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NR 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

Natural Sciences (NSGE)

NSGE 295  Natural Sciences Special Topics  (1-4 credit hours)
Special topics course offering for the general education Natural Sciences category.

GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

Natural Sciences and Global Knowledge (NSGK)

NSGK 295  Natural Sciences and Global Knowledge Special Topics  (3 credit hours)
Special topics course offering for the general education Natural Sciences and Global Knowledge categories. This course may be used for the Global Knowledge (GK) co-requisite and/or for the Natural Sciences (NS) requirement.

GEP Global Knowledge, GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

Naval Science (NS)

NS 100  Naval Science Lab  (0 credit hours)
Military drill, courtesies and honors, elements of unit leadership, physical fitness and professional development of the prospective Naval/Marine Corps Officer. Required for all Naval ROTC students.
Typically offered in Fall and Spring

NS 110  Introduction to Naval Science  (2 credit hours)
Fundamental orientation to the Naval Service emphasizing the mission, organization, regulations, customs and traditions, broad warfare components of Navy and the major challenges facing today's Navy and Marine Officers.
Typically offered in Fall only
**NS 210 Leadership and Management** (3 credit hours)
Assists students in acquiring knowledge and developing the cognitive processes necessary to make decisions in the practice of management. The student will learn the traditional foundations of management while developing decision skills to apply this knowledge in a real-world setting. The major focus is centered upon global management, ethics and social responsibility, total quality management, and cultural diversity.

**GEP Social Sciences**
Typically offered in Fall only

**NS 225 Navigation** (4 credit hours)
A broad yet thorough education in basic ship navigation. Course includes a study of various navigation methods, weather, the laws of the sea, and navigational rules. Practical work includes chart plotting and understanding relative motion.

Typically offered in Spring only

**NS 315 Naval Engineering** (3 credit hours)
Introduction to the application of engineering principles in the research, development, design, construction, and operation of ships, weapons systems, and ocean structures, with emphasis on thermodynamic processes and energy conversions.

Typically offered in Spring only

**NS 325 Naval Weapons Systems** (3 credit hours)
An introduction to the concepts and properties of electronic, physical, electromagnetic and mechanical systems to foster an understanding of the theory and principles of operation of shipboard weapons systems, course emphasizes types of weapons and fire control systems, capabilities and limitations, theory of target acquisition, identification and tracking, trajectory and ballistics principles, and basic theory of radar and sonar.

Typically offered in Fall only

**NS 330 Evolution of Warfare** (3 credit hours)
A survey of the evolution of warfare through the study of selected campaigns and classic battles with special emphasis on the principles of war, the military impact of leadership, and the evolution of tactics, weapons, and weaponry.

Typically offered in Spring only

**NS 415 Naval Operations** (4 credit hours)
A thorough exploration of the operations conducted by the U.S. Navy. Course includes a study of U.S. Naval evolutions, operations, command & control, communication, and an introduction to naval warfare doctrine. Practical applications include the determination of advanced maneuvering methods through and in-depth understanding of relative motion.

Prerequisite: NS 225 Navigation
Typically offered in Fall only

**NS 420 Naval Leadership and Ethics** (3 credit hours)
An intellectual exploration of Western moral traditions and ethical philosophy with a variety of topics, such as military leadership, core values, and professional ethics; the Uniform Code of Military Justice and Navy Regulations; and discussions relating to the roles of enlisted members, junior and senior officers, command relationships, and the conduct of warfare. The course provides students with a foundation of moral traditions, combined with a discussion of actual current and historical events in the United States navy and Marine Corps, to prepare them for the role and responsibilities of leadership in the naval service of the 21st century.

**GEP Humanities, GEP Interdisciplinary Perspectives**
Typically offered in Spring only

**NS 430 Amphibious Warfare** (3 credit hours)
A survey of the projection of sea power ashore with special emphasis on the evolution of and innovation in amphibious warfare in the 20th Century through the study of historical amphibious landings and campaigns.

Typically offered in Spring only

**NC Global Training Initiative (GTI)**

**GTI 401 US Culture and Education Colloquium** (3 credit hours)
Overview of US Culture, Higher Education in America, and Student Success Skills for degree or non-degree international students. Guest faculty lectures, media presentations, field trips, and required readings form basis for discussion groups, assignments, and capstone paper (reflection on issues discussed in class, personal development, and required community involvement). Includes break-out discussion groups, field trips, personal projects and research. Students may have additional travel cost associated with field trips. Enrollment limited to first year international students, participants in NC Global Training Initiative Certificate Programs, or by permission of the instructor.

Typically offered in Fall only

**Nonprofit Studies (NPS)**

**NPS 340 Fundamentals of Grant Development for Nonprofits** (3 credit hours)
The focus of this class is on obtaining grant funding for nonprofit organizations. This course covers the skills and strategies essential to the grants development process including basic strategies for researching funding sources and developing success

Typically offered in Spring only

**NPS 395 Special Topics in Nonprofit Studies** (1-6 credit hours)
Offered as needed to present material not normally available in regular departmental course offerings or for offering of new courses on a trial basis.
### Nonwovens (NW)

**NPS 490 Service Learning Internship in Nonprofit Studies** (3 credit hours)
The 150 hour (3 credit hour) online service learning internship course provides students with the opportunity to apply the knowledge, skills, and abilities gained through their coursework in the Nonprofits Studies Minor to a nonprofit organizational work setting. The online course builds on previous coursework in the minor and focuses learning from these courses on application to a service learning work setting by requiring students to reflect on the applicability of the Five Leadership Challenges studied throughout the minor to their real work experience. Students are expected to be active participants in work place discussions, lending expertise, ideas and knowledge from their course work to the organizations and their leaders.

Prerequisite: PS 203 and COM 466 and HI 380. Restricted to Nonprofit Studies Minor Students Only.

Typically offered in Fall, Spring, and Summer

**NPS 498 Capstone Seminar in Nonprofit Studies** (1 credit hours)
This capstone seminar integrates the knowledge, skills, and abilities gained through coursework in the minor in Nonprofit Studies through class discussions and reflective writings where students draw upon previous service-learning experiences to reflect on challenges facing nonprofit leaders. Case studies and articles that focus on the themes of the minor are used to stimulate class discussions. nonprofit leaders serve as discussants. In addition, students complete and submit a Nonprofit Studies portfolio, which documents successful achievement of program objectives. Departmental approval required

Prerequisite: PS 203, COM 466, Corequisite: NPS 490

Typically offered in Fall and Spring

### Nonwovens (NW)

**NW 404/TT 404/TN 504/NW 504 Introduction to Nonwovens Products and Processes** (3 credit hours)
This course introduces the fundamentals of nonwoven structures, process, and products. It provides performance criteria, raw materials, manufacturing methods, and market outlooks of major nonwoven application segments including hygiene, wipes, filters, medical, automotive, and geotextile. Emphasis is placed on building basic understandings of process/structure/property relationship in nonwoven product and the economic justification for process and production.

Prerequisite: (MA 131 or 141), PY 205; Corequisite: TT 503

Typically offered in Fall only

**NW 405/TT 405/TN 505/NW 505 Advanced Nonwovens Processing** (3 credit hours)
Mechanisms used in the production of nonwoven materials. Design and operation of these mechanisms. Process flow, optimization of process parameters, influence of process parameters on product properties.

Prerequisite: MA 231 or MA 241, PY 211 or (PY 205 and PY 206), TT 305 or TT 404

Typically offered in Spring only

**NW 408/TT 408/TN 508/NW 508 Nonwoven Product Development** (3 credit hours)

Prerequisites: TT 405 and TT 407

Typically offered in Spring only

**NW 503/TT 503 Materials, Polymers, and Fibers used in Nonwovens** (3 credit hours)
Fundamentals of raw material used in nonwoven processes. Raw material production, chemical and physical properties of nonwoven raw materials and assessment of material properties. Introduction of structure/property relationships for these materials and how these relationships influence end use applications.

Prerequisite: MA 141, PY 205, PCC 203

Typically offered in Fall and Spring

**NW 504/NW 404/TT 404/TN 504 Introduction to Nonwovens Products and Processes** (3 credit hours)
This course introduces the fundamentals of nonwoven structures, process, and products. It provides performance criteria, raw materials, manufacturing methods, and market outlooks of major nonwoven application segments including hygiene, wipes, filters, medical, automotive, and geotextile. Emphasis is placed on building basic understandings of process/structure/property relationship in nonwoven product and the economic justification for process and production.

Prerequisite: (MA 131 or 141), PY 205; Corequisite: TT 503

Typically offered in Fall only

**NW 505/NW 405/TT 405/TN 505 Advanced Nonwovens Processing** (3 credit hours)
Mechanisms used in the production of nonwoven materials. Design and operation of these mechanisms. Process flow, optimization of process parameters, influence of process parameters on product properties.

Prerequisite: MA 231 or MA 241, PY 211 or (PY 205 and PY 206), TT 305 or TT 404

Typically offered in Spring only

**NW 506 Bonding Principles in Nonwovens** (3 credit hours)
Fundamentals of fluid mechanics and heat transfer mechanisms during the bonding nonwovens. Provide engineering and in-depth description of hydroentangling, thermal bonding and needle punching techniques. Modeling methods and laboratory work are assigned.

Prerequisite: MAE 308, MAE 310, TT /NW505

Typically offered in Fall and Summer

**NW 507/TT 507 Nonwoven Characterization Methods** (3 credit hours)

Prerequisite: ST 361, Corequisite: TT/NW 505

Typically offered in Spring only
NW 508/NW 408/TT 408/TT 508 Nonwoven Product Development (3 credit hours)

Prerequisites: TT 405 and TT 407
Typically offered in Spring only

Nuclear Engineering (NE)

NE 201 Introduction to Nuclear Engineering (2 credit hours)
An introduction to the concepts, systems and application of nuclear processes. Topics include radioactivity, fission, fusion, reactor concepts, biological effects of radiation, nuclear propulsion, and radioactive waste disposal. Designed to give students a broad perspective of nuclear engineering and an introduction to fundamentals and applications of nuclear energy.

Prerequisite: Grade of C or better in MA 241, PY 205
Typically offered in Fall only

NE 202 Radiation Sources, Interaction and Detection (4 credit hours)
Introduction to nuclear energy. Topics include radioactivity, radiation detection, interaction of radiation with matter, nuclear reactions, fission, fusion, nuclear reactors, radiation safety and protection, and laboratory measurement of nuclear radiation.

Prerequisites: C- or better in MA 242 and PY 208
Typically offered in Spring only

NE 235 Nuclear Reactor Operations Training (2 credit hours)
Principles of nuclear reactor operations. Lectures to cover basic nuclear engineering theory pertaining to fission reactor operations; laboratory sessions to provide hands on training with the PULSTAR nuclear reactor including facility pre-startup checks, approach to criticality, steady state operations, and measurement of various operating parameters. Qualified students may opt to enter training and study for the U.S. Nuclear Regulatory Commission exam to become federally licensed nuclear Reactor Operators. Does not count towards NE graduation requirements

Typically offered in Fall only

NE 290 Introduction to Health Physics (3 credit hours)
Fundamentals of ionizing radiation safety. The course will review basic physical principles, radiation sources, introductory radiation dosimetry, radiation safety guidelines, evaluation of safety measures, and basic radiation control principles for contamination and radioactive material safety to include measurement physics, counting statistics and basic radiobiology principles.

Prerequisite: MA 242 and PY 208
Typically offered in Fall only

NE 301 Fundamentals of Nuclear Engineering (3 credit hours)
Introductory course in nuclear engineering. Neutron physics, reactor operation, and reactor dynamics. Basic principles underlying the design and operation of nuclear systems, facilities and applications.

Prerequisite: MA 341 and (CSC 112 or CSC 113) and C- or better in NE 202
Typically offered in Fall only

NE 400 Nuclear Reactor Energy Conversion (4 credit hours)
Introduction to the concepts and principles of heat generation and removal in reactor systems. Power cycles, reactor heat sources, analytic and numerical solutions to conduction problems in reactor components and fuel elements, heat transfer in reactor fuel bundles and heat exchangers. Problem sets emphasize design principles. Heat transfer lab included. Credit will not be given for both NE 400 and NE 500.

Prerequisite: MAE 201 and a C- or better in NE 301
Typically offered in Spring only

NE 401/NE 501 Reactor Analysis and Design (3 credit hours)
Elements of nuclear reactor theory for reactor core design and operation. Includes one-group neutron transport and multigroup diffusion models, analytical and numerical criticality search, and flux distribution and calculations for homogeneous and heterogeneous reactors, slowing down models, introduction to perturbation theory.

Prerequisites: MA 401 and C- or better in NE 301
Typically offered in Spring only

NE 402 Reactor Engineering (4 credit hours)
A course in thermal-hydraulic design and analysis of nuclear systems. Single and two-phase flow, boiling heat transfer, modeling of fluid systems. Design constraints imposed by thermal-hydraulic considerations are discussed. A thermal-hydraulics laboratory included. Credit will not be given for both NE 402 and NE 502.

Prerequisite: MAE 308 and either NE 400 or MAE 310
Typically offered in Fall only

NE 403 Nuclear Reactor Laboratory (2 credit hours)
Nuclear reactor laboratory. A laboratory course performed on the NCSU PULSTAR reactor. Topics include reactor startup and approach to critical. Neutron flux distributions. Reactivity balances. Control rod worth and power coefficients of reactivity.

*Co-requisite: NE 401*
Typically offered in Spring only

NE 404 Radiation Safety and Shielding (3 credit hours)
Radiation safety and environmental aspects of nuclear power generation. Radiation interaction, photon attenuation, shielding theory and design project, external and internal dose evaluation, reactor effluents and release of radioactivity into the environment, transportation and disposal of radioactive waste; and environmental impact of nuclear power plants.

Prerequisite: NE 301 with a grade of C- or better or NE 419
Typically offered in Fall only

NE 405 Reactor Systems (3 credit hours)
Nuclear power plant systems: design criteria, design parameters, and economics. Topics covered include: PWR, BWR, core design, primary loops, auxiliary and emergency systems; containment, reactor control and protection systems, accident and transient behaviors.

Prerequisite: NE 401, NE 402
Typically offered in Spring only
NE 406 Nuclear Engineering Senior Design Preparation (1 credit hour)
Typically offered in Fall only
Preliminary design phase in nuclear engineering systems to prepare for the final phase design. Preliminary designs developed by teams with advice of faculty, with reports presented in oral and written form. Current and future systems emphasized, and use of computers encouraged.
Prerequisite: NE 401, Corequisite: NE 402

NE 408 Nuclear Engineering Design Project (3 credit hours)
Projects in design of practical nuclear engineering systems. Preliminary designs developed by teams with advice by faculty as needed, with reports presented in oral and written form. Current and future systems emphasized, and use of computers encouraged.
Prerequisite: NE 406
Typically offered in Spring only

NE 409/MSE 409/NE 509/MSE 509 Nuclear Materials (3 credit hours)
Introduces students to properties and selection of materials for nuclear steam supply systems and to radiation effects on materials. Implications of radiation damage to reactor materials and materials problems in nuclear engineering are discussed. Topics include an overview of nuclear steam supply systems, crystal structure and defects, dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials. Students cannot receive credit for both 409 and 509.
Prerequisite: MSE 201
Typically offered in Fall only

NE 412 Nuclear Fuel Cycles (3 credit hours)
Processing of nuclear fuel with descriptions of mining, milling, conversion, enrichment, fabrication, irradiation, reprocessing, and waste disposal. In-core and out-of-core nuclear fuel management design, including objectives, constraints, decisions and methodologies. Nuclear power plant and fuel cycle economics.
Prerequisite: NE 401
Typically offered in Fall only

NE 418 Nuclear Power Plant Instrumentation (3 credit hours)
Instrumentation and supporting systems required for control and protection of a nuclear power plant. Radiation measurement, process measurement, and reactor operating principles used to develop instrumentation requirements and characteristics. Requirements and implementations of instrumentation, control and protection systems for pressurized and boiling water reactors. Design and implementation issues include power supplies, signal transmission, redundancy and diversity, response time, and reliability.
Prerequisite: ECE 221 or ECE 331
Typically offered in Spring only

NE 419 Introduction to Nuclear Energy (3 credit hours)
Electrical power generation from nuclear fission, fundamental aspects of fission chain reaction, and reactor design. Reactor types, their static and dynamic characteristics and instrumentation. Reactor operation and safety. Nuclear fusion and fusion reactor development. Not open to majors in Nuclear Engineering.
Prerequisite: PY 202 or PY 208
Typically offered in Fall and Spring

NE 431/NE 531 Nuclear Waste Management (3 credit hours)
Scientific and engineering aspects of nuclear waste management. Management of spent fuel, high-level waste, uranium mill tailings, low-level waste and decommissioning wastes. Fundamental processes for the evaluation of waste management systems with emphasis on the safety assessment of waste disposal facilities to include nuclear criticality safety, free release and transportation. There is also a required research project for the graduate version of the course.
Prerequisite: MA 341 and PY208 (or any equivalent)
Typically offered in Fall only

NE 490/NE 590 Health Physics and Radiological Emergency Response (3 credit hours)
This is an advanced health physics course encompassing internal and external radiological dosimetry along with control of radiation fields including airborne radioactivity. Students will learn basic interactions and response functions, biological effects as well as natural and manmade sources allowing emphasis on the final coverage of nuclear emergency response.
Prerequisite: MA 341 and PY 208 (or equivalent)
Typically offered in Fall only

NE 491 Special Topics in Nuclear Engineering (1-4 credit hours)
Detailed coverage of special topics.

NE 500 Advanced Energy Conversion in Nuclear Reactors (3 credit hours)
A course which introduces concepts and principles of heat generation and removal in reactor systems. Power cycles, reactor heat sources, analytic and numerical solutions to conduction problems in reactor components and fuel elements, heat transfer in reactor fuel bundles and heat exchangers. Design principles are emphasized in homework and in-class problems. Course project is required. Credit will not be given for both NE 400 and NE 500.
Prerequisite: MAE 201
Typically offered in Spring only

NE 501/NE 401 Reactor Analysis and Design (3 credit hours)
Elements of nuclear reactor theory for reactor core design and operation. Includes one-group neutron transport and multigroup diffusion models, analytical and numerical criticality search, and flux distribution and calculations for homogeneous and heterogeneous reactors, slowing down models, introduction to perturbation theory.
Prerequisites: MA 401 and C- or better in NE 301
Typically offered in Spring only

NE 502 Reactor Engineering (3 credit hours)
Thermal-hydraulic design and analysis of nuclear systems. Single and two-phase flow, boiling heat transfer, modeling of fluid systems. Design constraints imposed by thermal-hydraulic considerations are discussed. Credit will not be given for both NE 402 and NE 502.
Prerequisite: MAE 308
Typically offered in Fall only
NE 504 Radiation Safety and Shielding (3 credit hours)
A basic course in radiation safety and environmental aspects of nuclear power generation. Topics include radiation interaction, photon attenuation, shielding, internal and external dose evaluation, reactor effluents and release of radioactivity into the environment, transportation and disposal of radioactive waste; and environmental impact of nuclear power plants. Term-long project.
Prerequisite: NE 401 or NE 520
Typically offered in Fall only

NE 505 Reactor Systems (3 credit hours)
Nuclear power plant systems: PWR, BWR and advanced concepts. Design criteria, design parameters, economics, primary and secondary loops, safety systems, reactor control and protection systems, containment, accident and transient behaviors, core design, and reactivity control mechanisms. Term-long project. Credit for both NE 405 and NE 505 is not allowed
Prerequisite: NE 401, NE 402
Typically offered in Spring only

NE 509/MSE 509/NE 409/MSE 409 Nuclear Materials (3 credit hours)
Introduces students to properties and selection of materials for nuclear steam supply systems and to radiation effects on materials. Implications of radiation damage to reactor materials and materials problems in nuclear engineering are discussed. Topics include an overview of nuclear steam supply systems, crystal structure and defects, dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials. Students cannot receive credit for both 409 and 509.
Prerequisite: MSE 201
Typically offered in Fall only

NE 512 Nuclear Fuel Cycles (3 credit hours)
Processing of nuclear fuel with description of mining, milling, conversion, enrichment, fabrication, irradiation, shipping, reprocessing and waste disposal. Fuel cycle economics and fuel cost calculation. In-core and out-of-core nuclear fuel management, engineering concepts and methodology. Term-long project. Credit for both NE 412 and NE 512 is not allowed
Prerequisite: NE 401
Typically offered in Fall only

NE 521 Principles of Radiation Measurement (3 credit hours)
Radiation detection measurement methods employed in nuclear engineering. Topics include: physics of nuclear decay and nuclear reactions, interaction of charged particles, photons, and neutrons with matter, fundamental properties of radiation measurement systems, statistical analysis of radiation measurements, common radiation detectors (gas-filled detectors, scintillators, and semiconductor detectors), data acquisition and processing methods, and radiation measurement applications.
Prerequisites: Graduate standing in Nuclear Engineering or instructor permission
Typically offered in Fall only

NE 523 Computational Transport Theory (3 credit hours)
Derivation of the nonlinear Boltzmann equation for a rarefied gas and linearization to the equation of transport of neutral particles. Deterministic methods for solving the neutron transport equation: Multigroup energy discretization; Discrete Ordinates angular discretization; various spatial discretization methods. Convergence of numerical solutions with discretization refinement. Iterative solution algorithms: inner, outer, and power iterations. Spectral analysis of inner iterations convergence and acceleration. Selection of advanced topics.
NE 401/501: Reactor Analysis and Design Advanced math & moderate programming skills are necessary. Permissible programming languages: Fortran or C++
Typically offered in Spring only

NE 526/PY 528 Introduction to Plasma Physics and Fusion Energy (3 credit hours)
Concepts in plasma physics, basics of thermonuclear reactions; charged particle collisions, single particle motions and drifts, radiation from plasmas and plasma waves, fluid theory of plasmas, formation and heating of plasmas, plasma confinement, fusion devices and other plasma applications.
Prerequisite: MA 401 and PY 208
Typically offered in Fall only

NE 529/PY 529 Plasma Physics and Fusion Energy II (3 credit hours)
This course expands on the treatment of plasmas as a system of coupled fluids and introduces the foundations of plasma kinetic theory. Derivation of the plasma kinetic equation and the Vlasov equation serve as the starting point to introduce the kinetic study of plasma systems. From this introduction of the governing equations for full kinetic treatment, methods for analyzing plasma response to electromagnetic and electrostatic perturbations using the linearized Vlasov model for uncorrelated plasmas are introduced. Kinetic stability of Vlasov plasmas is introduced and the Nyquist method is used to determine conditions for kinetic stability. The concept of correlated plasmas is then introduced through the introduction of reduced distribution functions and the BBGKY hierarchy. Finally, simple correlated systems and the Liouville model for two-system correlation is covered to look at the impact of particle correlation due to collisions and coulomb interaction.
Prerequisite: NE 528
Typically offered in Spring only
NE 531/NE 431 Nuclear Waste Management (3 credit hours)
Scientific and engineering aspects of nuclear waste management. Management of spent fuel, high-level waste, uranium mill tailings, low-level waste and decommissioning wastes. Fundamental processes for the evaluation of waste management systems with emphasis on the safety assessment of waste disposal facilities to include nuclear criticality safety, free release and transportation. There is also a required research project for the graduate version of the course.
Prerequisite: MA 341 and PY 208 (or any equivalent)
Typically offered in Fall only

NE 541 Nuclear Nonproliferation Technology and Policy (3 credit hours)
Technology and policy challenges and solutions to prevent the spread of nuclear weapons. Topics include: issues of nuclear proliferation inherent to civilian nuclear power development; technologies, processes, and policies for safeguarding nuclear materials and technology; integrating the preceding subjects to strengthen the global nuclear nonproliferation regime. Includes a field trip to Oak Ridge National Laboratory during Spring Break to gain hands-on experience with safeguards measurements of nuclear material. The field trip is required; there is no cost to the student.

Graduate standing in Nuclear Engineering or instructor consent.
Typically offered in Spring only

NE 550 Introduction to Atomistic Simulations (3 credit hours)
NE 550 is an introductory course on molecular dynamics simulations. The course covers the principles of classical and statistical mechanics that underpin the simulation methods. Emphasis is placed on writing computer programs for determining thermodynamic, structural and transport properties of different types of materials.
Prerequisite: PY 208 or equivalent and MA 341
Typically offered in Spring only

NE 577/MAE 577 Multiscale Two-phase Flow Simulations (3 credit hours)
Modeling and simulation of two-phase flows using interface tracking approach and ensemble averaging approaches. Model validation and verification based on interface-tracking data, boiling models. Nuclear reactor applications. The course focuses on interface tracking methods understanding as applied to bubbly flow simulations. Students will develop a simplified solver to track 2D bubbles/droplets throughout the course homework assignments and will learn how to apply this approach for better understanding of multi-phase flow as part of the course project.
Typically offered in Fall only

NE 590/NE 490 Health Physics and Radiological Emergency Response (3 credit hours)
This is an advanced health physics course encompassing internal and external radiological dosimetry along with control of radiation fields including airborne radioactivity. Students will learn basic interactions and response functions, biological effects as well as natural and manmade sources allowing emphasis on the final coverage of nuclear emergency response.
Prerequisite: MA 341 and PY 208 (or equivalent)
Typically offered in Fall only

NE 591 Special Topics In Nuclear Engineering I (1-6 credit hours)
Credits Arranged
Typically offered in Fall and Spring

NE 592 Special Topics In Nuclear Engineering II (1-6 credit hours)
Credits Arranged
Typically offered in Fall and Spring

NE 601 Seminar (1 credit hours)
Discussion of selected topics in nuclear engineering.
Typically offered in Fall and Spring

NE 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall only

NE 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Fall only

NE 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NE 695 Master's Thesis Research (1-9 credit hours)
The thesis research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NE 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

NE 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NE 721 Nuclear Laboratory Fundamentals (3 credit hours)
Laboratory experiments and techniques that are useful and instructive to a Nuclear Engineer. The labs include experiments on radiation detectors and detection techniques, Gamma-and X-ray spectroscopy, and use of the thermal neutron beam of the nuclear reactor for neutron imaging. All state-of-the art radiation detectors are taught and used. Restricted to Nuclear Engineering Graduate Students.
Prerequisite: MA 401 and NE 401
Typically offered in Spring only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>NE 722</td>
<td>Reactor Dynamics and Control</td>
<td>(3 credit hours)</td>
<td>Methods of describing and analyzing dynamic behavior of systems. These methods applied to reactor systems and the effects of feedbacks studies. Methods of measuring the behavior of reactor systems and development of logic systems for control and safety. Prerequisite: NE 401 or NE 520 Typically offered in Fall only</td>
</tr>
<tr>
<td>NE 723</td>
<td>Neutron Transport Theory</td>
<td>(3 credit hours)</td>
<td>Advanced theory of neutron transport and computational methods of solving particle transport (linear Boltzmann) equation for reactor physics problems. Principle topics: models of neutron transport; analytic methods for solving transport equation; asymptotic diffusion limit; PN and SPN methods, homogenization methodology; numerical methods for multidimensional problems; computational methods for multiphysics problems. Objective is to enable students to read literature and perform relevant analysis of neutron transport and reactor-physics problems. Prerequisite: NE 401 or NE 520 Typically offered in Fall only</td>
</tr>
<tr>
<td>NE 724</td>
<td>Reactor Heat Transfer</td>
<td>(3 credit hours)</td>
<td>Consideration of heat generation and transfer in nuclear power reactors. Topics include reactor heat generation, steady-state and transient heat combustion in reactor fuel elements, boiling heat transfer and single and two-phase flow. Prerequisite: NE 402 and NE 401 or NE 520 Typically offered in Fall only</td>
</tr>
<tr>
<td>NE 726</td>
<td>Radioisotopes Measurement Applications</td>
<td>(3 credit hours)</td>
<td>Introduction the student to measurement applications using radioisotopes and radiation. Discussion of all major tracing, gauging and analyzer principles and treatment of several specific applications in detail. Objective is to familiarize student with design and analysis of industrial measurement systems using radioisotopes and/or radiation. Prerequisite: NE 401 or NE 520 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 727</td>
<td>Nuclear Engineering Analysis</td>
<td>(3 credit hours)</td>
<td>Fundamental material on: (1) numerical methods for solving the partial differential equations pertinent to nuclear engineering problems, (2) Monte Carlo simulation of radiation transport and (3) data and error analysis techniques including estimation of linear and nonlinear model parameters from experimental data. Prerequisite: NE 401 or NE 520 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 729</td>
<td>Reactor Theory and Analysis</td>
<td>(3 credit hours)</td>
<td>Theoretical aspects of neutron diffusion and transport related to the design computation and performance analysis of nuclear reactors. Principal topics: a unified view of the neutron cycle including slowing down, resonance capture and thermalization; reactor dynamics and control; fuel cycle studies; and neutron transport methods. Background provided for research in power and test reactor analysis. Prerequisite: NE 723, NE 727 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 730</td>
<td>Radiological Assessment</td>
<td>(3 credit hours)</td>
<td>Principles of analyzing environmental radiation transport and resulting human exposure and dose and dose management. Sources term of radiation exposure, the radon problem, transport or radionuclides in the atmosphere, surface water, and groundwater, pathways modeling, radiation dosimetry, probabilistic models for environmental assessment, uncertainty analysis, and radiation risk management. A package of computer codes is developed as a class project. Prerequisite: NE 404 or NE 504 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 732</td>
<td>Principles of Industrial Plasmas</td>
<td>(3 credit hours)</td>
<td>Theory and fundamental physical principles of industrial plasmas. Applications in plasma processing, plasma manufacturing technology, arcs and torches, plasma sprayers, high-voltage high-current switching devices, plasma-driven devices and plasma-aided technology. Emphasis on particle transport and plasma flow. Prerequisite: NE/PY 528 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 740</td>
<td>Laboratory Projects In Nuclear Engineering</td>
<td>(3 credit hours)</td>
<td>Enhancement of laboratory skills pertinent to nuclear engineering research through projects that requiring student to design the experiment, assemble equipment, carry out the measurements and analyze and interpret data. Students work in groups of two and perform to completion two laboratory projects. Prerequisite: NE 721 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 745</td>
<td>Plasma Laboratory</td>
<td>(3 credit hours)</td>
<td>Experimental plasma generation and plasma diagnostic techniques. Lecture topics include high vacuum techniques, perturbing and non-perturbing probe techniques, and laser and emission spectroscopy. Laboratories utilize various methods of measuring plasma parameters discussed in lectures. Prerequisite: NE 528 or PY 508 or PY 509 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 746</td>
<td>Fusion Energy Engineering</td>
<td>(3 credit hours)</td>
<td>Description and analysis of the technologies of devices necessary to produce fusion energy including vacuum technology, plasma heating and fueling, magnetics, special energy conversion, neutronics, materials, environment and safety. Stress upon design integration and ensuing technological constraints. Prerequisite: NE 528 Typically offered in Spring only</td>
</tr>
<tr>
<td>NE 751</td>
<td>Nuclear Reactor Design Calculations</td>
<td>(3 credit hours)</td>
<td>Application of digital computer to problems in reactor core nuclear design. Study and exercise of available reactor core physics computer modules. Description of systems and programs used by industry for power reactor core design and core follow. A revi Prerequisite: NE 723 Typically offered in Spring only</td>
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NE 752 **Thermal Hydraulic Design Calculations** (3 credit hours)
Advanced presentation of thermal-hydraulic analysis of nuclear power systems. Topics including development of single phase and two-phase fluid flow equations, subchannel analysis, interphase phenomena and numerical solution methods relevant to design and safety analysis codes.

Prerequisite: NE 724

Typically offered in Fall only

NE 753 **Reactor Kinetics and Control** (3 credit hours)
The control of nuclear reactor systems. Development of basic control theory including the use of Bode, Nyquist and S-plane diagrams and state-variable methods. Analysis of reactor and reactor systems by these methods and development of control methods and optimum-control methods. Discussion of models of reactors and reactor-associated units, such as heat exchangers. Presentation of effects of nonlinearity.

Prerequisite: NE 722

Typically offered in Spring only

NE 755 **Reactor Theory and Analysis** (3 credit hours)
Theoretical aspects of neutron diffusion and transport related to the design computation and performance analysis of nuclear reactors. Principal topics: a unified view of the neutron cycle including slowing down, resonance capture and thermalization; reactor dynamics and control; fuel cycle studies; and neutron transport methods. Background provided for research in power and test reactor analysis.

Prerequisite: NE 723, NE 727

Typically offered in Spring only

NE 757 **Radiation Effects On Materials** (3 credit hours)
Interaction of radiation with matter with emphasis on microstructural modification, physical and mechanical effects. Defects generation and annealing, void swelling, irradiation growth and creep, and irradiation induced effects in reactor materials are discussed. Current theories and experimental techniques are discussed.

Typically offered in Spring only

NE 761 **Radiation Detection** (3 credit hours)
Advanced aspects of radiation detection such as computer methods applied to gamma-ray spectroscopy, absolute detector efficiencies by experimental and Monte Carlo techniques, the use and theory of solid state detectors, time-of-flight detection experiments and M’ssbaauer and other resonance phenomena.

Prerequisite: NE 726

Typically offered in Spring only

NE 762 **Radioisotope Applications** (3 credit hours)
Presentation of advanced principles and techniques of radioisotope applications. Topics include radiotracer principles; radiotracer applications to engineering processes; radioisotope gauging principles; charged particle, gamma ray and neutron radioisotope gauges.

Prerequisite: NE 726

Typically offered in Fall only

NE 770 **Nuclear Radiation Attenuation** (3 credit hours)
Advanced course in computational methods for neutron and photon transport. Methods include Monte Carlo and deterministic solutions to the transport equation for both fixed source and eigenvalue problems. Digital computers employed in the solution of pra

Prerequisite: NE 723 or equivalent

Typically offered in Fall only

NE 772/CE 772 **Environmental Exposure and Risk Analysis** (3 credit hours)
Course covers the identification, transport, and fate of hazardous substances in the environment; quantification of human exposures to such substances; dose-response analysis; and uncertainty and variability analysis. The general risk assessment framework, study design aspects for exposure assessment, and quantitative methods for estimating the consequences and probability of adverse health outcomes are emphasized.

Prerequisite: ST 511 or 515

Typically offered in Spring only

NE 780 **Magnetohydrodynamics & Transport in Plasmas** (3 credit hours)
Advanced fluid description of plasmas for magnetic fusion, space and industrial plasmas, and other applications. Emphasis on a first principles approach to transport, equilibria, and stability.

Prerequisite: NE 528, NE/PY 414 and 415

Typically offered in Fall only

NE 781 **Kinetic Theory, Waves, & Non-Linear Effects in Plasmas** (3 credit hours)
Kinetic theory, waves, and non-linear phenomena in magnetized plasmas. First principles approach to the treatment of instabilities and other collective effects.

Prerequisite: NE 528, NE/PY 414 and 415, Corequisite: MA 775

Typically offered in Fall only

NE 795 **Advanced Topics In Nuclear Engineering I** (1-3 credit hours)
A study of recent developments in nuclear engineering theory and practice.

Typically offered in Fall and Spring

NE 796 **Advanced Topics In Nuclear Engineering II** (3 credit hours)
A study of recent developments in nuclear engineering theory and practice.

Typically offered in Fall and Spring

NE 801 **Seminar** (1 credit hours)
Discussion of selected topics in nuclear engineering.

Typically offered in Fall and Spring

NE 885 **Doctoral Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student

Typically offered in Fall, Spring, and Summer

NE 890 **Doctoral Preliminary Examination** (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student

Typically offered in Fall and Spring
NE 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Summer only

NUTRITION (NTR)

NTR 210 Introduction to Community Food Security (3 credit hours)
This introductory interdisciplinary course teaches students about the many facets of food security in the United States, including historical impacts of race and social class on food security; food justice and food accessibility; the roles of non-profit organizations, government agencies, and disciplinary experts in developing food security efforts; and approaches to developing programs and policies, federal to local, to address the problem. In addition, service-learning experiences in students’ own communities allow them to gain knowledge about the specific agencies approaches to community food security, critically reflecting upon the experience and creating their own community food security action plan.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Summer only

NTR 220 Food and Culture (3 credit hours)
This course explores traditional food cultures around the world; highlighting foodways, flavor profiles, and commonly used ingredients. This course focuses on and to what extent traditional foodways of US immigrants are impacted by the majority culture and how regional cuisines have been impacted by historical migration patterns. Students will examine their own food culture, biases, and how these impact personal interactions with others through a semester-long project. Food tastings and sensory experiences will expose students to a variety of global and US regional cuisines allowing students to compare and contrast flavor profiles and commonly used ingredients. Course is available to all majors.

GEP Global Knowledge
Typically offered in Summer only

NTR 301/FS 301 Introduction to Human Nutrition (3 credit hours)
Functions, dietary sources, digestion and absorption, deficiencies and excesses of essential nutrients in humans; dietary guidelines; food labels; the study of diet-disease relationships; the role of diet in heart disease, diabetes, hypertension, osteoporosis; energy balance and weight control; dietary supplement regulation; diet and athletic performance.
Prerequisite: Sophomore standing
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

NTR 320 Nutrition Education (3 credit hours)
This course exposes students to the principles behind the development, implementation, and evaluation of nutrition education programs in the United States. Course topics will cover behavior change models, educational pedagogies, nutrition needs assessments, curricular and tool development, social marketing, and social media and technology related to nutrition education. The course is a flipped-course design with course content posted online through pre-recorded lectures and reading assignments. In-class lecture time will be reserved for class discussion and in-class assignments. Student evaluations include exams, in-class assignments, and a term paper.
Prerequisite: NTR 301
Typically offered in Fall only

NTR 330 Public Health Nutrition (3 credit hours)
Students will explore factors that affect the health and nutrition of the population as well as how those factors are identified, studied, and applied to improve health issues. Students will identify services and programs available to address nutrition and health issues. Students will analyze current events related to public health, evaluate nutrition related policy, and advocate for issues related to nutrition.
Typically offered in Fall and Summer

NTR 401/FS 401/NTR 501/FS 501 Advanced Nutrition and Metabolism (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.
Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225)
Typically offered in Fall and Summer
NTR 410/NTR 510 Maternal and Infant Nutrition (3 credit hours)
Students will explore the current research, controversies, and biological mechanisms related to nutrition for women before, during, and after pregnancy, as well as for infants in utero and after birth.

Prerequisite: NTR 301
Typically offered in Spring and Summer

NTR 415/PO 415/PO 515/NTR 515/ANS 515/ANS 415 Comparative Nutrition (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.

Prerequisite: ANS 225 or CH 222 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

NTR 419 Human Nutrition and Chronic Disease (3 credit hours)
Current concepts regarding, and physiological bases of the roles of nutrition in the prevention and treatment of acute and chronic disease states in humans with emphasis on the process of scientific discovery, reading of original research and transformation of research findings to public policy.

Prerequisite: Junior standing, ANS 230, or ANS/FS/NTR 301 or ANS/NTR/PO 415
Typically offered in Spring only

NTR 420 Applied Nutrition Education (3 credit hours)
In this service-learning course, students will develop nutrition education, lesson planning, conflict management, and knife safety skills through implementation of a nutrition education course in a community-based setting. Students will team-teach the nutrition education course at an established community partner location, gaining experience collaborating with nonprofit organizations to teach the clients they serve. Through critical reflection assignments and discussions, students will set goals to improve teaching, honing nutrition education and communication skills. Students are expected to provide their own transportation to community partner locations in the greater Raleigh area. Junior standing, NTR 301 and NTR 320 prerequisites.

Prerequisites: NTR 301 and NTR 320, and junior standing or greater required
Typically offered in Spring only

NTR 421/NTR 521 Life Cycle Nutrition (3 credit hours)
This course focuses on the physiologic changes and nutritional needs throughout the life cycle. Additionally, students will explore psychosocial and environmental influencers on food consumption and diet quality at each stage of life. Pregnancy and lactation, fetal development, infancy, early childhood, childhood, adolescence, young and middle adulthood, and geriatrics will be examined. Student will apply course content to real-world settings through individual and/or group service-learning projects.
Credit will not be given for both NTR 421 and NTR 521.

Prerequisite: NTR 301 and junior standing required
Typically offered in Spring only

NTR 425/ANS 425/PO 425/PO 425/NTR 525/ANS 525/PO 525 Feed Manufacturing Technology (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

NTR 454/ANS 554/ANS 454 Lactation, Milk and Nutrition (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.

Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421
Typically offered in Spring only

NTR 490 Senior Capstone Experience in Nutrition (4 credit hours)
In this capstone course, students will work in groups to complete research and service projects for community partners while gaining professional experiences in nutrition. Students will be expected to apply their knowledge and skills gained throughout their nutrition coursework to develop solutions to problems in public health and community nutrition. Students will complete comprehensive written and poster presentations about their work as a group, in addition to individual reflection(s) about their learnings. Students must provide their own transportation when visiting their community partner site. Students should complete this course in the last semester (or year) of their degree. NTS and NTA Majors only; Senior status required.

Prerequisite: NTR 301, NTR 302, and NTR 401; Nutrition Science majors only; Senior status required
Typically offered in Fall and Spring

NTR 492 Professional Internship Experience in Nutrition Science (1-3 credit hours)
This course provides an opportunity for students to gain real-world experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 492 contract and have it approved by his/her experience supervisor, academic advisor and the undergraduate teaching coordinator/course instructor. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer
NTR 493 Research Experience in Nutrition Science  (1-3 credit hours)
This course provides an opportunity for students to gain real-world experience in a scientific research program. A minimum of 42 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 493 contract and have it approved by his/her research supervisor, academic advisor and the NTR 493 coordinator. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer

NTR 494 Teaching Experience in Nutrition Science  (1-3 credit hours)
This course provides an opportunity for students to gain teaching experience relevant to their academic and career goals. A minimum of 45 hours must be completed for each credit hour earned, with 3 credit hours maximum for each experience. The experience must be arranged by the student and approved by the Undergraduate Teaching Coordinator for Nutrition prior to the start of the experience. To gain approval, a student must submit the completed NTR 494 contract and have it approved by his/her experience supervisor, academic advisor and the undergraduate teaching coordinator/course instructor. In addition to the work described in the contract, a student will complete a series of reflective assignments during and at the end of the experience.

Typically offered in Fall, Spring, and Summer

NTR 495 Special Topics in Nutrition  (1-6 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

NTR 500 Principles of Human Nutrition  (3 credit hours)
Overview of fields of Nutritional Sciences; functions of nutrients in the human body; sources and properties of nutrients; relationships of food industry practices to nutrition. Credit will not be given for both NTR (FS)400 and NTR 500
Prerequisite: CH 220 and (CH 221 or CH 223) and (ZO 160 or BIO 181/183)

Typically offered in Fall and Summer

NTR 501/FS 501/NTR 401/FS 401 Advanced Nutrition and Metabolism  (3 credit hours)
Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.
Prerequisite: (NTR 301 or NTR 415) and (CH 221 or CH 220 or CH 225)

Typically offered in Fall and Summer

NTR 510/NTR 410 Maternal and Infant Nutrition  (3 credit hours)
Students will explore the current research, controversies, and biological mechanisms related to nutrition for women before, during, and after pregnancy, as well as for infants in utero and after birth.
Prerequisite: NTR 301

Typically offered in Spring and Summer

NTR 515/ANS 515/ANS 415/NTR 415/PO 415/PO 515 Comparative Nutrition  (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.
Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227

Typically offered in Fall, Spring, and Summer

NTR 521/NTR 421 Life Cycle Nutrition  (3 credit hours)
This course focuses on the physiologic changes and nutritional needs throughout the life cycle. Additionally, students will explore psychosocial and environmental influencers on food consumption and diet quality at each stage of life. Pregnancy and lactation, fetal development, infancy, early childhood, childhood, adolescence, young and middle adulthood, and geriatrics will be examined. Student will apply course content to real-world settings through individual/or group service-learning projects. Credit will not be given for both NTR 421 and NTR 521.
Prerequisite: NTR 301 and junior standing required

Typically offered in Spring only

NTR 525/FS 525/ANS 525/PO 525/NTR 425/ANS 425/FS 425/PO 425 Feed Manufacturing Technology  (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.
Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225

Typically offered in Fall and Spring

NTR 550/ANS 550 Applied Ruminant Nutrition  (3 credit hours)
Applied concepts in ruminant nutrition for the practicing agricultural professional. Protein, energy, vitamin and mineral nutrition in relation to the nutritional needs and practical feeding of beef cattle, dairy cattle, sheep, and goats. New developments in feeding systems, feed additives and the prevention and treatment of metabolic disorders. Emphasis on solving problems in case studies. Permission given to undergraduates
Prerequisite: ANS 230 or ANS(NTR,PO) 415. Permission given to undergraduates

Typically offered in Fall only

NTR 554/FS 554 Lactation, Milk, and Nutrition  (3 credit hours)
Nutritional properties of milk as a high-quality food with nutritional diversity. Principles of physiology, biochemistry and cell biology in the mammary gland. Procedures of milk production and milk collection for milk quality and nutrition. Human lactation vs. that of domestic animals. Impacts of biotechnology and food safety on dairy production. Credit will not be given for both ANS 454 and 554.
Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421

Typically offered in Spring only
NTR 555/FS 555  Exercise Nutrition (3 credit hours)
Metabolism of macro- and micronutrients as affected by exercise and physical activity. Effects of dietary patterns, specific foods, dietary supplements and ergogenic aids on sports performance. Reading and discussion of current literature and individual or group projects.
Prerequisite: NTR 400/500
Typically offered in Spring only

NTR 557/FS 557  Nutraceuticals and Functional Foods (3 credit hours)
This course evaluates the weight of evidence from peer-reviewed scientific literature relating food bioactives, whole foods, and diets to disease prevention, athletic performance, and cognitive development/enhancement. Data are viewed in the context of processing effects, global food and supplement regulations, as well as commercial marketing claims. Key concepts include dose-response, signal transduction, and the use of advanced technologies such as genomics, proteomics and metabolomics. Students will work in teams to develop and write a critical review manuscript suitable for publication.
Typically offered in Fall only

NTR 561/ANS 561  Equine Nutrition (3 credit hours)
This course explores concepts in equine nutrition including digestive physiology of horses, nutrient requirements for different classes of horses and feed management. Ration evaluation and balancing, as well as problem solving will be a core component to this course.
Prerequisite:NTR 500 or NTR/FS 501 or NTR/PO 515
Typically offered in Spring only

NTR 565/ANS 565  Advanced Canine and Feline Nutrition (3 credit hours)
This course is about the advanced principles of nutrition within canines and felines. The course focuses on the unique gastro-intestinal tracts for the two species as well as their specific nutrient requirements and how the animal industry addresses them
Restriction: Graduate Student or Senior with 3.35 GPA; Prerequisite: 400-level Nutrition Course
Typically offered in Fall only

NTR 594  Special Topics in Nutrition (1-6 credit hours)
The study of special problems and selected topics of current interest in nutrition and related fields.
Typically offered in Fall, Spring, and Summer

NTR 601  Master's Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

NTR 624  Topical Problems In Nutrition (1-6 credit hours)
Analysis of current problems in nutrition. Also entails the scientific appraisal and solution of a selected problem designed to provide training and experience in research.
Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

NTR 625  Advanced Special Problems In Nutrition (1-6 credit hours)
Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.
Prerequisite: Graduate standing
Typically offered in Spring only

NTR 685  Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring

NTR 690  Advanced Special Problems In Nutrition (1-6 credit hours)
Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.
Prerequisite: Graduate standing
Typically offered in Fall only

NTR 693  Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NTR 695  Master's Thesis Research (1-9 credit hours)
Thesis research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

NTR 696  Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

NTR 699  Research In Nutrition (1-9 credit hours)
Original research preparatory to the thesis for Master of Science or Doctor of Philosophy degree.
Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

NTR 701/ANS 701  Protein and Amino Acid Metabolism (3 credit hours)
Study of protein and amino acid metabolism, regulation, dietary requirements and techniques for their investigation in human and other animals.
Prerequisite: BCH 453, ZO 421, a 400-level nutrition course
Typically offered in Spring only
NTR 706/FM 706  Vitamin Metabolism  (3 credit hours)
Structures, chemical and physical properties, functions, distribution, absorption, transport, metabolism, storage, excretion, deficiencies, and toxicity of vitamins in humans and domestic animals. Interactions between vitamins and other factors affecting vitamin metabolism or bioavailability as well as the nutritional significance of essential fatty acids and metabolism of prostaglandins, prostacyclins and leukotrienes. Application of knowledge will include critical review of scientific literature, experimental design, and formulation of vitamin supplements.
Prerequisite: ANS(NTR,PO) 415 and BCH 453
Typically offered in Fall only

NTR 708  Energy Metabolism  (3 credit hours)
Relationship of biochemical and physiological events within the cell, tissue, organ and system with the nutrient needs as sources of energy for productive animal life. Digestion, absorption and metabolism of energy sources. Presentation of processes of energy transformations within living structures in relation to energetics, biological oxidations, coupled reactions, anabolic and catabolic systems, metabolic control, partitioning and efficiency.
Prerequisite: BCH 453 and an introductory NTR course
Typically offered in Fall only

NTR 764/PHY 764/CBS 764  Advances in Gastrointestinal Pathophysiology  (3 credit hours)
This course will focus on advanced gastrointestinal physiology and the pathophysiology of diseases of relevance to scientists involved in animal-related research. In particular, the course will cover the pathophysiology of ulceration, infectious diarrhea, ischemia, motility disorders, and inflammatory diseases of the gut. An in-depth review paper will be required based on recent literature regarding a specific gastrointestinal disease.
Prerequisite: PHY 503, PHY 504
Typically offered in Fall only

NTR 775/PO 775  Mineral Metabolism  (3 credit hours)
Requirements, function, distribution, absorption, excretion and toxicity of minerals in humans and domestic animals. Interactions between minerals and other factors affecting mineral metabolism or availability. Emphasis on mechanisms associated with mineral functions and the metabolic bases for the development of signs of deficiency.
Prerequisite: ANS(NTR,PO) 415, BCH 451 and ZO 421
Typically offered in Fall only

NTR 785  Digestion and Metabolism in Ruminants  (3 credit hours)
Advanced concepts in ruminant digestion and metabolism, with emphasis on bovine, ovine, and caprine species. Major topics include voluntary intake, ruminal fermentation, mechanisms and rates of digestion, absorption and passage of dietary components, and postabsorptive metabolism of carbohydrates, lipids, and proteins. New developments in feeding systems, feed additives and the prevention and treatment of metabolic disorders.
Prerequisite: Graduate standing
Typically offered in Spring only

NTR 790/FM 790  Advanced Feed Formulation  (3 credit hours)
Principles of feed and ingredient quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of an approved supplier list, ingredient specifications, feed manufacturing quality assurance procedures, and risk based feed safety programs.
Prerequisite: NTR(FM) 525
Typically offered in Fall only

NTR 794  Special Topics in Nutrition  (1-6 credit hours)
The study of special problems and selected topics of current interest in nutrition and related fields.
Typically offered in Fall, Spring, and Summer

NTR 801  Doctoral Seminar  (1 credit hour)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Typically offered in Fall and Spring

NTR 824  Topical Problems In Nutrition  (1-6 credit hours)
Analysis of current problems in nutrition. Also entails the scientific appraisal and solution of a selected problem designed to provide training and experience in research.
Prerequisite: Graduate standing or Senior standing
Typically offered in Fall, Spring, and Summer

NTR 825  Advanced Special Problems In Nutrition  (1-6 credit hours)
Directed research in a specialized phase of nutrition designed to provide experience in research methodology and philosophy.
Prerequisite: Graduate standing
Typically offered in Fall only

NTR 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

NTR 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

NTR 893  Doctoral Dissertation Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

NTR 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
**Operations Research (OR)**

**OR 433/OR 533/ISE 433/ISE 533 Service Systems Engineering** (3 credit hours)
This course intends to provide a comprehensive treatment on the use of quantitative modeling for decision making and best practices in the service industries. The goal of this class is to teach students to be able to identify, understand, and analyze services; and acquire the quantitative skills necessary to model key decisions and performance metrics associated with services. Students will be exposed both to classical and contemporary examples of challenges and opportunities that arise when working in the service sector.

Prerequisite: ISE 361
Typically offered in Spring only

**OR 501/ISE 501 Introduction to Operations Research** (3 credit hours)
OR Approach: modeling, constraints, objective and criterion. Problems of multiple criteria, optimization, model validation and systems design. OR Methodology: mathematical programming; optimum seeking; simulation, gaming; heuristic programming. Examples, OR Applications: theory of inventory; economic ordering under deterministic and stochastic demand. Production smoothing problem; linear and quadratic cost functions. Waiting line problems: single and multiple servers with Poisson input and output. Theory of games for two-person competitive situations. Project management through PERT-CPM.

Prerequisite: MA 421 or ST 421 or ST 371 and ST 372
Typically offered in Fall and Spring

**OR 504/MA 504 Introduction to Mathematical Programming** (3 credit hours)
Basic concepts of linear, nonlinear and dynamic programming theory. Not for majors in OR at Ph.D. level.

Prerequisite: MA 242, MA 405
Typically offered in Fall only

**OR 505/ISE 505/MA 505 Linear Programming** (3 credit hours)
Introduction including: applications to economics and engineering; the simplex and interior-point methods; parametric programming and post-optimality analysis; duality matrix games, linear systems solvability theory and linear systems duality theory; polyhedral sets and cones, including their convexity and separation properties and dual representations; equilibrium prices, Lagrange multipliers, subgradients and sensitivity analysis.

Prerequisite: MA 405
Typically offered in Fall only

**OR 506 Algorithmic Methods in Nonlinear Programming** (3 credit hours)

Prerequisite: MA 301, MA 405, knowledge of computer language, such as FORTRAN or PL1
Typically offered in Fall only
OR 531/MA 531/E 531 Dynamic Systems and Multivariable Control
I (3 credit hours)
Introduction to modeling, analysis and control of linear discrete-time
and continuous-time dynamical systems. State space representations
and transfer methods. Controllability and observability. Realization.
Applications to biological, chemical, economic, electrical, mechanical and
sociological systems.
Prerequisite: MA 341, MA 405
Typically offered in Fall only

OR 533/ISE 433/ISE 533/OR 433 Service Systems Engineering (3 credit hours)
This course intends to provide a comprehensive treatment on the use
of quantitative modeling for decision making and best practices in the
service industries. The goal of this class is to teach students to able to
identify, understand, and analyze services; and acquire the quantitative
skills necessary to model key decisions and performance metrics
associated with services. Students will be exposed both to classical and
contemporary examples of challenges and opportunities that arise when
working in the service sector.
Prerequisite: ISE 361
Typically offered in Spring only

OR 537/CE 537 Computer Methods and Applications (3 credit hours)
Computational approaches to support civil planning, analysis, evaluation
and design. Applications to various areas of civil engineering, including
construction, structures, transportation and water resources.
Prerequisite: CSC 112 and (MA 341 or MA 305)
Typically offered in Fall only

OR 560/ISE 560 Stochastic Models in Industrial Engineering (3 credit hours)
ISE/OR 560 will introduce mathematical modeling, analysis, and solution
procedures applicable to uncertain (stochastic) production and service
systems. Methodologies covered include probability theory and stochastic
processes including discrete and continuous Markov processes.
Applications relate to design and analysis of problems, capacity planning,
inventory control, waiting lines, and service systems.
Typically offered in Fall only

OR 562/ISE 562/TE 562 Simulation Modeling (3 credit hours)
This course concentrates on design, construction, and use of discrete/
continuous simulation object-based models employing the SIMIO
software, with application to manufacturing, service, and healthcare.
The focus is on methods for modeling and analyzing complex problems
using simulation objects. Analysis includes data-based modeling, process
design, input modeling, output analysis, and the use of 3D animation
with other graphical displays. Object-oriented modeling is used to extend
models and enhance re-usability.
Typically offered in Spring only

OR 565/CSC 565/MA 565 Graph Theory (3 credit hours)
Basic concepts of graph theory. Trees and forests. Vector spaces
associated with a graph. Representation of graphs by binary matrices
and list structures. Traversability. Connectivity. Matchings and
Prerequisite: CSC 226 or MA 351.
Typically offered in Spring only

OR 579/CSC 579/ECE 579 Introduction to Computer Performance
Modeling (3 credit hours)
Workload characterization, collection and analysis of performance data,
instrumentation, tuning, analytic models including queuing network
models and operational analysis, economic considerations.
Prerequisite: CSC 312 or ECE 206 and MA 421
Typically offered in Fall and Spring

OR 591 Special Topics in Operations Research (1-6 credit hours)
Individual or small group studies of special areas of OR which fit into
students’ programs of study and which may not be covered by other OR
courses. Furthermore, course serves as a vehicle for introducing new or
specialized topics at introductory graduate level.
Typically offered in Fall, Spring, and Summer

OR 601 Seminar in Operations Research (1 credit hours)
Seminar discussion of operations research problems. Case analyses and
reports. Graduate students with minors or majors in operations research
expected to attend throughout period of their residence.
Prerequisite: OR Major or OR Minor
Typically offered in Fall and Spring

OR 610 Special Topics in Operations Research (1-6 credit hours)
Individual or small group studies of special areas of OR which fit into
students’ programs of study and which may not be covered by other OR
courses. Furthermore, course serves as a vehicle for introducing new or
specialized topics at introductory graduate level.
Typically offered in Fall, Spring, and Summer

OR 652 Practicum in Operations Research (1-3 credit hours)
Practicum in problem solving in industry applying applicable OR
methodologies. Practical experience in diagnosing and solving problems
in operational systems at either an industrial site or at NC State.
Prerequisite: OR 501, OR 505, OR 709 and OR 761
Typically offered in Spring and Summer

OR 685 Master’s Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the
student in planning for the teaching assignment, observe and provide
feedback to the student during the teaching assignment, and evaluate the
student upon completion of the assignment.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

OR 688 Non-Thesis Masters Continuous Registration - Half Time
Registration (1 credit hours)
For students in non-thesis master’s programs who have completed all
credit hour requirements for their degree but need to maintain half-time
continuous registration to complete incomplete grades, projects, final
master’s exam, etc.
Prerequisite: Master’s student
Typically offered in Spring only
OR 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring only

OR 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

OR 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

OR 695 Master's Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

OR 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

OR 699 Master's Thesis Preparation (1-9 credit hours)
For student who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

OR 705 Large-Scale Linear Programming Systems (3 credit hours)
Specialized algorithms for efficient solution of large-scale LP problems. Parametric programming, bounded variable algorithms, generalized upper bounding, decomposition, matrix factorization and sparse matrix techniques. Emphasis on gaining firsthand practical experience with current computer codes and computational procedures.

Prerequisite: OR 505 and FORTRAN programming experience
Typically offered in Spring only

OR 706/ST 706/MA 706 Nonlinear Programming (3 credit hours)
An advanced mathematical treatment of analytical and algorithmic aspects of finite dimensional nonlinear programming. Including an examination of structure and effectiveness of computational methods for unconstrained and constrained minimization. Specia

Prerequisite: OR(IE,MA) 505 and MA 425
Typically offered in Spring only

OR 708/ISE 708/MA 708 Integer Programming (3 credit hours)
General integer programming problems and principal methods of solving them. Emphasis on intuitive presentation of ideas underlying various algorithms rather than detailed description of computer codes. Students have some "hands on" computing experience

Prerequisite: MA 405, OR (MA,IE) 505, Corequisite: Some familiarity with computers (e.g., CSC 112)
Typically offered in Spring only

OR 709/ISE 709 Dynamic Programming (3 credit hours)
Introduction to theory and computational aspects of dynamic programming and its application to sequential decision problems.

Prerequisite: MA 405, ST 421
Typically offered in Spring only

OR 719/MA 719 Vector Space Methods in System Optimization (3 credit hours)
Introduction to algebraic and function-analytic concepts used in system modeling and optimization: vector space, linear mappings, spectral decomposition, adjoints, orthogonal projection, quality, fixed points and differentials. Emphasis on geometric insight. Topics include least square optimization of linear systems, minimum norm problems in Banach space, linearization in Hilbert space, iterative solution of system equations and optimization problems. Broad range of applications in operations research and system engineering including control theory, mathematical programming, econometrics, statistical estimation, circuit theory and numerical analysis.

Prerequisite: MA 405, 511
Typically offered in Fall only

OR 731/E 731/MA 731 Dynamic Systems and Multivariable Control II (3 credit hours)
Prerequisite: OR(E,MA) 531
Typically offered in Spring only

OR 747/ISE 747 Reliability Engineering (3 credit hours)
Introduction to basic concepts of reliability engineering. Application of probability and statistics to estimate reliability of industrial systems; development of reliability measures; analysis of static and dynamic reliability models; development and a

Prerequisite: ST 511
Typically offered in Fall only

OR 760/ISE 760 Applied Stochastic Models in Industrial Engineering (3 credit hours)
Formulation and analysis of stochastic models with particular emphasis on applications in industrial engineering; univariate, multivariate and conditional probability distributions; unconditional and conditional expectations; elements of stochastic processes; moment-generating functions; concepts of stochastic convergence; limit theorems; homogeneous, nonhomogeneous and compound Poisson processes; basic renewal theory; transient and steady-state properties of Markov processes in discrete and continuous time.

Prerequisite: MA 303, ST 371
Typically offered in Fall only
OR 761/ISE 761  Queue and Stochastic Service Systems  (3 credit hours)
Introduction of general concepts of stochastic processes. Poisson processes, Markov processes and renewal theory. Usage of these in analysis of queues, from with a completely memoryless queue to one with general parameters. Applications to many engineering problems.

Typically offered in Spring only

OR 762/ISE 762/CSC 762  Computer Simulation Techniques  (3 credit hours)
Basic discrete event simulation methodology: random number generators, simulation designs, validation, analysis of simulation output. Applications to various areas of scientific modeling. Simulation language such as SLAM and GPSS. Computer assignments and projects.

Prerequisite: ST 512 and a scientific programming language
Typically offered in Fall only

OR 766/ISE 766/MA 766  Network Flows  (3 credit hours)
Study of problems of flows in networks. These problems include the determination of shortest chain, maximal flow and minimal cost flow in networks. Relationship between network flows and linear programming developed as well as problems with nonlinear cost functions, multi-commodity flows and problem of network synthesis.

Prerequisite: OR(IE,MA) 505
Typically offered in Spring only

OR 772/ISE 772  Stochastic Simulation Design and Analysis  (3 credit hours)
Advanced topics in stochastic system simulation, including random variate generation, output estimation for stationary and non-stationary models, performance optimization techniques, variance reduction approaches. Student application of these techniques to actual simulations. A current topic research paper required.

Prerequisite: (CSC,ECE,IE,OR) 762 and ST 516
Typically offered in Spring only

OR 773/ST 773/BMA 773/MA 773  Stochastic Modeling  (3 credit hours)

Prerequisite: BMA 772 or ST (MA) 746
Typically offered in Spring only

OR 774/MA 774/BMA 774  Partial Differential Equation Modeling in Biology  (3 credit hours)

Prerequisite: BMA 771 or MA/OR 731; BMA 772 or MA 401 or MA 501
Typically offered in Spring only

OR 791  Advanced Special Topics  (1-6 credit hours)
Typically offered in Fall and Spring

OR 801  Seminar in Operations Research  (1 credit hours)
Seminar discussion of operations research problems. Case analyses and reports. Graduate students with minors or majors in operations research expected to attend throughout period of their residence.

Prerequisite: OR Major or OR Minor
Typically offered in Fall and Spring

OR 810  Special Topics in Operations Research  (1-6 credit hours)
Individual or small group studies of special areas of OR which fit into students' programs of study and which may not be covered by other OR courses. Furthermore, course serves as a vehicle for introducing new or specialized topics at introductory graduate level.

Typically offered in Fall, Spring, and Summer

OR 852  Practicum in Operations Research  (1-3 credit hours)
Practicum in problem solving in industry applying applicable OR methodologies. Practical experience in diagnosing and solving problems in operational systems at either an industrial site or at NC State.

Prerequisite: OR 501, OR 505, OR 709 and OR 761
Typically offered in Summer only

OR 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

OR 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

OR 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

OR 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

OR 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

OR 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
Paper Science Engineering (PSE)

PSE 201 Pulping and Papermaking Technology (3 credit hours)
Survey of the pulping and papermaking processes. Covers characteristics of wood and different types of fiber, key equipment and process variables for pulping, bleaching and chemical recovery processes, with emphasis on the kraft process. Papercrafting variables and equipment, particularly on a Fourdrinier machine, secondary fiber processing, and aspects of printing and coating discussed.

Typically offered in Spring only

PSE 211 Pulp and Paper Internship (1 credit hour)
Experience in the pulp and paper industry. Problem solving in an industrial setting to gain insight of pulp and paper technology. Written report required. Engineering ethics discussed in light of the work experience.

Prerequisite: PSE 201
Typically offered in Fall only

PSE 212 Paper Properties (4 credit hours)
Measurement and characterization of the structural, mechanical, and optical properties of paper and board. Effect of raw materials and manufacturing processes on structure and properties. Basic concepts of paper physics.

Prerequisite: PSE 201
Typically offered in Fall only

PSE 220 From Papyrus to Plasma Screens: Paper and Society (2 credit hours)
The impact of paper and paper products on society, examined from the broad interdisciplinary perspectives of technology/engineering and sociology/communication. How the written word and printing affected human development and history. How paper products affect people with regard to communication, education, commerce, and comfort/hygiene. The history and development of paper making and the paper industry. Important properties of paper. Basic types of paper products, how they are manufactured, and their impacts. The environmental impacts of paper and the paper industry. Current issues involving the paper industry.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

PSE 293 Independent Study in Paper Science & Engineering (1-6 credit hours)
Independent Study for Paper Science & Engineering students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled"

Typically offered in Fall, Spring, and Summer

PSE 294 Independent Study in Paper Science & Engineering (1-6 credit hours)
Independent Study for Paper Science & Engineering students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled"

Typically offered in Fall, Spring, and Summer

PSE 295 Special Topics in Paper Science & Engineering (1-3 credit hours)
Special Topics in Paper Science & Engineering at the 200 level for offering courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

PSE 322 Wet End and Polymer Chemistry (4 credit hours)
Introduction to carbohydrate chemistry focusing on the structure and reactivity of wood polysaccharides, hemicelluloses and cellulose and on the chemical structure of lignins and wood extractives. Special emphasis on the chemical reaction of wood components occurring in pulping and bleaching processes.

Prerequisite: PSE 212 and (CH 221 or CH 225) and (CH 222 or CH 226)
Typically offered in Fall only

PSE 332 Wood and Pulping Chemistry (3 credit hours)
Introduction to carbohydrate chemistry focusing on the structure and reactivity of wood polysaccharides, hemicelluloses and cellulose and on the chemical structure of lignins and wood extractives. Special emphasis on the chemical reaction of wood components occurring in pulping and bleaching processes.

Prerequisite: CH 221/225 and CH 222/226 and CH 223/227 and CH 224/228
Typically offered in Spring only

PSE 355 Pulp and Paper Unit Processes I (3 credit hours)
Selected topics in chemical engineering as applied in the pulp and paper industry. Emphasis on computational practice.

Prerequisite: CHE 205
Typically offered in Fall only

PSE 360 Pulp and Paper Unit Processes II (3 credit hours)
Application of chemical engineering principles to the analysis of pulp and paper unit processes. Emphasis on practical problems in fluid dynamics, heat transfer, mass transfer and thermodynamics. Problem solution techniques include hand calculation and computer simulation tools.

Prerequisite: PSE 201, PSE 355 or CHE 311
Typically offered in Spring only

PSE 370 Pulp and Paper Products and Markets (3 credit hours)
Major product sectors for pulp and paper. Market outlook and analysis. Critical fiber, pulp, finished product requirements and properties. Special emphasis on packaging grades and emerging markets. Technology intelligence and techno-economic tools to identify and address challenges related to selected pulp and paper products. Laboratory session used for research and development of selected products.

Prerequisites: PSE 201 with a C- or better and PSE 212 with a C- or better
Typically offered in Spring only
Typically offered in Fall only

PSE 465 Process Engineering (3 credit hours)
Advanced use of process engineering tools in process design, improvement and operation. Particular emphasis is placed on pulp and paper industry. Topics include basic statistics, Lean Six Sigma/DMAIC methodology, statistical software, measurement system analysis, process mapping/value stream mapping, statistical process and quality control, control charts, process capability analysis, hypothesis testing, design of experiments, Excel modeling, and big data analysis. An independent project is required, which can lead to Lean Six Sigma Yellow Belt trained status.

Prerequisite: Senior standing in PSE or SMT
Typically offered in Spring only

PSE 472 Paper Process Analysis (3 credit hours)
Product analysis, materials selection, process planning, manufacture of various types of paper using pilot plant equipment, finished product testing and comparison with standard products. Machine unit operations, materials flow balances, energy balances performed on operations. Team assignments with written and oral presentation of results.

Prerequisite: PSE 212, PSE 322, PSE 371
Typically offered in Fall only

PSE 415 Paper Industry Strategic Project Analysis (3 credit hours)
Design problems in process and project engineering are analyzed from strategic, economic, and business perspectives. Typical pulp and paper processes are computer modeled and analyzed with regard to feasibility and profitability. Specific capital projects are assessed for capital requirements, total installed cost, operating costs, payback, and cash flow. Traditional business concepts are presented, including: financial analysis; capital allocation; marketing and pricing theory; manufacturing work systems; management systems; leadership; what "good" looks like. Senior Standing.

Typically offered in Fall only

PSE 416 Process Design and Analysis (3 credit hours)
Design, management and analysis of technical projects. Emphasis on concepts and techniques used in economic analysis of projects. Use of computer simulation for process design and cost analyses. Team projects to analyze cost and operating feasibility of proposed major mill modification. Written and oral presentations required throughout the semester.

Prerequisite: PSE 415 and PSE 417
Typically offered in Spring only

PSE 417 Modeling & Simulation of Pulp & Paper Processes (3 credit hours)
Application of modeling and simulation techniques for the analysis of pulp and paper making processes. Model development and computer simulation using existing models will allow analysis of process interactions and operating/economic feasibility of processes.

Prerequisite: PSE 360
Typically offered in Fall only

PSE 425 Bioenergy & Biomaterials Engineering (3 credit hours)
This course acquaints students with the basic science, terminology, technology, economic concepts, and engineering concepts associated with the conversion of biomass into energy and materials. Topics include: biomass types and properties; biochemical platforms; thermochemical platforms; unit operations; the biorefinery; biocomposites. Some design content is included. Targeted to engineering students with a suitable background (PSE, CHE, BAE).

Prerequisite: For PSE Majors: (MAE 201 or CHE 316) and PSE 360; For CHE Majors: CHE 312 and CHE 316; For BAE Majors: MAE 201 and BAE 402
Typically offered in Fall only

PSE 493 Independent Study in Paper Science & Engineering (1-6 credit hours)
Independent Study for Paper Science & Engineering students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard"
Typically offered in Fall, Spring, and Summer

PSE 494 Independent Study in Paper Science & Engineering (1-6 credit hours)
Independent Study for Paper Science & Engineering students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard"
Typically offered in Fall, Spring, and Summer
**Park Scholars (PRK)**

**PRK 102  Topics in Scholarship, Leadership, and Service II** (0 credit hours)
Interdisciplinary seminar with distinguished speakers and community leaders. A one-two day, off-campus trip will develop student leadership skills through examination of leadership challenges facing North Carolina. Volunteer work with an off-campus service agency will build awareness of community needs and how to address those needs. Students may need to use public transportation, which is free to NC State students with their id, to perform required public service. Restricted to Park Scholars.

Prerequisite: PRK 101, restricted to Park Scholars
Typically offered in Spring only

**PRK 202  Topics in Scholarship, Leadership and Service IV** (0 credit hours)
Interdisciplinary seminar includes speaker seminars and organizing Service Raleigh, a major spring service project. Planning begins for senior year enrichment activities. Students may need to use public transportation, which is free to NC State Students with their id, to perform required public service. Restricted to Park Scholars.

Prerequisite: PRK 201, restricted to Park Scholars
Typically offered in Spring only

**PRK 302  Topics in Scholarship, Leadership, and Service VI** (0 credit hours)
Interdisciplinary seminar to develop leadership skills through a Leadership Academy, attendance at various speaker seminars and dinners, and through continued community volunteerism. The Leadership Academy is a half-day workshop in February and builds on the skills from the fall Leadership Academy. Students may need to use public transportation, which is free to NC State Students with their id, to perform required public service. Restricted to Park Scholars.

Prerequisite: PRK 301, restricted to Park Scholars
Typically offered in Spring only

**PRK 402  Topics in Scholarship, Leadership and Service VIII** (0 credit hours)
Interdisciplinary seminar will promote understanding of scholarship, leadership, and service. Students hold a dinner with a William Friday Award recipient, establish their class legacy for the campus, and work with younger students on developing their leadership styles. Students continue to volunteer in the community. Students may need to use public transportation, which is free to NC State Students with their id, to perform required public service. Restricted to Park Scholars.

Prerequisite: PRK 401, restricted to Park Scholars
Typically offered in Spring only

**Parks, Recreation, and Tourism Management (PRT)**

**PRT 150  Parks, Recreation and Tourism Management Orientation** (1 credit hours)
Introduction topics related to the department of Parks, Recreation and Tourism Management; The recreation, tourism, sport and golf industries; all PRTM curricula; advising, academic skills, and team work; and research and personnel involved in the department and college. PRT, SMT and PGM Majors Only.

Typically offered in Fall and Spring

**PRT 152  Introduction to Parks, Recreation and Tourism** (3 credit hours)
Introduction to the professional field of recreation by presenting the basic principles, fundamentals and concepts of recreation as related to such factors as recreation history and objectives, sociological and economic aspects of recreation, leadership qualities and facility provision; and settings for organized recreation in modern society.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

**PRT 156  Professional Golf Management Orientation** (3 credit hours)
Overview of the golf industry and introduction to the concepts and practices of effective golf management including turfgrass management, golf shop operations, food & beverage control, customer services, personnel management, and tournament operations. Theoretical foundations for understanding leisure behavior and the parks, recreation and tourism management profession.

Prerequisite: PGM Majors
Typically offered in Fall and Spring

**PRT 200  Health, Wellness and the Pursuit of Happiness** (3 credit hours)
Despite having one of the highest standards of living in the world, a growing number of Americans are unhappy. The purpose of this course is to help students understand the behaviors that are personally beneficial and contribute to a healthy and happy life. Students will learn what research says about what makes us happy and healthy, and how to put those strategies into practice. Course modules focus on activities that have been proven to increase happiness along with strategies to build healthy habits.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

**PRT 210  Golf Management I** (1 credit hours)
Emphasis on concepts, techniques, and practices of teaching golf skills; understanding the Professional Golfers' Association Constitution; rules of golf, golf tournament operations; and golf car fleet management.

Prerequisite: PGM Majors & PRT 156
Typically offered in Spring only

**PRT 211  Golf Management II** (1 credit hours)
Advanced concepts, techniques, and practices of teaching golf; golfer development programs, golf club design and repair.

Prerequisite: PGM Majors & PRT 210
Typically offered in Fall only
PRT 212 Golf Instructor Development (2 credit hours)
Students will learn to teach using a variety of instructional methods including various technological methods. Students will also learn to teach to students with a variety of learning styles including visual, auditory and kinesthetic. The students will learn the fundamental theories and concepts of the golf swing as well as basic ball flight laws.

Prerequisite: PGM Majors and PRT 156 and PRT 210
Typically offered in Fall only

PRT 214/HESM 214 Introduction to Adventure Education (3 credit hours)
History and philosophy, social psychology of adventure, theories of adventure, benefits, risk-taking behavior, current trends and issues, research and evaluation, and model programs. Field trip required. Students are responsible for their own transportation for field trip.

Typically offered in Fall only

PRT 215/HESM 215 Principles and Practices of Outdoor Leadership (3 credit hours)
Principles and practices of leadership in adventure education and recreation programs: group management, trip planning, staffing, group dynamics, health and safety issues, risk management and other relevant topics.

Typically offered in Spring only

PRT 220 Commercial Recreation and Tourism Management (3 credit hours)
Commercial recreation and the tourism industry, including its origin, present characteristics, behavioral foundations and societal impacts. Emphasis on recreation administration in the commercial sector.

Prerequisite: PRT 152
Typically offered in Fall and Spring

PRT 238 Diversity and Inclusion in Recreation and Sport (3 credit hours)
Provides knowledge, attitude awareness and resources needed to provide programs, services and facilities for all people. Students gain an understanding of people's differences and potential barriers to participation. 10 hours of volunteer work with people who have disabilities is required. Students are responsible for providing their own transportation to and from volunteer work. PRT, SMT and PGM Majors Only; PRT minors.

Prerequisite: PRT 152
GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

PRT 240 Geospatial Applications for Parks, Recreation and Tourism (3 credit hours)
Geospatial applications have a multitude of uses in both the private and public sectors and are integral to innovative solutions in parks and recreation. Students will gain an understanding of how spatial data are collected, organized, analyzed, and displayed and learn the foundations of representing environmental and social phenomena in a geospatial environment. Students will be able to explain how geospatial tools enable spatial thinking and problem solving for parks, recreation, and tourism applications, such as siting recreation facilities, mapping health-related issues, and creating compelling maps and visuals for destination marketing. Students will apply spatial concepts to hands-on applications, gaining familiarity with commonly used software.

Typically offered in Fall and Spring

PRT 250 Management of Park and Recreation Facilities (3 credit hours)
Management principles applied to park, recreation, sport areas and facilities. Emphasis on operational efficiency, quality service, fiscal responsibility and maintenance management. Laboratory provides for application of management and maintenance principles.

Prerequisite: PRT 152
Typically offered in Fall and Spring

PRT 256 Introduction to Sport Management (3 credit hours)
Introduction to concepts and practices of effective sport programming and management at the professional, collegiate and community levels. Overview of various program delivery systems such as fitness, instructional sport, informal sport, and intramural sport. Examination of management elements of sport programming, including planning, personnel, finance, facilities, risk and liability and marketing.

Typically offered in Fall, Spring, and Summer

PRT 277 Psychological & Cultural Dimensions of Sport (3 credit hours)
The psychological behavior of the individual in physical activity and sport. The development of sport and the sports industry, political and cultural significance of sport, and sport in international relationships. The relationship between sport, gender, class, ethnicity, health, drugs, violence, education, and life long physical activity.

Prerequisite: Sport Management or PRT Majors, PRT 266
Typically offered in Fall, Spring, and Summer

PRT 286 Writing and Speaking in Sports Organizations (3 credit hours)
Concepts related to effective communication within sport organizations. Including interpersonal communication, group communication, public speaking, use of electronic media, and basic knowledge and understanding of media in sport and sport enterprises.

Prerequisite: Sport Management or PRT Majors, PRT 266
Typically offered in Fall, Spring, and Summer

PRT 292 External Learning Experience (1-3 credit hours)
Learning experience in parks, recreation, tourism, and sports within an academic framework with agencies external to the department. Contact and arrangements with prospective supervisors initiated by the student. Approval by prospective supervisor and departmental undergraduate coordinator necessary. Students can receive between 1 and 3 hours credit for the the learning experience (1 credit = 45 hours) PRT and SMT majors only.

Prerequisite: PRT 152 and Sophomore Standing
Typically offered in Fall, Spring, and Summer

PRT 293 Independent Study in Parks, Recreation, & Tourism Management (1-6 credit hours)
Independent Study for Parks, Recreation, & Tourism Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer
PRT 294 Independent Study in Parks, Recreation, & Tourism Management (1-6 credit hours)
Independent Study for Parks, Recreation, & Tourism Management students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

PRT 295 Special Topics in Parks, Recreation, and Tourism Management (1-3 credit hours)
Special topics in the Department of Parks, Recreation, and Tourism Management at the 200 level for offering of courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

PRT 311 Golf Course Turf Grass Management (3 credit hours)
Introduction to the roles and responsibilities of the golf course superintendent as well as the practices and procedures associated with golf course turfgrass management. Preparation for completion of Level II Turfgrass Management, elements of the Professional Golfers’ Association of America’s Professional Golf Management apprentice program. Periodically class/lab meetings require transportation to area golf facilities. Students are expected to provide their own transportation accommodations.

Prerequisite: PGM Majors and PRT 210 and PRT 211
Typically offered in Fall only

PRT 312 Golf Management III (1 credit hours)
Advanced concepts, techniques, and practices of golf management: business analysis, planning and operations, and analysis of the golf swing. Preparation for completion of PGA of America’s Professional golf Management Level II knowledge tests and skills simulations.

Prerequisite: PGM Majors and PRT 210 and PRT 211
Typically offered in Spring only

PRT 315 Organization and Administration of Adventure Programs (3 credit hours)
Overview of the organizational and administration of adventure programs and services, professional standards, programming, management, staffing, budgeting, public relations, liability and risk management.

Prerequisite: PRT 152
Typically offered in Spring only

PRT 350 Outdoor Recreation Management (3 credit hours)
This course explores concepts and methods of outdoor recreation planning and management, with emphasis on public lands. Students will examine environmental and social impacts of recreation and develop strategies that promote quality visitor experiences and sustainable resource management.

Typically offered in Fall and Spring

PRT 351 Outdoor Consortium (3 credit hours)
Examines outdoor recreation and resource management approaches and research results from an applied perspective. Students will practice problem-solving techniques and interact with a wide variety of park managers and planners. This course culminates in a

Typically offered in Spring only

PRT 358 Recreation Program Planning (4 credit hours)
The ultimate goal of the recreation and park profession is to improve the quality of life for the people and communities we serve. We often do this by providing programs for people. It is important for the student to realize the breadth of recreation program possibilities and to be able to analyze and apply the program planning principles to deliver services in a variety of recreation settings. As a full-immersion service-learning course, PRT 358 is designed to provide knowledge and tools to enable the student to achieve the above objectives. For many students, this should be one of the most valuable courses in the entire PRT curriculum.

Prerequisite: PRT 152
Typically offered in Fall and Spring

PRT 359 Leadership and Supervision in Recreation (3 credit hours)
Systematic principles for managing human resource component of parks, recreation and tourism organizations. Leadership, group dynamics, human resources planning and organizing, employee recruitment, selection and supervision.

Prerequisite: PRT 250
Typically offered in Fall, Spring, and Summer

PRT 366 Sport Programming (3 credit hours)
Foundations, administrative support systems, delivery systems and desirable practices of sport programming. Program delivery systems overview with emphasis on problems and solutions associated with sport programs. Topics include sport league administration, youth sport delivery issues, sport tournament operations, community based sport delivery issues, college/university recreation sport delivery.

Prerequisite: Sport Management and PRT Majors, PRT 266
Typically offered in Fall only

PRT 375 Professional Development and Internship Orientation (2 credit hours)
The purpose of PRT 375 is to help students adequately prepare for their internship and for their career following graduation. Students will explore internship opportunities and explore the best practices for internship and/or job seeking through resume preparation, practicing interview skills, utilizing social media, and learning job negotiating skills.

Prerequisite: PRT 152
Typically offered in Fall and Spring

PRT 376 Sport Administration (3 credit hours)
Concepts related to policy development, organization and management specific to sport organizations. Including theories and practices of policy development and implementation, management theories, organizational behavior, the strategic management process, organizational design, managing change, and operational planning.

P: PRT 266 and Sports Management students only.
Typically offered in Spring and Summer

PRT 380 Analysis and Evaluation in Parks, Recreation (3 credit hours)
Examination of the steps involved in analyzing and estimating the impact of recreation and parks services. Includes relevant issues and useful approaches for systematic analysis. Emphasis is placed on an understanding and development of various types of

Prerequisite: 300-level Statistics course, PRT 359
Typically offered in Fall, Spring, and Summer
PRT 385 Environmental Education in Practice (3 credit hours)
This course is designed to prepare students to enter the environmental education (EE) profession. Topics will include EE professional standards, program planning and delivery, and program evaluation. A significant portion of the course focuses on securing and completing a field placement involving at least 10 contact hours with learners through teaching or observations. In addition, students are expected to attend an EE professional conference which may require overnight travel. Completion of course activities will provide 50-80 hours toward the NC Environmental Education Certification Program. Only students who have taken EMS 355 (Environmental Education Teaching Methods) will be enrolled, except with permission from the instructor.

Typically offered in Spring only

PRT 406 Sports Law (3 credit hours)
Fundamental principles of law, especially tort and contract law, applied to sports situations. Analysis of liability of sports personnel in various roles including participant, coach, promoter, trainer and official. Analysis of common law court decisions in sports contexts as well as key state and federal statutory legislation such as civil rights and antitrust.

Prerequisite: Junior standing.
Typically offered in Fall and Summer

PRT 407 Services, Facilities and Event Marketing (3 credit hours)
Examination of marketing methods as applied to Parks, Recreation, Tourism and Sport Management facilities and programs. Aspects of advanced marketing: market research, marketing strategy and revenue-generation in both public and private settings. Credit will not be given for both PRT 407 and PRT 507

Prerequisite: PRT 358, PRT 507
Typically offered in Fall only

PRT 410 Food and Beverage Management (3 credit hours)
Introduction to practices and procedures in food and beverage service. Basics of food service needs, cost controls, legal issues affecting food and beverage service, staffing, and customer satisfaction. Critical elements of food costing, purchasing, inventory control, menu planning, and security. Preparation for completion of Level III Food and Beverage control elements of the Professional Golfers' Association of America's Professional Golf Management apprentice Program

Prerequisite: Junior standing and PRT 152
Typically offered in Spring only

PRT 411 Club Management (3 credit hours)
Introduction to practices and procedures in contemporary club management. Application of general management functions to club environments including human resources, training, financial management marketing; leadership food and beverage service operations facilities and risk management; legal issues; and career planning. Preparation for completion of Club Management elements of the Professional Golfers' Association of America's Professional Golf Management apprentice Program

Prerequisite: Junior standing, PRT 152
Typically offered in Spring only

PRT 412 Golf Course Architecture (3 credit hours)
Basic principles of golf course design. Historical architectural influences on current golf course design trends. Strategic golf course design principles, shot values, construction practices, environmental issues, and maintenance issues. Golf course design and management implications. Restricted to PGM and Landscape Arch. Majors. Junior Standing

Prerequisite: PRT 211
Typically offered in Fall only

PRT 413 Golf Management IV (1 credit hours)
Advanced concepts, techniques, and practices of golf management: swing concepts of teaching, supervising and delegating, merchandising and inventory control. Preparation for completion of PGA of America’s Professional Golf Management Level III knowledge tests and skill simulations.

Prerequisite: PGM Majors and PRT 312
Typically offered in Spring only

PRT 414 PGA Apprentice Program Completion (0 credit hours)
Checkpoint mechanism to register the successful completion of the Professional Golfers' Association Apprentice requirement.

Prerequisite: PGM Majors and PRT 312
Typically offered in Fall and Spring

PRT 419 Sustainable Tourism (3 credit hours)
This course introduces the concepts and principles associated with sustainable tourism development, emphasizing on their implications for management and planning purposes. Topics to be addressed include: concept, justification and evolution of sustainable development; socio-cultural, economic, and environmental dimensions of sustainable tourism; positive and negative impacts of tourism development; and principles conducive to sustainable tourism planning and community development. Given that each case of tourism development is unique, examples from the U.S. and around the world will be used to examine and discuss issues and practices of sustainable tourism development within different geo-cultural contexts. This course adopts the Problem-Based Learning Format, which promotes and enhances students' analytical skills, problem solving skill and team working skills. Junior or senior standing.

Typically offered in Spring only

PRT 420 Destination Planning and Management (3 credit hours)
Destination planning, development, and management from a theoretical and applied perspective. Includes an examination the destination experience, destinations as they fit into the tourism system, and contributions made in the development of the tourism industry.

Prerequisite: PRT 152
Typically offered in Spring only
PRT 430  **Tourism, Poverty, and Health**  (3 credit hours)
Students will learn about the potential role of tourism in fueling equitable development and human health in destination communities, and about the factors that lead to negative social and economic tourism impacts. Students will learn about equitable community development, human health and well-being principles; and about how micro-entrepreneurs and host communities react to the challenges and opportunities posted by tourism development. The course is grounded in scholarly knowledge and is also unreservedly engaged in real life; accordingly, students will work on new ways to help under-resourced individuals pursue dignified livelihoods through tourism. Fieldwork outside of class is required, with a fee of $50.00. PRT majors and PRT minors only.

*Typically offered in Fall only*

PRT 442  **Recreation and Park Interpretive Services**  (3 credit hours)
Interpretation is a form of communication in which the technical language of natural sciences and related fields is translated in a way connects people's hearts and minds to a resource. Commonly, interpretation occurs at local, county, state and national parks; state and national forests; other protected areas; as well as natural and cultural history centers and sites. However, these skills can be transferred to any setting in which you are seeking to connect people's hearts and minds to a resource. This course is designed to provide you with fundamental knowledge of environmental and cultural interpretation, as well as develop your practical skills in providing interpretive services. Students will enroll in the National Association of Interpretation Certified Interpretive Guide course and have opportunity to apply for certification ($125 fee). Certification is optional. Students completing this course will also earn a minimum of 20 hours toward NC Environmental Education Certification.

Prerequisite: Junior standing.

*Typically offered in Spring only*

PRT 449/ES 449  **Human Dimensions of Natural Resources in Australia/New Zealand**  (3 credit hours)
This 3.5 week study abroad program examines human dimensions of natural and environmental conservation in Australia. The course will involve an orientation and lectures from faculty at James Cook University. Students will explore the natural environments in Australia including the Great Barrier Reef, Tropical Rainforest and Outback; learn about sustainable development and protection of the natural environment through educational travel, field trips, active participation, lecture presentations and seminars, written assignments, research projects and reflective exercises. Students must apply through NCSU Study Abroad Office. Students must pay program fees, airfare, some meals and incidentals.

Corequisite: PRT 450

*GEP Global Knowledge, GEP Interdisciplinary Perspectives Typically offered in Summer only*

PRT 450/ES 450  **Sustaining Natural Resources in Australia/New Zealand**  (3 credit hours)
This 3.5 week study abroad program will examine issues related to natural history and environmental conservation in Australia. This course will involve an orientation and lectures from Australian university faculty. Students will explore natural environments in Australia including the Great Barrier Reef, Tropical Rainforest and Outback; learn about sustainable development and protection of the natural environment through educational travel, field trips, active participation, lecture presentations and seminars, written assignments, research projects and reflective exercises. Students must apply through NCSU Study Abroad Office. Students must pay program fees, airfare, some meals and incidentals.

Corequisite: PRT 449

*GEP Global Knowledge, GEP Interdisciplinary Perspectives Typically offered in Summer only*

PRT 451  **Principles of Recreation Planning and Facility Development**  (3 credit hours)
Planning activities analyzed as decision-making processes. Identification, interpretation, evaluation and utilization of data and resources necessary for recreation planning. Planning principles applied in the analysis of proposed and existing recreation sites.

Prerequisite: PRT 358

*Typically offered in Fall and Spring*

PRT 454  **Parks and Recreation Finance and Administration**  (3 credit hours)
Recreation and park fiscal administration, sources of finance for operating and capital expenditures, revenue activities, financial planning, budgeting, expenditure policies, auditing and planning for recreation and park services, decision-making tools, legal aspects of administration.

Prerequisite: PRT 359

*Typically offered in Fall, Spring, and Summer*

PRT 458  **Special Events Planning**  (3 credit hours)
Theoretical and applied approaches to the planning of special events. Components and considerations of event planning, applied to various recreational settings. Participation in a community special event is required. Attendance at professional conference also required.

Prerequisite: PRT 358

*Typically offered in Spring only*

PRT 466  **Sport Finance and Economics**  (3 credit hours)
Concepts include sources of revenue for financing, principles of budgeting, spreadsheet utilization, and financial management of sport facilities and enterprises. Additional topics include fundraising principles and methods, economic impact principles and their application to sport venues and events, economic theory applied to sport manufacturing, service industries, professional sports, stadiums and arenas, intercollegiate sports, and the sport club industry.

Prerequisite: Sport Management and PRT Majors, PRT 266, ACC 210, and (ARE 201 or EC 201 or EC 205)

*Typically offered in Fall, Spring, and Summer*
PRT 475 Recreation and Park Internship (8 credit hours)
Provides prospective park, recreation and leisure service professionals a 400-hour (ten week) learning experience in a selected agency or organization, under the joint supervision of a qualified manager and a university internship supervisor. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PRT 350, PRT 358, PRT 359, PRT 375, PRT 380, 100 hours of approved work experience.
Typically offered in Fall, Spring, and Summer

PRT 476 Sport Marketing (3 credit hours)
Fundamental marketing principles and concepts related to the sport industry. Overview of marketing mix, marketing strategies and the bases of segmentation, sponsorship, licensing, fundraising and merchandising. Special emphasis on the marketing of sport and its strong relationship to research. Credit will not be given for both PRT 476 and PRT 407.
Prerequisite: PRT 486, Sport Management or PRT Majors, PRT 266
Typically offered in Fall and Spring

PRT 478 Sustainable Sport Facility Management (3 credit hours)
In this course, students will examine the development and management of sport facilities, paying particular attention to environmental concerns and the sustainability of the sport stadia. Specifically, the course first focuses on the 3 E’s of sustainability (Environment, Equity, Economics) and learn about sustainable systems. From this underpinning, the course is divided into two main frameworks: 1. Development of sport facilities; and 2. Sport facility operations. Each part of the course is enhanced by guest lectures from industry experts and hands on learning experiences.
R: Sport Management Majors only
Typically offered in Fall, Spring, and Summer

PRT 491 Special Topics in Recreation (1-3 credit hours)
Investigation and analysis of a problem associated with recreation resources.
Typically offered in Fall, Spring, and Summer

PRT 493 Independent Study in Parks, Recreation, and Tourism Management (1-6 credit hours)
Independent Study for Parks, Recreation, and Tourism Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

PRT 494 Independent Study in Parks, Recreation, and Tourism Management (1-6 credit hours)
Independent Study for Parks, Recreation, and Tourism Management students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.
Typically offered in Fall, Spring, and Summer

PRT 500 Conceptual Foundations of Recreation (3 credit hours)
Exploration of the conceptual foundations of leisure, recreation, sport, play, and work, the history of ideas in the field and the relationships of these ideas to contemporary professional and social problems. Restricted to PRTM masters and students and others by consent of the instructor. This course will be offered in an accelerated seven-week format.
Restriction: PRT Grad Students Only
Typically offered in Fall only

PRT 501 Research Methods In Recreation (3 credit hours)
Examination and understanding of advanced scientific investigative methods in their application toward explaining recreation and leisure behavioral phenomena and for resolution of recreation management problems.
Restricted to: Graduate-level Statistics
Typically offered in Spring only

PRT 503 Advanced Fiscal Management for Parks, Recreation, Tourism and Sport Organizations (3 credit hours)
This course is intended to provide students with advanced concepts of fiscal management as applied to the unique industries of parks, recreation, tourism and sport management. Emphasis will be placed on understanding how the receipt, disbursement, and utilization of funds can foster sustainability within these types of organizations. Additionally, this course will focus on developing the skills necessary to apply ethical financial analysis principles through financial risk management. This course is restricted to PRTM masters students and others by consent of the instructor. This course will be offered online in an accelerated seven-week format.
Typically offered in Fall only

PRT 504 Data Management and Applications in Parks, Recreation, Tourism and Sport Management (3 credit hours)
Introduction to procedures and techniques used in research and evaluation in parks, recreation, sport, and tourism settings to solve management problems. The course emphasizes techniques for data collection, management, analysis, and communication of research findings. This course is restricted to PRTM masters students and others by consent of the instructor. This course will be offered online in an accelerated seven-week format.
Typically offered in Fall only

PRT 505 GIS and Spatial Analysis in PRTS (3 credit hours)
Introduction to spatial reasoning and spatial analysis as implemented in geographic information systems (GIS) to perform evaluation and research in parks, recreation, tourism, and sport settings. This course is restricted to PRTM master's degree students or others with consent of the instructor.
Prerequisite: Graduate Standing and MPRTSM
Typically offered in Spring only
PRT 506 Organizational Behavior and Leadership in Parks, Recreation, Tourism and Sport (3 credit hours)
This course will focus on the organization and administration of public, private and not-for-profit park, recreation, tourism and sports (PRTS) agencies. Emphasis will be placed on understanding the structural, human, political, and cultural factors that impact organizational efficiency and effectiveness - specifically focusing on these environments. The course will primarily address issues related to organization, management, ethical leadership, human personnel supervision, theory, and research. This course is restricted to PRTM master's degree students or by permission of instructor. This course will be offered online in an accelerated seven-week format.

Typically offered in Fall only

PRT 507 Strategic Marketing Management in Parks, Recreation, Tourism and Sport Organizations (3 credit hours)
This course examines the theoretical principles and applications of marketing and promotion strategies for recreational sport and key marketing concepts and strategies using case studies. There is significant discussion on marketing activation, leveraging strategies of sport/event sponsor brands/ companies, and developing a marketing plan. This course is restricted to PRTM master's degree students and others with the content of the instructor. This course will be offered online in an accelerated seven-week format.

Typically offered in Spring only

PRT 508 Risk Management for Parks, Recreation, Tourism and Sport Organizations (3 credit hours)
This course explores risk management in PRTs organizations with an emphasis on ethical managerial strategies. The topics include legal concepts related to specific managerial functions, impacts on functions in recreation environments that result in more efficient and successful operation and protection for the organization. In addition, effective strategies for risk management related to facilitating active-healthy lifestyles and sustainable communities will be explored. This course is restricted to PRT master's degree students and others by consent of the instructor. This course will be offered online in an accelerated seven-week format.

Typically offered in Summer only

PRT 509 Program Evaluation for Parks, Recreation, Tourism and Sport Organizations (3 credit hours)
This course focuses on the development of a working knowledge of the rationale, procedures and tools for conducting sound program evaluation assessments in parks, recreation, tourism, and sport organizations. Effective skills for mastering comprehensive program evaluation strategies including formative, summative, and knowledge building strategies are taught. Students explore social science methods specifically appropriate for evaluation of youth programs.

Typically offered in Summer only

PRT 510 Active Recreation and Community Health (3 credit hours)
This course focuses on the association of active recreation in communities and community health. Students explore individual, social, community, environmental, and policy factors that affect community health and the contribution of recreation and park programs and facilities. This is a seven week course.

Typically offered in Spring only

PRT 511 Sport and Entertainment Venue Management - Facilities (3 credit hours)
In this course, students will examine the management of sport facilities, paying particular attention to environmental concerns and the sustainability of the event venue. Specifically, we will first focus on the three E's of sustainability (Environment, Equity, Economics) and learn about sustainable systems. From this underpinning, the class will be divided into six critical topic areas of sport facility management: 1. History and role of venues 2. Venue Safety and Security 3. Venue Policy and Procedures 4. Food and Beverage Operations 5. Transportation and Parking Management 6. Ancillary Revenue Sources

Typically offered in Fall, Spring, and Summer

PRT 512 Sport and Entertainment Venue Management - Operations and Services (3 credit hours)
A thorough background on operations and services is essential for sport and entertainment venue managers. This course examines venue management by covering essential managerial functions. These include management and human resources, customer service and crowd management, managing volunteers, scheduling and booking venues, and ticket office operations.

Typically offered in Spring only

PRT 550 Human Behavior and the Environment (3 credit hours)
This course helps students understand the variety of cognitive, social, affective, and environmental factors that influence human behavior in natural resource contexts, with an emphasis on nature-based recreation experiences and conservation behaviors. Students will explore behavioral models from different disciplines, examine pathways to promote behavior change, and assess implications for park management, environmental stewardship, and natural resource conservation.

Typically offered in Fall only

PRT 555 Environmental Impacts of Recreation and Tourism (3 credit hours)
Understanding of environmental impacts of recreation and tourism, and different methods for assessing and managing such impacts. Examination of the scientific and management literature and application of impact assessment techniques.

Typically offered in Fall only

PRT 560 Theory and Practice of Partnerships for Conservation and Community Sustainability (3 credit hours)
Understanding of collaborative processes and the role of partnerships in public land management, community based conservation, tourism development, and community health and recreation. Examination of literature and evaluation of collaboration and partnerships in practice.

Typically offered in Fall only

PRT 595 Special Topics In Recreation Resources (1-6 credit hours)
Special topics in various aspects of recreation resources developed under direction of a graduate faculty member on a tutorial basis. Subjects offered under this course listing also used to test and develop new courses.

Prerequisite: Graduate standing

Typically offered in Fall and Spring
**PRT 610 Special Topics in Recreation Resources** (1-6 credit hours)
Special topics in various aspects of recreation resources developed under direction of a graduate faculty member on a tutorial basis. Subjects offered under this course listing also used to test and develop new courses.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

**PRT 620 Recreation Resources Problems** (1-4 credit hours)
Assigned or selected problems in field of recreation administration, planning, supervision, maintenance, operations, financing or program. Special research problems selected on basis of interest of students and supervised by members of graduate faculty.

Prerequisite: Advanced Undergraduate standing or Graduate standing
Typically offered in Fall, Spring, and Summer

**PRT 650 Professional Electronic Portfolio for Parks, Recreation and Tourism Management** (1 credit hours)
Students will develop a personalized digital portfolio of the work completed in all required courses in the Masters of Parks, Recreation & Tourism Management program. The portfolio should include evidence, reflection, and critical analysis of core competencies achieved throughout their academic course of study. This course must be taken during a student's last semester after he or she has completed all the required courses.

Prerequisite: Graduate Standing and PRT 500 and PRT 504 and PRT 505 and PRT 506 and PRT 508 and PRT 503 and PRT 507.
Typically offered in Fall and Spring

**PRT 685 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

**PRT 693 Master's Supervised Research** (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

**PRT 695 Master's Thesis Research** (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

**PRT 696 Summer Thesis Research** (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

**PRT 699 Master's Thesis Preparation** (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits Arranged

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

**PRT 700 Advanced Theories of Leisure** (3 credit hours)
This course is designed to examine theory as it can be applied to understanding of leisure behavior and parks, recreation, and tourism management research. The goal is to provide a foundation for identifying, evaluating, and applying theoretical perspectives to PRTM research. Students are expected to engage in a critical analysis of theory in PRTM.

Ph.D. student
Typically offered in Fall only

**PRT 701 Research Methods in Parks, Recreation, & Tourism Management** (3 credit hours)
The overall goal of this course is to provide students with a background in advanced social science research methods commonly used in PRTM-related fields as well as strategies for planning, designing, evaluating, and applying research using the social science framework. This course will also be designed in a way to guide students through the phases of the research design and to develop a research proposal.

Completion of PRT 500/700 or concurrently enrolled; Graduate Status
Typically offered in Fall only

**PRT 705 Qualitative Research Methods in Conservation & Community Sustainability** (3 credit hours)
Examination of qualitative research methods and designs in the contexts of human dimensions of natural resources, equitable and sustainable tourism development, and community health and well-being, including data generation, organization, analysis, quality and presentation. A research project will be conducted with the application of qualitative data organization software.

P: Doctoral student status, or with consent of instructor.
Typically offered in Spring only

**PRT 730 Tourism, Community Health, and Sustainability** (3 credit hours)
In this course students will examine the potential role of tourism in mitigating or exacerbating health disparities and environmental degradation in rural poor areas. The course endorses an academic ethic of engaged scholarship. Students will be asked to make original contributions to participatory development scholarship, and they will be asked to collaborate with community partners on an applied project addressing tourism, health disparities and environmental degradation in an economically depressed rural community. Consistent with the engaged nature of this course, we will travel to rural communities to meet stakeholders, collect data, and provide coaching/training to tourism micro-entrepreneurs.

Typically offered in Spring only

**PRT 795 Special Topics in Recreation Resources** (1-6 credit hours)
Typically offered in Fall, Spring, and Summer
PRT 801 Doctoral Seminar in Parks, Recreation and Tourism Research
(1 credit hours)
Research studies, scientific articles and progress reports on research effects presented and critically evaluated. Each student pursuing a doctoral degree is expected to take this offering four times for one hour of credit each time.

Typically offered in Fall and Spring

PRT 810 Special Topics In Recreation Resources
(1-6 credit hours)
Special topics in various aspects of recreation resources developed under direction of a graduate faculty member on a tutorial basis. Subjects offered under this course listing also used to test and develop new courses.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

PRT 885 Doctoral Supervised Teaching
(1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PRT 893 Doctoral Supervised Research
(1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PRT 895 Doctoral Dissertation Research
(1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PRT 896 Summer Dissertation Research
(1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

PRT 899 Doctoral Dissertation Preparation
(1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PHI 205 Introduction to Philosophy
(3 credit hours)
Introduction to selected problems of enduring philosophical importance, including such topics as the nature of morality, knowledge, human freedom, and the existence of God. Content varies with different sections.

Credit is not allowed for both PHI 205 and PHI 210.

GEP Humanities
Typically offered in Fall, Spring, and Summer

PHI 210 Representation, Reason and Reality
(3 credit hours)
This course is an introduction to philosophical issues concerning topics such as language, thought, knowledge, reason, truth, and reality through the study of problems, puzzles, and paradoxes. Not both PHI 205 and PHI 210 may be used towards satisfaction on PHI major or PHI minor requirements.

Credit is not allowed for both PHI 210 and PHI 205
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

PHI 214 Issues in Business Ethics
(3 credit hours)
An analysis and evaluation of major issues in business ethics. Topics include the social responsibility of business; social justice and free enterprise; the rights and duties of employers, employees, manufacturers, and consumers; duties to the environment, the world's poor, future generations, and the victims of past injustices; the moral status of the corporation; and the ethics of advertising.

GEP Humanities
Typically offered in Fall, Spring, and Summer

PHI 221 Contemporary Moral Issues
(3 credit hours)
Philosophical analysis and theory applied to a broad range of contemporary moral issues, including euthanasia, suicide, capital punishment, abortion, war, famine relief, and environmental concerns.

GEP Humanities
Typically offered in Fall, Spring, and Summer

PHI 250 Thinking Logically
(3 credit hours)
Deductive arguments attempt to guarantee their conclusions. Inductive arguments attempt to make their conclusions more probable. Using a small number of simple, powerful logical techniques, this course teaches you how to find, analyze and evaluate deductive and inductive arguments, and thus how to avoid the most common errors in reasoning.

GEP Mathematical Sciences
Typically offered in Fall and Spring

PHI 298 Special Topics in Philosophy
(3 credit hours)
Selected studies in philosophy that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

PHI 300 Ancient Philosophy
(3 credit hours)
Western philosophy of the ancient world, with special emphasis on Plato and Aristotle.

GEP Humanities
Typically offered in Fall and Spring

PHI 301 Early Modern Philosophy
(3 credit hours)
Western philosophy of the 17th and 18th centuries, including such philosophers as Descartes, Hobbes, Leibniz, Locke, Berkeley, Hume, and Kant.

GEP Humanities
Typically offered in Fall and Spring

PHI 302 19th Century Philosophy
(3 credit hours)
Western philosophy of the 19th century, including such philosophers as Kant, Hegel, Schopenhauer, Kierkegaard, Marx, and Nietzsche.

GEP Humanities
Typically offered in Fall only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI 305</td>
<td>Philosophy of Religion</td>
<td>3</td>
<td>The existence and nature of God, including such topics as traditional proofs of God, skeptical challenges to religious belief, miracles, the problem of evil, faith and reason, and religious experience.</td>
</tr>
<tr>
<td>PHI 309</td>
<td>Political Philosophy</td>
<td>3</td>
<td>Philosophical study of important political ideas and values such as liberty, equality, justice, rights, and democracy. May include readings from classical and contemporary sources.</td>
</tr>
<tr>
<td>PHI 310</td>
<td>Existentialism</td>
<td>3</td>
<td>Philosophy of Existentialism, including such thinkers as Kierkegaard, Nietzsche, Doestoevsky, Sartre, Heidegger, and Camus.</td>
</tr>
<tr>
<td>PHI 312</td>
<td>Philosophy of Law</td>
<td>3</td>
<td>Fundamental legal issues such as what constitutes a law or legal system. Justifications of legal interference with individual liberty. Philosophical legal issues illustrated by specific legal cases.</td>
</tr>
<tr>
<td>PHI 313</td>
<td>Ethical Problems in the Law</td>
<td>3</td>
<td>Explores uses of the legal system, including such topics as the death penalty, plea bargaining, legalizing euthanasia, censorship, Good Samaritan laws, the insanity defense, civil disobedience, preferential treatment.</td>
</tr>
<tr>
<td>PHI 319</td>
<td>Africana Political Philosophy</td>
<td>3</td>
<td>Africana thought on central issues in political philosophy such as justice, equality and state authority in the work of select African-American Philosophers. Material from African and Caribbean traditions may also be considered.</td>
</tr>
<tr>
<td>PHI 320</td>
<td>Philosophy of Race</td>
<td>3</td>
<td>Fundamental philosophical questions raised by the concept of race, such as whether race is a legitimate category for identifying human beings, and whether the category of race reinforces racism.</td>
</tr>
<tr>
<td>PHI 325/STS 325</td>
<td>Bio-Medical Ethics</td>
<td>3</td>
<td>Interdisciplinary examination and appraisal of emerging ethical and social issues resulting from recent advances in the biological and medical sciences. Abortion, euthanasia, physician-assisted suicide, compromised infants, aids, reproductive technologies, and health care. Focus on factual details and value questions, fact-value questions, fact-value interplay, and questions of impact assessment and policy formulation.</td>
</tr>
<tr>
<td>PHI 330</td>
<td>Metaphysics</td>
<td>3</td>
<td>Problems of metaphysics, including such topics as: possibility and necessity, paradoxes of time travel, nature of space and time, free will and determinism, causation, mind-body problem and identity-over-time.</td>
</tr>
<tr>
<td>PHI 331</td>
<td>Philosophy of Language</td>
<td>3</td>
<td>Introduction to traditional and modern accounts of the relations between language and reality, the nature of truth, problems of intentionality and propositional attitudes.</td>
</tr>
<tr>
<td>PHI 332</td>
<td>Philosophy of Psychology</td>
<td>3</td>
<td>Problems and controversies that overlap the boundary between philosophy and psychology: the mind/body problem, behaviorism vs. cognitivism, the prospects for artificial intelligence, and language and the questions of innate knowledge.</td>
</tr>
<tr>
<td>PHI 333</td>
<td>Knowledge and Skepticism</td>
<td>3</td>
<td>Analysis of such central concepts as knowledge, belief, and truth, and the investigation of the principles by which claims to knowledge may be justified.</td>
</tr>
<tr>
<td>PHI 340</td>
<td>Philosophy of Science</td>
<td>3</td>
<td>Nature of science highlighted by differences between science and pseudoscience, relationships between science and religion, and roles of purpose-directed (teleological) and causal explanation in physical, life and social sciences.</td>
</tr>
<tr>
<td>PHI 347</td>
<td>Neuroscience and Philosophy</td>
<td>3</td>
<td>Introduction to principal theoretical, empirical and normative issues at the intersection of neuroscience and philosophy, including such issues as: consciousness, the mind's I and the brain's I: free will, moral responsibility and neuroscience; the ethics of personal enhancement; brains, human nature and personal identity; neuroscientifically informed evaluation of well-being.</td>
</tr>
</tbody>
</table>
PHI 375 Ethics (3 credit hours)
Examination of traditional questions of philosophical ethics: What are the principles of moral conduct? What sort of life is worthy of a human being? Includes both classic and contemporary literature.

GEP Humanities
Typically offered in Fall and Spring

PHI 376 History of Ethics (3 credit hours)
Topics in the history of ethics. Philosophers to be studied may include Plato, Aristotle, Aquinas, Butler, Hume, Kant, Sidgwick and Nietzsche.

Prerequisite: One PHI course
GEP Humanities

PHI 401 Kant’s Critique of Pure Reason (3 credit hours)
A text-based critical study of Kant’s Critique of Pure Reason. Focusing on such topics as perception, judgment, knowledge, space, time, substance, causation and reality. Students cannot receive credit for both PHI 401 and PHI 501.

Prerequisite: 6 credits in PHI. Credit is not allowed for both PHI 401 and PHI 501.
GEP Humanities

PHI 403 Continental Philosophy After 1900 (3 credit hours)
Key themes in continental European philosophy after 1900. Work studied will include selections from writings of authors in at least two major traditions, e.g., phenomenology, hermeneutics, structuralism, and critical theory. Junior standing or above required. Students may not receive credit for both PHI 403 and PHI 503.

R: Junior standing or above
GEP Humanities
Typically offered in Spring only

PHI 420 Global Justice (3 credit hours)
The applications of the ideas of justice and right beyond and across the borders of individual nation states, attending to the facts of globalization and their consequences for political and economic justice and human rights. Topics: skepticism about global justice; transnational distributive justice, pollution, and poverty; national sovereignty, self-determination, and intervention; the ethics of war; international human rights; and global democracy. No one can receive credit for both PHI 420 and PHI 520.

Prerequisite: One PHI course. Credit is not allowed for both PHI 420 and PHI 520.
GEP Humanities

PHI 425/PSY 425 Introduction to Cognitive Science (3 credit hours)
Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language. Students cannot receive credit for both PHI/PSY 425 and PHI/PSY 525.

Prerequisite: One upper-level PHI, PSY, CSC or Linguistics course. Credit is not allowed for PHI 425 and PHI/PSY 525.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

PHI 440 The Scientific Method (3 credit hours)
Detailed examination of core issues in the philosophy of science: the confirmation of scientific theories, falsification, projectibility, the nature of scientific explanation, laws of nature, and causation. Students cannot receive credit for both PHI 440 and PHI 540.

Prerequisite: One PHI course. Credit is not allowed for both PHI 440 and PHI 540.

PHI 447 Philosophy, Evolution and Human Nature (3 credit hours)
This course covers philosophical issues in the evolutionary study of human cognition: the role of adaptationism; the values of psychological vs. behavioral approaches; the phenotypic gambit; the evolution of morality and altruism; the nature of culture and the possibility of cultural evolution; inativeness, genetic determinism and development; and case studies of evolutionary explanation of human behavior or psychology. Students cannot receive credit for both PHI 447 and PHI 547.

Prerequisite: One 300 level or higher course in Philosophy, Biology, Psychology or Anthropology. Credit is not allowed for PHI 447 and PHI 547.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

PHI 475 Ethical Theory (3 credit hours)
An introduction to some central themes and issues in ethical theory. Topics in normative and meta-ethics such as consequentialism, deontology, virtue ethics, constructivism, realism, relativism, subjectivism, and expressivism. Readings primarily from contemporary literature.

Prerequisite: PHI 375 or PHI 376. Credit is not allowed for both PHI 475 and PHI 575.

PHI 494 Research and Writing in Ethics (1 credit hours)
A substantial paper in ethics, assigned by the instructor of the corequisite; enrollment subject to departmental approval; may be repeated for credit. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: PHI 250 or LOG/MA 201 or LOG/MA 335 and one other (non PHI 250) PHI course. Corequisite: One of (PHI 298, 309, 310, 313, 319, 325, 375, 376, 420, 475, or 498) Typically offered in Fall, Spring, and Summer

PHI 495 Research and Writing in History of Philosophy (1 credit hours)
A substantial paper in history of philosophy, assigned by the instructor of the co-requisite; enrollment subject to departmental approval; may be repeated for credit. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Prerequisite: PHI 250, LOG/MA 201 or LOG/MA 335 and one other (non PHI 250) PHI course. Co-requisite: One of PHI 298, 300, 301, 302, 310, 401 or 498 Typically offered in Fall, Spring, and Summer
PHI 496 Research and Writing in Contemporary Philosophy (1 credit hours)
A substantial paper in contemporary philosophy, assigned by the instructor of the corequisite; enrollment subject to departmental approval; may be repeated for credit. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: (PHI 250 or LOG 201 or LOG 335) and one other PHI course. Corequisite: One of PHI 298, 305, 320, 330, 331, 332, 333, 340, 347, 425, 440, 447 or 498
Typically offered in Fall, Spring, and Summer

PHI 497 Research and Writing in Logic, Representation and Reasoning (1 credit hours)
A substantial paper in logic, representation and reasoning, assigned by the instructor of the corequisite. enrollment subject to departmental approval; may be repeated for credit. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: LOG 201 or 335, and one other PHI course, not PHI 250. Corequisite: One of LOG/MA 335, LOG 430/530, 435/535, PHI 298, 330, 331, 332, 333, 347, 340, 425/525, 440/540 or 447/547
Typically offered in Fall, Spring, and Summer

PHI 498 Special Topics in Philosophy (1-6 credit hours)
Detailed investigation of selected topics in philosophy. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study.
Prerequisite: Six credits in PHI courses
Typically offered in Fall and Spring

PHI 501 Kant’s Critique of Pure Reason (3 credit hours)
A text-based critical study of Kant's Critique of Pure Reason focusing on topics such as perception, judgment, knowledge, space, time, substance, causation, and reality. Students cannot receive credit for both PHI 401 and PHI 501.
Prerequisite: Graduate Standing. Credit is not allowed for both PHI 501 and PHI 401.

PHI 503 Continental Philosophy After 1900 (3 credit hours)
Key themes in continental European philosophy after 1900. Work studied will include selections from writings of authors in at least two major traditions, e.g., phenomenology, hermeneutics, structuralism, and critical theory. Students cannot receive credit for both PHI 403 and PHI 503. Junior standing is required for PHI 403. Graduate standing is required for PHI 503.
R: Graduate Standing
Typically offered in Spring only

PHI 520 Global Justice (3 credit hours)
The applications of the ideas of justice and right beyond and across the borders of individual nation states, attending to the facts of globalization and their consequences for political and economic justice and human rights. Topics: skepticism about global justice; transnational distributive justice, pollution, and poverty; national sovereignty, self-determination, and intervention; the ethics of war; international human rights; and global democracy. No one can receive credit for both PHI 420 and PHI 520.
Prerequisite: Graduate standing. Credit is not allowed for both PHI 520 and PHI 420.

PHI 525/PSY 525 Introduction To Cognitive Science (3 credit hours)
Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language. Students cannot receive credit for both PHI/PSY 425 and PHI/PSY 525.
Prerequisite: Graduate standing. Credit is not allowed for both PHI 525 and PHI/PSY 425.
Typically offered in Spring only

PHI 540 The Scientific Method (3 credit hours)
Detailed examination of core issues in the philosophy of science: the confirmation of scientific theories, falsification, projectibility, the nature of scientific explanation, laws of nature, and causation. Students cannot receive credit for both PHI 440 and PHI 540.
Prerequisite: Graduate standing. Credit is not allowed for both PHI 540 and PHI 440.
Typically offered in Fall only

PHI 547 Philosophy, Evolution and Human Nature (3 credit hours)
This course covers philosophical issues in the evolutionary study of human cognition: the role of adaptationism; the values of psychological vs. behavioral approaches; the phenotypic gambit; the evolution of morality and altruism; the nature of culture and the possibility of cultural evolution; innateness, genetic determinism and development; and case studies of evolutionary explanation of human behavior or psychology. Students cannot receive credit for both PHI 447 and PHI 547.
Credit is not allowed for both PHI 547 and PHI 447. Graduate Standing Required.
Typically offered in Fall only

PHI 550 Ethical Theory (3 credit hours)
An introduction to some central themes and issues in ethical theory. Topics in normative and meta-ethics such as consequentialism, deontology, virtue ethics, constructivism, realism, relativism, subjectivism, and expressivism. Readings primarily from contemporary literature.
Prerequisite: Graduate Standing. Credit is not allowed for both PHI 575 and PHI 475.

PHI 598 Special Topics in Philosophy (3-6 credit hours)
Typically offered in Fall and Spring

PHI 696 Summer Thesis Res (1 credit hours)
PHI 816 Introduction to Research Ethics (1 credit hours)
Institutional rules guiding the responsible conduct of research (RCR) and their philosophical justification. Rudiments of moral reasoning and their application to RCR. Topics: plagiarism, falsification and fabrication of data, and ethics versus custom, law, science, and religion.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

PHI 896 Summer Dissert Res (1 credit hours)

Physics (PY)

PY 123 Stellar and Galactic Astronomy (3 credit hours)
Introductory, descriptive survey of stars, galaxies and cosmology, designed primarily for non-science majors. Exotic recent discoveries such as quasars, pulsars, and black holes will be included. Complements PY 124, Solar System Astronomy. Companion laboratory course PY 125.

GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 124 Solar System Astronomy (3 credit hours)
Introductory, descriptive survey of the solar system designed primarily for non-science majors, including current results from space probes, history of astronomy, and the motions of the moon, stars, and planets in the night sky. Complementary course covering stars, galaxies and cosmology (PY 123). Companion laboratory course (PY 125).

GEP Natural Sciences
Typically offered in Fall and Spring

PY 125 Astronomy Laboratory (1 credit hours)
Introduction to astronomical observing. Twelve exercises include astronomical instruments; the nature of light; Kepler's and Newton's laws of motion; the constellations, planets, binary stars, stellar clusters, and galaxies. Use of small telescopes to observe celestial objects.
Corequisite: PY 123 or 124
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 131 Conceptual Physics (4 credit hours)

GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 201 University Physics I (4 credit hours)
First course of three semester sequence for students majoring in physical and mathematical sciences. Calculus used throughout. Principles of classical Newtonian mechanics covered in detail.
Corequisite: MA 141. Credit is not allowed for both PY 201 and PY 205 or PY 211.

Typically offered in Fall only

PY 202 University Physics II (4 credit hours)
Second course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus used throughout. Principles of electricity and magnetism covered in detail.
Prerequisite: PY 201, MA 141, Corequisite: MA 241. Credit is not allowed for both PY 202 and PY 208 or PY 211.
Typically offered in Spring only

PY 203 University Physics III (4 credit hours)
Third course of three semester sequence designed primarily for students majoring in physical and mathematical sciences. Calculus is used throughout. Principles of wave optics and modern physics are covered in detail.
Prerequisite: PY 202, MA 241, Corequisite: MA 242
Typically offered in Fall only

PY 205 Physics for Engineers and Scientists I (3 credit hours)
First semester of a two-semester sequence in introductory physics, with coordinated problem-solving experiences. A calculus-based study of mechanics, sound and heat. Credit not allowed for more than one of PY 205, PY 201, and PY 211.
Prerequisite: MA 141 with a grade of C- or better or MA 241PL. Credit is not allowed for both PY 205 and PY 201 or PY 211. Co-requisite: PY 206. ADD BOTH PY 205 and PY 206 TO YOUR SHOPPING CART AND THEN ENROLL SIMULTANEOUSLY
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 206 Physics for Engineers and Scientists I Laboratory (1 credit hours)
Laboratory course to accompany the PY 205 lecture course. A calculus-based study of mechanics, sound and heat.
Prerequisite: MA 141 with a grade of C- or better or MA 241 Placement. Co-requisite: PY 205. ADD BOTH PY 205 and PY 206 TO YOUR SHOPPING CART AND THEN ENROLL SIMULTANEOUSLY
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 208 Physics for Engineers and Scientists II (3 credit hours)
Second semester of a two-semester sequence in introductory physics. A calculus-based study of electricity, magnetism, optics and modern physics. Credit not allowed for more than one of PY 208, PY 202, and PY 212
Prerequisite: C- or better in PY 205 and C- or better in MA 241. Credit is not allowed for both PY 208 and PY 202 or PY 212. Co-requisite: PY 209. ADD BOTH PY 208 and PY 209 TO YOUR SHOPPING CART AND THEN ENROLL SIMULTANEOUSLY
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 209 Physics for Engineers and Scientists II Laboratory (1 credit hours)
Laboratory course to accompany the PY 208 lecture course. A calculus-based study of electricity, magnetism, optics and modern physics.
Pre-requisite: PY 205 with grade of C- or better, MA 241 with grade of C- or better, PY 206 with grade of C- or better. Co-requisite: PY 208. ADD BOTH PY 208 and PY 209 TO YOUR SHOPPING CART AND THEN ENROLL SIMULTANEOUSLY
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer
PY 211 College Physics I (4 credit hours)
First semester of a two-semester introductory sequence in non-calculus physics, with laboratory. Mechanics, heat, wave motion and sound. Credit not allowed for more than one of PY 211, PY 201 or PY 205
Prerequisite: MA 107 or 111 or 121 or 131 or 108 or 141 with a C- or better, or 480 on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test, or 2 or better on an AP Calc exam. Credit is not allowed for both PY 211 & PY 201 or PY 205
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

PY 212 College Physics II (4 credit hours)
Second semester of a two-semester introductory sequence in non-calculus physics, with laboratory, Electricity, and magnetism, light, modern physics. Credit not allowed for more than one of PY 212, PY 202, and PY 208
Prerequisite: PY 211 or PY 205. Credit is not allowed for both PY 212 and PY 202 or PY 208.
Typically offered in Fall, Spring, and Summer

PY 251 Introduction to Scientific Computing (3 credit hours)
An introductory course in scientific computing for the physical and mathematical sciences using python and other open-source tools. Using a problem-oriented approach, students will learn the basic computing skills needed to conduct scientific research and to prepare for upper-level courses in science and engineering. Topics will include algorithm development, numerical methods, elements of programming, data analysis, and data visualization.
Prerequisite: MA 241; Corequisite: PY 202 or PY 208
Typically offered in Fall and Spring

PY 252 Instrumental and Data Analysis for Physics (2 credit hours)
Digital data acquisition and lab computers (e.g. using LabView or MatLab) are tools used in nearly all current physics research labs. By using both analysis and thorough lab experimental investigation the student will learn basic skills with electronic devices (oscilloscope, power supplies, function generator, op-amps, high & low-pass filters, feedback circuits), electronic noise (measurement and analysis), and basic circuit construction methods (such as shielding/grounding, soldering).
Prerequisite: PY 202 or PY 208
Typically offered in Fall and Spring

PY 299 Special Problems in Physics (1-3 credit hours)
Study in experimental or analytical topics in classical and modern physics.
Typically offered in Fall, Spring, and Summer

PY 301 Introduction to Quantum Mechanics (3 credit hours)
An introduction to wave mechanics and quantum phenomena including the Schroedinger equation for simple systems, the Hamiltonian operator, the use of commutator relations, and the application of angular momentum operators. Emphasis on mathematical tools used in wave mechanics, including complex numbers, function operators, eigenvalues and eigenvectors.
Prerequisite: C- or better in PY 203 or PY 407
Typically offered in Fall only

PY 328 Stellar and Galactic Astrophysics (3 credit hours)
Introduction to the study of stars, galaxies, and the universe. Stars and stellar evolution; interstellar medium; galaxies and galaxy clusters; cosmology. Recent developments in the understanding of neutron stars, black holes, active galaxies, quasars and inflationary cosmologies.
Prerequisite: PY 202 or PY 208
Typically offered in Fall only

PY 341 Relativity, Gravitation and Cosmology (3 credit hours)
Introduction to relativity, gravitation and cosmology in accordance with Einstein's special and general theories of relativity. Flat spacetime: Minkowski metric, time dilation, length contraction, doppler effect, twin paradox, and space travel. Curved spacetime: Schwarzschild metric, black holes and event horizons, particle and light motion, Global positioning system, precession of planetary orbits. Cosmology: hubble law, expansion of the universe, Friedman-Robertson-Walker metric, big bang, cosmological redshift, dark matter and dark energy.
Prerequisite: C- or better in PY 203 or PY 407
Typically offered in Spring only

PY 401 Quantum Physics I (3 credit hours)
An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.
Prerequisite: Grade of C- or better in PY 411 and grade of C- or better in PY 203.
Typically offered in Spring only

PY 402 Quantum Physics II (3 credit hours)
An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.
Prerequisite: C- or better in PY 401
Typically offered in Fall only

PY 407 Introduction to Modern Physics (3 credit hours)
Major developments in modern physics: special relativity, origin of the quantum theory, atomic and molecular structure, radioactivity, properties of nuclei. Credit not allowed for both PY 203 and PY 407
Prerequisite: MA 242, PY 208
Typically offered in Spring only

PY 411/PY 511 Mechanics I (3 credit hours)
First semester of a two-semester sequence in particle and continuum mechanics at the intermediate level. Focuses on single-particle dynamics: Elementary Newtonian mechanics, harmonic oscillator, central force motion, conservation laws, motion in non-inertial frames, Coriolis and centrifugal forces, Lagrangian dynamics, Hamilton's equations.
"Co-requisite: MA 341"
Typically offered in Spring only

PY 412/PY 512 Mechanics II (3 credit hours)
Second semester of a two-semester sequence in particle and continuum mechanics at the intermediate level. Focuses on dynamics of systems of particles and continua: Center of mass, collisions, rigid bodies, inertia tensor, principal axes, stress and strain tensors, mechanical properties of fluids and solids; Waves in discrete and continuum systems, coupled oscillators, normal modes, elements of special relativity.
Prerequisite: C- or better in PY 411
Typically offered in Fall only
PY 413 Thermal Physics (3 credit hours)
An introduction to statistical mechanics and thermodynamics. The statistical study of physical systems emphasizing the connection between the statistical description of macroscopic systems and classical thermodynamics. Concepts of heat, internal energy, temperature and entropy. Classical and quantum statistical distributions.

Prerequisite: PY 203 or PY 407; Corequisite: MA 341
Typically offered in Spring only

PY 414/PY 514 Electromagnetism I (3 credit hours)
First semester of a two-semester sequence. An intermediate course in electromagnetic theory using the methods of vector calculus. Electrostatic field and potential, dielectrics, solution to Laplace's and Poisson's equations, magnetic fields of steady currents.

Prerequisite: C- or better in PY 203 or C- or better in PY 407, and MA 341
Typically offered in Fall only

PY 415/PY 515 Electromagnetism II (3 credit hours)

Prerequisite: C- or better in PY 414
Typically offered in Spring only

PY 452 Advanced Physics Laboratory (3 credit hours)
Introduction to laboratory electronics and instrumentation. Experiments in mechanics; electromagnetism; electronics; optics; and atomic, nuclear, plasma and solid state physics. Senior Physics students only

Prerequisite: Senior standing, Physics Majors
Typically offered in Fall and Spring

PY 489/ PY 589/ECE 489/ECE 589/MSE 489/MSE 589 Solid State Solar and Thermal Energy Harvesting (3 credit hours)
This course studies the fundamental and recent advances of energy harvesting from two of the most abundant sources, namely solar and thermal energies. The first part of the course focuses on photovoltaic science and technology. The characteristics and design of common types of solar cells is discussed, and the known approaches to increasing solar cell efficiency will be introduced. After the review of the physics of solar cells, we will discuss advanced topics and recent progresses in solar cell technology. The second part of the course is focused on thermoelectric effect. The basic physical properties, Seebeck coefficient, electrical and thermal conductivities, are discussed and analyzed through the Boltzmann transport formalism. Advanced subject such as carrier scattering time approximations in relation to dimensionality and the density of states are studied. Different approaches for further increasing efficiencies are discussed including energy filtering, quantum confinement, size effects, band structure engineering, and phonon confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

PY 499 Independent Research in Physics (1-6 credit hours)
Study and research in physics. Topics for experimental or theoretical investigation. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member

Typically offered in Fall, Spring, and Summer

PY 501 Quantum Physics I (3 credit hours)
Basic principles of quantum physics with emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles. PY 501 - first semester in two-semester sequence in quantum mechanics; PY 501 - second semester of sequence. Credit for both PY 401 and PY 501 is not allowed

Prerequisite: Graduate Level Status in Physics or Physics Departmental Approval
Typically offered in Spring only

PY 502 Quantum Physics II (3 credit hours)
Basic principles of quantum physics with emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles. PY 502 - second semester in two-semester sequence in quantum mechanics; PY 501, first semester of sequence. Credit for both PY 402 and PY 502 is not allowed

Prerequisite: PY 501
Typically offered in Fall only

PY 506 Nuclear and Subatomic Physics (3 credit hours)
Introduction to nuclear and subatomic phenomena: properties of nuclear radiations and detectors, accelerators, nuclear forces and nuclear structure, elementary particles, fundamental symmetries and conservation laws.

Prerequisite: PY 203 or 407; PY 412
Typically offered in Fall only

PY 507 Elementary Particle Physics (3 credit hours)
Introduction to fundamental symmetries and dynamics of quarks and leptons. The Standard Model, Dirac equation, Feynman rules in QED and QCD, the Higgs mechanism and electroweak unification.

Prerequisite: PY 401 and PY 506
Typically offered in Spring only

PY 509 General Relativity (3 credit hours)
This course provides in-depth knowledge of general relativity covering: Einstein's equation, Schwarzschild metric, Kerr metric, Friedman-Robertson-Walker metric, Christoffel symbols, Killing vectors, Riemann curvature, and Ricci tensors. Theoretical computations are compared with experimental data including the precession rate of the perihelion for Mercury and the deflection in the solar eclipse, the geodetic affect and the frame dragging effect measured in Gravity Probe B experiment.

P: MA 401 and MA 405 and PY 412 and PY 415; R: Graduate Standing
Typically offered in Fall only

PY 511/PY 411 Mechanics I (3 credit hours)

*Co-requisite: MA 341*
Typically offered in Spring only
**PY 512/PY 412 Mechanics II** (3 credit hours)  
Second semester of a two-semester sequence in particle and continuum mechanics at the intermediate level. Focuses on dynamics of systems of particles and continua: Center of mass, collisions, rigid bodies, inertia tensor, principal axes, stress and strain tensors, mechanical properties of fluids and solids; Waves in discrete and continuum systems, coupled oscillators, normal modes, elements of special relativity.  
Prerequisite: C- or better in PY 411  
Typically offered in Fall only

**PY 514/PY 414 Electromagnetism I** (3 credit hours)  
First semester of a two-semester sequence. An intermediate course in electromagnetic theory using the methods of vector calculus. Electrostatic field and potential, dielectrics, solution to Laplace's and Poisson's equations, magnetic fields of steady currents.  
Prerequisite: C- or better in PY 203 or C- or better in PY 407, and MA 341  
Typically offered in Fall only

**PY 515/PY 415 Electromagnetism II** (3 credit hours)  
Prerequisite: C- or better in PY 414  
Typically offered in Spring only

**PY 516 Physical Optics** (3 credit hours)  
Physical optics with major emphasis on wave properties of light. Boundary conditions, interference and diffraction, optics of thin films, fiber optics and applications to absorption, scattering and laser operation. A background in Maxwell's equations and vector analysis required.  
Prerequisite: PY 415  
Typically offered in Fall only

**PY 517 Atomic and Molecular Physics** (3 credit hours)  
The quantum mechanical treatment of structure and spectra for atoms and molecules. The hydrogen atom, helium atom, multielectron atoms, selection rules, diatomic and simple polyatomic molecules and nuclear magnetic resonance spectroscopy.  
Prerequisite: PY 401, 412  
Typically offered in Spring only

**PY 519 Biological Physics** (3 credit hours)  
This course presents the application of physics principles and methods to problems in biological systems. Important biological molecules, their structures and their processes are introduced for physical scientists. Functional mechanisms are analyzed with concepts from thermodynamics, statistical mechanics, fluid mechanics, and electrostatics. Modern experimental methods and computational approaches to molecular and cellular level biological phenomena are emphasized.  
Prerequisite: PY 413 or Graduate Standing  
Typically offered in Spring only

**PY 525 Computational Physics** (3 credit hours)  
Computational approach to physics problem solving using standard software relevant for physicists. Electrostatic potentials, data analysis, Monte Carlo simulations, Fourier optics, particle orbits, Schrodinger's equation. Examples and assignments for each topic chosen to complement other physics courses.  
Prerequisite: CSC 112 or equivalent; Corequisite: of PY 401  
Typically offered in Fall only

**PY 528/NE 528 Introduction to Plasma Physics and Fusion Energy** (3 credit hours)  
Concepts in plasma physics, basics of thermonuclear reactions; charged particle collisions, single particle motions and drifts, radiation from plasmas and plasma waves, fluid theory of plasmas, formation and heating of plasmas, plasma confinement, fusion devices and other plasma applications.  
Prerequisite: MA 401 and PY 208  
Typically offered in Fall only

**PY 529/NE 529 Plasma Physics and Fusion Energy II** (3 credit hours)  
This course expands on the treatment of plasmas as a system of coupled fluids and introduces the foundations of plasma kinetic theory. Derivation of the plasma kinetic equation and the Vlasov equation serve as the starting point to introduce the kinetic study of plasma systems. From this introduction of the governing equations for full kinetic treatment, methods for analyzing plasma response to electromagnetic and electrostatic perturbations using the linearized Vlasov model for uncorrelated plasmas are introduced. Kinetic stability of Vlasov plasmas is introduced and the Nyquist method is used to determine conditions for kinetic stability. The concept of correlated plasmas is then introduced through the introduction of reduced distribution functions and the BBGKY hierarchy. Finally, simple correlated systems and the Liouville model for two-system correlation is covered to look at the impact of particle correlation due to collisions and Coulomb interaction.  
Prerequisite: NE 528  
Typically offered in Spring only

**PY 543 Astrophysics** (3 credit hours)  
Basic physics necessary to investigate, from observational data, internal conditions and evolution of stars. The formation and structure of spectral lines, methods of energy generation and transport, stellar structure, degeneracy, white dwarfs and neutron stars.  
Prerequisite: PY 203 or 407; PY 411  
Typically offered in Spring only

**PY 552 Condensed Matter Physics I** (3 credit hours)  
Basic considerations of crystalline solids, metals, conductors and semiconductors.  
Prerequisite: C- or better in PY 401  
Typically offered in Spring only

**PY 570/TE 570 Polymer Physics** (3 credit hours)  
Polymer microstructures, polymer solutions, polymer physical states (including amorphous polymers, crystalline polymers, polymer melts, melting of polymers, glass-transition, and other transitions), polymer blends, polymer mechanical properties, polymer viscoelasticity and flow, multicomponent polymer systems, and modern polymer topics. The physics of polymer fibers. Graduate standing or permission of instructor.  
Typically offered in Fall only
PY 581 Matter & Interactions for Teachers I (3 credit hours)
First semester (mechanics) of a two-semester sequence intended to
broaden and deepen in high school physics teachers their knowledge of
introductory-level physics from a contemporary point of view. Includes an
introduction to computational physics. Depa

Typically offered in Spring only

PY 582 Matter & Interactions for Teachers II (3 credit hours)
Second semester (electricity and magnetism) of a two-semester
sequence intended to broaden and deepen in high school physics
teachers their knowledge of introductory-level physics from a
contemporary point of view. Includes an introduction to computati

Typically offered in Fall only

PY 589/ECE 489/ECE 589/MSE 489/MSE 589/PY 489 Solid State
Solar and Thermal Energy Harvesting (3 credit hours)
This course studies the fundamental and recent advances of energy
harvesting from two of the most abundant sources, namely solar and
thermal energies. The first part of the course focuses on photovoltaic
science and technology. The characteristics and design of common
types of solar cells is discussed, and the known approaches to increasing
solar cell efficiency will be introduced. After the review of the physics
of solar cells, we will discuss advanced topics and recent progresses
in solar cell technology. The second part of the course is focused on
thermoelectric effect. The basic physical properties, Seebeck coefficient,
electrical and thermal conductivities, are discussed and analyzed
through the Boltzmann transport formalism. Advanced subject such as
carrier scattering time approximations in relation to dimensionality
and the density of states are studied. Different approaches for further
increasing efficiencies are discussed including energy filtering, quantum
confinement, size effects, band structure engineering, and phonon
confinement.

P: ECE 302 or E 304 or MSE 355 or PY 407
Typically offered in Fall only

PY 590 Special Topics In Physics (1-6 credit hours)
Investigations in physics under staff guidance. May consist of literature
reviews, experimental or theoretical projects or special topics lectures.
Credits Arranged

Typically offered in Fall, Spring, and Summer

PY 599 Special Topics in Physics (1-6 credit hours)
Investigations in physics under staff guidance. May consist of literature
reviews, experimental or theoretical projects or special topics lectures.
Credits arranged

Typically offered in Fall, Spring, and Summer

PY 601 Seminar (1 credit hours)
Reports on topics of current interest in physics. Several sections offered
so that students with common research interests may be grouped
together.

Typically offered in Fall and Spring

PY 610 Special Topics (1-6 credit hours)
Investigations in physics under staff guidance. May consist of literature
reviews, experimental or theoretical projects or special topics lectures.
Credits Arranged.

Typically offered in Fall and Spring

PY 615 Advanced Special Topics In Physics (1-6 credit hours)
Advanced study in astrophysics, atomic and molecular physics,
condensed matter physics, nuclear physics or plasma physics. Emphasis
on new and rapidly developing research areas.

Typically offered in Fall and Spring

PY 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the
student in planning for the teaching assignment, observe and provide
feedback to the student during the teaching assignment, and evaluate the
student upon completion of the assignment.

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

PY 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of
the Graduate Faculty.

Prerequisite: Master's student

Typically offered in Spring only

PY 695 Master's Thesis Research (1-9 credit hours)
Thesis Research

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

PY 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.

Prerequisite: Master's student

Typically offered in Summer only

PY 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-
time enrollment for the master's degree and are writing and defending
their thesis. Credits Arranged

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

PY 711 Advanced Quantum Mechanics I (3 credit hours)
Introduction to relativistic quantum theory of Dirac particles and the
positron. Other topics including second quantization technique and its
application to many-body problems, radiation theory and quantization of
the electromagnetic field.

Prerequisite: MA 512, PY 782
Typically offered in Fall only

PY 712 Advanced Quantum Mechanics II (3 credit hours)
A general propagator treatment of Dirac particles, photons and scalar
and vector mesons. Applications of Feynman graphs and rules illustrating
basic techniques employed in treatment of electromagnetic, weak and
strong interactions. Renormalization theory, the effects of radiative
corrections and aspects of the general Lorentz covariant theory of
quantized fields.

Prerequisite: PY 711
Typically offered in Spring only
**PY 721** Statistical Physics I (3 credit hours)
Basic elements of kinetic theory and equilibrium statistical mechanics, both classical and quantum; applications of the techniques developed to various ideal models of noninteracting particles.
Prerequisite: PY 401, PY 413
Typically offered in Spring only

**PY 722** Statistical Physics II (3 credit hours)
A continuation of PY 721, with emphasis on the static and dynamic properties of real (interacting) systems. Topics including equilibrium theory of fluids and linear response theory of time-dependent phenomena.
Prerequisite: PY 721
Typically offered in Fall only

**PY 753** Condensed Matter Physics II (3 credit hours)
The properties of semiconductors, superconductors, magnets, ferroelectrics and crystalline defects and dislocations.
Prerequisite: PY 552
Typically offered in Fall only

**PY 755** Dielectric Films and their Interfaces (3 credit hours)
This course addresses: i) local atomic structure of non-crystalline/amorphous dielectrics - experimental methods and theory; ii) classification of dielectric materials - by bond ionicity, bond density and bonding contraints/atom to discriminate between ideal covalent random networks, disrupted networks, and nano-crystallinity; iii) thermally-grown silicon dioxide and its interface with Si - the standard for alternative dielectrics; iv) electronic structure and bonding in transition metal/lathanide rare earth dielectrics; and v) intrinsic limitations on the performance and reliability of metal-oxide-semiconductor devices.
Prerequisite: PY 552
Typically offered in Spring only

**PY 781** Quantum Mechanics I (3 credit hours)
Fundamental concepts and formulations, including interpretation and techniques, and the application of theory to simple physical systems, such as the free particle, the harmonic oscillator, the particle in a potential well and central force problems. Other topics including approximation methods, identical particles and spin, transformation theory, symmetries and invariance, and an introduction to quantum theory of scattering and angular momentum.
Prerequisite: MA 512; PY 411 or 414; Graduate standing
Typically offered in Fall only

**PY 782** Quantum Mechanics II (3 credit hours)
Fundamental concepts and formulations, including interpretation and techniques, and the application of theory to simple physical systems, such as the free particle, the harmonic oscillator, the particle in a potential well and central force problems. Other topics including approximation methods, identical particles and spin, transformation theory, symmetries and invariance, and an introduction to quantum theory of scattering and angular momentum.
Prerequisite: MA 512; PY 411 or 414; Graduate standing
Typically offered in Spring only

**PY 783** Advanced Classical Mechanics I (3 credit hours)
Introduction to theoretical physics in preparation for advanced study. Emphasis on classical mechanics, special relativity and the motion of charged particles. Topics including variational principles, Hamiltonian dynamics and canonical transformation theory, structure of the Lorentz group and elementary dynamics of unquantized fields.
Prerequisite: MA 512, PY 412, PY 414; Graduate standing
Typically offered in Fall only

**PY 785** Advanced Electricity and Magnetism I (3 credit hours)
Topics including techniques for solution of potential problems, development of Maxwell's equations; wave equations, energy, force and momentum relations of an electromagnetic field; covariant formulation of electrodynamics; radiation from accelerated charges.
Prerequisite: PY 415; Graduate standing
Typically offered in Fall only

**PY 786** Advanced Electricity and Magnetism II (3 credit hours)
Topics including techniques for solution of potential problems, development of Maxwell's equations; wave equations, energy, force and momentum relations of an electromagnetic field; covariant formulation of electrodynamics; radiation from accelerated charges.
Prerequisite: PY 415; Graduate standing
Typically offered in Spring only

**PY 790** Special Topics in Physics (1-99 credit hours)
Reports on topics of current interest in physics. Several sections offered so that students with common research interests may be grouped together.
Typically offered in Fall and Spring

**PY 801** Seminar (1 credit hours)
Investigations in physics under staff guidance. May consist of literature reviews, experimental or theoretical projects or special topics lectures. Credits Arranged
Typically offered in Fall and Spring

**PY 885** Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Spring only

**PY 890** Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

**PY 893** Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Spring only
PHYSIOLOGY (PHY)

PHY 452/ANS 452/ANS 552/PHY 552 Comparative Reproductive Physiology and Biotechnology (3 credit hours)
Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies and ethical issues associated with the application of reproductive biotechnologies. Credit

Prerequisite: ANS 220
Typically offered in Fall only

PHY 503 General Physiology I (3 credit hours)
Physiology is the study of the how living systems function from the molecular to organismal level. As such, this course will build on your knowledge of anatomy, biochemistry, and cell biology and also presumes a working knowledge of the basics of college level physics and chemistry. Students will learn the fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body and be able to integrate knowledge and concepts from various organ systems to explain function in the human body. In this course, we will address cellular, nervous, muscular, and gastrointestinal physiology in humans.

P: BCH451 and BCH553 (or equivalents) and one year each of college-level physics and chemistry
Typically offered in Fall only

PHY 504 General Physiology II (3 credit hours)
Physiology is the study of the how living systems function from the molecular to organismal level. As such, this course will build on your knowledge of anatomy, biochemistry, and cell biology and also presumes a working knowledge of the basics of college level physics and chemistry. Students will learn the fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body and be able to integrate knowledge and concepts from various organ systems to explain function in the human body. In this course, we will address cardiovascular, respiratory, and renal physiology in humans.

P: BCH451 and BCH553 (or equivalents) and one year each of college-level physics and chemistry
Typically offered in Spring only

PHY 524/PO 524/ZO 524 Comparative Endocrinology (3 credit hours)
Basic concepts of endocrinology, including functions of major endocrine glands involved in processes of growth, metabolism and reproduction.

Prerequisite: BIO 421 or PO 405
Typically offered in Spring only

PHY 552/PHY 452/ANS 452/ANS 552 Comparative Reproductive Physiology and Biotechnology (3 credit hours)
Comparative approach to examining aspects of reproductive physiology in selected vertebrate species. Detailed examination of current reproductive biotechnologies and ethical issues associated with the application of reproductive biotechnologies. Credit

Prerequisite: Masters 220
Typically offered in Fall only

PHY 595 Special Topics in Physiology (1-6 credit hours)
The study of special problems and selected topics of current interest in physiology and related fields.

Typically offered in Spring only

PHY 601 Physiology Seminar (1 credit hour)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Prerequisite: Masters standing
Typically offered in Spring only

PHY 610 Special Topics in Physiology (1-6 credit hours)
The study of special problems and selected topics of current interest in physiology and related fields.

Prerequisite: Masters standing
Typically offered in Fall, Spring, and Summer

PHY 620 Special Problems in Physiology (1-6 credit hours)
Credits Arranged

Prerequisite: Masters standing
Typically offered in Fall, Spring, and Summer

PHY 665 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Masters student
Typically offered in Fall, Spring, and Summer

PHY 690 Master's Examination (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Masters student
Typically offered in Summer only

PHY 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Masters student
Typically offered in Fall, Spring, and Summer
PHY 695 Master’s Thesis Research (1-9 credit hours)
Thesis Research
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

PHY 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master’s student
Typically offered in Summer only

PHY 699 Master’s Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master’s degree and are writing and defending their thesis.
Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer

PHY 702/ANS 702 Reproductive Physiology of Mammals (3 credit hours)
Survey of reproductive strategies among vertebrates; in-depth coverage of mammalian reproductive physiology; gametogenesis, fertilization, embryonic and fetal development, parturition, puberty, neuroendocrine control mechanisms in male and female mammals.
Prerequisite: ZO 421
Typically offered in Fall and Spring

PHY 764/CBS 764/NTR 764 Advances in Gastrointestinal Pathophysiology (3 credit hours)
This course will focus on advanced gastrointestinal physiology and the pathophysiology of diseases of relevance to scientists involved in animal-related research. In particular, the course will cover the pathophysiology of ulceration, infectious diarrhea, ischemia, motility disorders, and inflammatory diseases of the gut. An in-depth review paper will be required based on recent literature regarding a specific gastrointestinal disease.
Prerequisite: PHY 503, PHY 504
Typically offered in Fall only

PHY 780/ANS 780 Mammalian Endocrinology (3 credit hours)
Mammalian endocrine system with emphasis on ontogeny and anatomy of key organs; synthesis and action of hormones. Role of hormones in regulation of physiological processes such as metabolism, exocrine function, digestion, ion balance, behavior, lactation, growth and reproduction.
Prerequisite: BCH 451, ZO 421

PHY 795 Special Topics in Physiology (1-9 credit hours)
The study of special problems and selected topics of current interest in physiology and related fields.
Typically offered in Fall and Spring

PHY 801 Physiology Seminar (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.
Prerequisite: Graduate standing
Typically offered in Spring only

PHY 810 Special Topics in Physiology (1-4 credit hours)
The study of special problems and selected topics of current interest in physiology and related fields.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

PHY 820 Special Problems in Physiology (1-6 credit hours)
Credits Arranged
Prerequisite: Graduate standing
Typically offered in Fall and Spring

PHY 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Summer only

PHY 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PHY 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PHY 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PHY 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

PHY 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Plant Biology (PB)

PB 103 Perspectives on Botany (1 credit hours)
Orientation to modern botany, including discussions of historical background, relation to other sciences, the nature of modern subdisciplines, professionalism and ethics, local resources of personnel and facilities, educational opportunities, and career possibilities.
Typically offered in Fall only
PB 200  **Plant Life**  (4 credit hours)
An introduction to the structure, processes, and reproduction of higher plants, including the diversity of the plant kingdom and principles of inheritance, ecology, and evolution. Students cannot receive credit for both PB 200 and PB 250.

**GEP Natural Sciences**
Typically offered in Fall and Spring

PB 205  **Our Green World**  (3 credit hours)
Awareness and understanding of plants in the world for the non-science student. Essential fundamental concepts of plant structure, growth, processes, uses, biotechnology, evolution, environmental issues and ecology. Short field trips will be held that may require students to provide their own transportation. Credit cannot be received for both PB 205 and (PB 200 or PB 250).

**GEP Natural Sciences**
Typically offered in Fall, Spring, and Summer

PB 208/AEE 208/ANS 208  **Agricultural Biotechnology: Issues and Implications**  (3 credit hours)
Trends and issues of agricultural biotechnology in today's society are addressed while covering the basic biological science behind the technology. Applications of and policy issues associated with plant, animal, and environmental biotechnology used in the agricultural industry are examined from an interdisciplinary approach.

Prerequisite: (BIO 105 or BIO 115 or BIO 181 or BIO 183)

**GEP Interdisciplinary Perspectives**
Typically offered in Spring only

PB 213  **Plants and Civilization**  (3 credit hours)
This course covers plant use in ancient civilizations, including the economic, social, political, religious, culinary and medical roles of plants and plant products. Plant use in ancient cultures, including but not limited to, Amazonian, Celtic, Chinese, Egyptian, Greek, Inca, Indian, Maya, Mesopotamian, Nubian, Persian, and Roman will be discussed. Topics include foods, beverages, medicines, fibers, construction materials, psychoactive drugs, and religious symbols.

**GEP Interdisciplinary Perspectives**
Typically offered in Spring only

PB 215  **Medicinal Plants**  (3 credit hours)
Plants and their derived pharmaceuticals in Western medicine and in herbal medicine.

Prerequisite: CH 101 and any one of the following courses: BIO 125, BIO 181, PB 200, ZO 150, ZO 160

**Typically offered in Fall only**

PB 219  **Plants in Folklore, Myth, and religion**  (3 credit hours)
The structural and functional biology of plants and cultural inclusions in folklore, myth, and religion. The myth/religion-plant-human culture nexus. Mythical and religious themes covered, but not limited to, are: the world tree and cosmic order; plants and the creation of Earth; the unity of plants and divine entities; the tree of life; life-giving waters and human immortality; human descent from plants; origin of food plants from humans; plants of witchcraft and magic; psychoactive plants and access to deities; solidarity between humans and plants; death and resurrection of plants and humans.

**GEP Interdisciplinary Perspectives**
Typically offered in Fall and Summer

PB 220  **Local Flora**  (3 credit hours)
Structural terminology of vascular plants, field identification of plant species by sight and using taxonomic keys, description of natural community types, including their soil and topographic features. Two Saturday field trips required.

Prerequisite: BIO 105 or BIO 181 or PB 200

**GEP Natural Sciences**
Typically offered in Fall only

PB 250  **Plant Biology**  (4 credit hours)
An introduction for Life Science majors to the ecology, structure, function, processes, reproduction and evolution of higher plants. Students may not receive credit for both PB 200 and PB 250.

Prerequisite: BIO 181 and BIO 183

**Typically offered in Fall only**

PB 277  **Space Biology**  (3 credit hours)
Overview of the biology of plants, animals, and humans in the space environment, including gravitational biology, aerospace medicine, astrobiology, search for extraterrestrial life, terraforming, and life support.

Prerequisite: BIO 105 or BIO 181 or BIO 183 or PB 200

**GEP Natural Sciences**
Typically offered in Fall only

PB 295  **Special Topics in Botany**  (1-4 credit hours)
Trial offerings of new or experimental courses in Botany at the early undergraduate level.

Typically offered in Fall, Spring, and Summer

PB 321  **Introduction to Whole Plant Physiology**  (3 credit hours)
Physiology of higher plants with emphasis on whole plant aspects including structure-function relationships, water and solute movement, energy sources and needs, plant growth and development, and the impact of plant physiology findings on agriculture. Students cannot receive credit for both PB 321 and PB 421.

Prerequisite: (BIO 183 or PB 200 or PB 250) and CH 101/102

**Typically offered in Spring only**

PB 325  **Culinary Botany**  (3 credit hours)
This course explores the ethnobotany, taxonomic diversity, and unique physical and chemical characteristics of important food and beverage plants used by peoples in different regions of the world. After an introduction to plant domestication and agricultural origins, most course weeks are spent examining the culturally significant edible flora of a different geographic region, combining short lectures on the botany of selected species, discussions about the uses of plant biocultural diversity, and, when feasible, hands-on activities where course participants can sample plant-based foods from each region. One Saturday field trip required.

Prerequisite: CS 213 or HS 201 or PB 200 or PB 250

**Typically offered in Fall only**
PB 345 Economic Botany (3 credit hours)
This course covers plants of economic importance that have been valued by societies regionally, nationally and globally from the modern era to the present day. Topics include, but are not limited to, plant species used as food, spices, beverages, oils, fibers, paper, dyes, perfumes, body care, construction materials, fuels and ornamentals. Aspects related to the botany and ethnobotany of economically important plant species will be discussed including taxonomy, anatomy, physiology, ecology, conservation, human uses, social and environmental issues, and roles in the economy.
Prerequisite: BIO 181 or PB 200 or PB 250
Typically offered in Spring only

PB 346 Economic Botany Lab (1 credit hours)
This lab course explores plants and plant products of economic importance through hands-on activities. Aspects related to the botany and ethnobotany of economically important plant species will be covered including taxonomy, anatomy, physiology, ecology, conservation, human uses, social and environmental issues, and roles in the economy.
"Co-requisite: PB 345"
Typically offered in Spring only

PB 360/AEC 360 Ecology (4 credit hours)
The science of ecology, including factors which control distribution and population dynamics of organisms, structure and function of biological communities, and energy flow and nutrient cycling in ecosystems; contrasts among the major biomes; and principles governing ecological responses to global climatic and other environmental changes.
Prerequisite: C- or better in BIO 181
Typically offered in Fall only

PB 400 Plant Diversity and Evolution (4 credit hours)
Diversity, morphology, taxonomy, and evolutionary history of living and fossil plants including fungi, algae, bryophytes, pteridophytes, gymnosperms, and angiosperms. Two one-day weekend field trips required.
Prerequisite: BIO 181 or PB 200 or PB 250
Typically offered in Spring only

PB 403/PB 503 Systematic Botany (4 credit hours)
The course introduces basic and contemporary systematic principles and methods as applied to vascular plants, with emphasis on flowering plants. It covers classification, identification, phylogenetics, and molecular approaches, and surveys important and common plant families representing major groups of vascular plants.
Prerequisite: PB 200, PB 250, BIO 183, Junior standing
Typically offered in Spring only

PB 407/PB 507 Medical Ethnobotany (3 credit hours)
This course covers traditional medical systems from a diversity of ancient and modern cultures, with an emphasis on the medicinal plants utilized within these healing traditions. Humans, as well as a number of other species, have utilized plants and other products from nature to treat their physical and spiritual ailments since prehistoric times. In addition to covering medicinal plant species and their known bioactivity, other topics will include traditional diagnostic techniques, complementary healing modalities, beliefs regarding health and illness, treatment and causes of spiritual diseases, food and spices as medicine, and ethical considerations in ethnobotanical research.
Typically offered in Spring only

PB 413/PB 513 Plant Anatomy (2 credit hours)
Organelles, cells, tissues and organs of flowering plants and selected gymnosperms. Emphasis placed on developmental patterns and structural adaptations for survival. Laboratory focuses on dissection, histochemistry, and imaging of plant cells and tissues. Students cannot reserve credit for both PB 413 and PB 513.
Prerequisite: PB 200 or PB 250 or PB 321 or PB 421
Typically offered in Spring only

PB 421 Plant Physiology (3 credit hours)
Physiology of higher plants with emphasis on biochemical, cell biological and molecular aspects of how plants function. Unique aspects of regulation of plant metabolism including photosynthesis, respiration, nitrogen fixation, cell wall biosynthesis, growth and stress responses will be emphasized. The course is intended for students interested in postgraduate studies in plant biology. Students cannot receive credit for both PB 321 and PB 421.
Prerequisite: BIO 183 or ZO 160, or PB 200 and CH 220 or CH 221 or CH 225
Typically offered in Fall only

PB 445/PB 545 Paleobotany (4 credit hours)
Morphologic, taxonomic, geologic and evolutionary relationships of fossil plants; emphasis on vascular plants; discussions of taphonomy, biogeography and palynology. Requires weekend field trips at student expense. Credit will not be allowed for both BO 445 and BO 545.
Prerequisite: BIO 181 or MEA 102

PB 450/PB 550 Plant Ecology (3 credit hours)
This course introduces students to the principles and methods of plant ecology. Topics include how individual plants extract resources from their environments; population dynamics and plant life histories; species interactions in communities; and global change ecology. The course emphasizes distinctive ways that plant natural history affects their ecology while also illustrating how plants can be ideal systems for studying general ecological problems. Undergraduate students gain hands-on ecological experience by gathering real data through field activities, and all students design independent research proposals.
Typically offered in Spring only

PB 464/PB 564 Rare Plants of North Carolina (3 credit hours)
This course provides a taxonomic survey of the rare plants of North Carolina, focusing primarily on federally- and secondarily on state-listed species. Particular attention will be placed on: (1) the identification of rare species, their congeners, and morphologically similar species, (2) the biogeography of rare species, (3) optimum survey windows, and (4) the conservation biology of select taxa. Two Saturday field trips required. Junior level or higher. Students cannot receive credit for both PB 464 and PB 564.
Prerequisite: One of the following: (PB 200, PB 220, PB 403, or PB 405)
Typically offered in Fall only
PB 480/PB 580  Introduction to Plant Biotechnology (3 credit hours)
Introduction to gene cloning, plant tissue culture and transformation, and the development of agriculturally important transgenic traits. Critical thinking, case studies, and discussions are used to examine global approaches to the regulation and risks of genetically-modified organisms, plant and gene patents, and the consequences of these factors on food sovereignty and trade. Students cannot receive credit for both PB 480 and PB 580.
Prerequisite: BCH 454 or BIT 410 or CS 211 or GN 311 or PB/BIO 414 or PB 421.
Typically offered in Fall only

PB 481/BIT 481  Plant Tissue Culture and Transformation (2 credit hours)
Basic techniques in plant tissue culture and transformation. Empirical approaches to techniques in plant tissue culture, designing transgenes for expression in specific plant cell organelles and tissues, use of reporter genes to optimize transformation, and troubleshooting transformation. Laboratory sessions provide hands-on experience with plant tissue culture and transformation. Use of reporter genes, fluorescence microscopy and digital imaging. Half semester course, first part.
Typically offered in Spring only

PB 488/ECE 488/PB 588/ECE 588  Systems Biology Modeling of Plant Regulation (3 credit hours)
This course provides an introduction to the field of systems biology with a focus on mathematical modeling, gene regulatory network and metabolic pathway reconstruction in plants. Students will learn how to integrate biological data with mathematical, statistical, and computational approaches to gain new insights into structure and behavior of complex cellular systems. Students are expected to have a minimal background in calculus and basic biology. The course will build on these basic concepts and provide all students, regardless of background or home department, with the fundamental biology, mathematics, and computing knowledge needed to address systems biology problems.
Prerequisite: MA 131 or MA 141
Typically offered in Fall only

PB 492  External Learning Experience (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

PB 493  SP Problems in BO (1-6 credit hours)
A learning experience within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Typically offered in Fall, Spring, and Summer

PB 495  Special Topics in Botany (1-6 credit hours)
Offered as needed to present material not normally available in regular course offerings or for offering of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

PB 501/MB 501/PP 501  Biology of Plant Pathogens (3 credit hours)
Biology of microbes that cause plant diseases. The ecology, genetics, physiology, taxonomy, and mechanisms of parasitism, pathogenicity and virulence of bacteria (and other prokaryotes), fungi (and oomycetes), nematodes, and viruses that cause plant diseases. Prepares graduate students for advanced courses in plant pathology, host-parasite interactions, and provides a knowledge base for students in other disciplines involved with plant pathogens or who seek to broaden their knowledge of microbes.
Prerequisite: PP 315, or PP 318, or an introductory course in microbiology
Typically offered in Fall only

PB 503/PB 403  Systematic Botany (4 credit hours)
The course introduces basic and contemporary systematic principles and methods as applied to vascular plants, with emphasis on flowering plants. It covers classification, identification, phylogenetics, and molecular approaches, and surveys important and common plant families representing major groups of vascular plants.
Prerequisite: PB 200, PB 250, BIO 183, Junior standing
Typically offered in Spring only

PB 507/PB 407  Medical Ethnobotany (3 credit hours)
This course covers traditional medical systems from a diversity of ancient and modern cultures, with an emphasis on the medicinal plants utilized within these healing traditions. Humans, as well as a number of other species, have utilized plants and other products from nature to treat their physical and spiritual ailments since prehistoric times. In addition to covering medicinal plant species and their known bioactivity, other topics will include traditional diagnostic techniques, complementary healing modalities, beliefs regarding health and illness, treatment and causes of spiritual diseases, food and spices as medicine, and ethical considerations in ethnobotanical research.
Typically offered in Spring only

PB 513/PB 413  Plant Anatomy (2 credit hours)
Organelles, cells, tissues and organs of flowering plants and selected gymnosperms. Emphasis placed on developmental patterns and structural adaptations for survival. Laboratory focuses on dissection, histochemistry, and imaging of plant cells and tissues. Students cannot reserve credit for both PB 413 and PB 513.
Prerequisite: PB 200 or PB 250 or PB 321 or PB 421
Typically offered in Spring only

PB 545/PB 445  Paleobotany (4 credit hours)
Morphologic, taxonomic, geologic and evolutionary relationships of fossil plants; emphasis on vascular plants; discussions of taphonomy, biogeography and palynology. Requires weekend field trips at student expense. Credit will not be allowed for both BO 445 and BO 545.
Prerequisite: BIO 181 or MEA 102
Typically offered in Spring only
PB 550/PB 450  Plant Ecology  (3 credit hours)
This course introduces students to the principles and methods of plant ecology. Topics include how individual plants extract resources from their environments; population dynamics and plant life histories; species interactions in communities; and global change ecology. The course emphasizes distinctive ways that plant natural history affects their ecology while also illustrating how plants can be ideal systems for studying general ecological problems. Undergraduate students gain hands-on ecological experience by gathering real data through field activities, and all students design independent research proposals.

Typically offered in Spring only

PB 559  Plant Water Relations  (2 credit hours)
Physical and biological mechanisms that govern water uptake, water transport, transpiration, and plant responses to drought; constraints and tradeoffs that limit evolution and artificial selection of drought tolerance; methods for studying water relations. Weekly lecture and paper discussions will draw upon examples from both crop and wild plants.

Typically offered in Spring only

PB 564/PB 464  Rare Plants of North Carolina  (3 credit hours)
This course provides a taxonomic survey of the rare plants of North Carolina, focusing primarily on federally- and secondarily on state-listed species. Particular attention will be placed on: (1) the identification of rare species, their congers, and morphologically similar species, (2) the biogeography of rare species, (3) optimum survey windows, and (4) the conservation biology of select taxa. Two Saturday field trips required. Junior level or higher. Students cannot receive credit for both PB 464 and PB 564.

Prerequisite: One of the following: (PB 200, PB 220, PB 403, or PB 405)
Typically offered in Fall only

PB 570  Plant Functional Ecology  (3 credit hours)
Mechanisms by which plants interact with their environment, with an emphasis on the role of physiological, morphological, and life history traits, and the evolution of these traits.

Prerequisite: PB/BIO 360
Typically offered in Fall only

PB 575/MB 575/PP 575  Introduction to Mycology  (4 credit hours)

Prerequisite: BS 125 or BS 181 and 183 or BO 200 or PP 315 or PP 318
Typically offered in Fall only

PB 580/PB 480  Introduction to Plant Biotechnology  (3 credit hours)
Introduction to gene cloning, plant tissue culture and transformation, and the development of agriculturally important transgenic traits. Critical thinking, case studies, and discussions are used to examine global approaches to the regulation and risks of genetically-modified organisms, plant and gene patents, and the consequences of these factors on food sovereignty and trade. Students cannot receive credit for both PB 480 and PB 580.

Prerequisite: BCH 454 or BIT 410 or CS 211 or GN 311 or PB/BIO 414 or PB 421.
Typically offered in Fall only

PB 588/ECE 588/PB 488/ECE 488  Systems Biology Modeling of Plant Regulation  (3 credit hours)
This course provides an introduction to the field of systems biology with a focus on mathematical modeling, gene regulatory network and metabolic pathway reconstruction in plants. Students will learn how to integrate biological data with mathematical, statistical, and computational approaches to gain new insights into structure and behavior of complex cellular systems. Students are expected to have a minimal background in calculus and basic biology. The course will build on these basic concepts and provide all students, regardless of background or home department, with the fundamental biology, mathematics, and computing knowledge needed to address systems biology problems.

Prerequisite: MA 131 or MA 141
Typically offered in Fall only

PB 595  Special Topics Botany  (1-6 credit hours)
The study of special problems and selected topics of current interest in botany and related fields.

PB 601  Botany Seminar  (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring

PB 620  Special Problems In Botany  (1-6 credit hours)
Directed research in some phase of botany other than a thesis problem, but designed to provide experience and training in research. Credits Arranged.

Typically offered in Fall, Spring, and Summer

PB 624  Topical Problems  (1-4 credit hours)
Discussions and readings on problems of current interest in fields of ecology, anatomy and morphology, taxonomy, plant physiology and cell biology. May be repeated with a change in topic for a maximum of six credits.

Typically offered in Fall and Spring

PB 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PB 688  Non-Thesis Masters Continuous Registration - Half Time  (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer
PB 689  Non-Thesis Master Continuous Registration - Full Time Registration  (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer

PB 690  Master's Examination  (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer

PB 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer

PB 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer

PB 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's Student
Typically offered in Summer only

PB 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.

Prerequisite: Master's Student
Typically offered in Fall, Spring, and Summer

PB 704  Plant Nomenclature  (1 credit hours)
A practical foundation in plant nomenclature and nomenclatural references. Emphasis on the evolution of international rules for naming plant taxa and their application in both wild and cultivated plants. Nomenclature applications used in patents, cultivar releases and journal articles. Taught mid-semester. Taught five weeks of semester.

Typically offered in Spring only

PB 730/GN 730/MB 730/PP 730  Fungal Genetics and Physiology  (3 credit hours)
Basic concepts of genetics and physiology of fungi, with emphasis on saprophytic and plant pathogenic mycelial fungi. Current literature on evolution, cell structure, growth and development, gene expression, metabolism, sexual and asexual reproduction and incompatibility systems. Laboratory exercises on mutant isolation, sexual and parasexual analysis, genetic transformation, and RFLP and isozyme analysis.

Prerequisite: BCH 451, BO 775, GN 311 or PP 501
Typically offered in Spring only

PB 733  Plant Growth and Development  (3 credit hours)
Advanced course in plant physiology covering plant growth, development, senescence and biological control mechanisms.

Prerequisite: PB(ZO) 414 or PB 421, organic chemistry
Typically offered in Spring only

PB 751  Advanced Plant Physiology I  (3 credit hours)
Cellular mechanisms and regulatory features related to plant respiration, photosynthesis, sulfur metabolism, nitrogen fixation and metabolism, and signal transduction. One of two courses covering field of plant physiology.

Prerequisite: PB 421
Typically offered in Fall only

PB 761/BCH 761/GN 761  Advanced Molecular Biology Of the Cell  (3 credit hours)
An advanced graduate class involving integrated approaches to complex biological questions at the molecular level, encompassing biochemistry, cell biology and molecular genetics. The course will focus on an important, current area of research in eukaryotic biology using the primary scientific literature, and will involve class discussions, oral presentations, and a written research proposal.

Typically offered in Spring only

PB 774/MB 774  Phycology  (3 credit hours)
Introduction to taxonomy, morphology, reproduction and ecological importance of organisms which may be included in the algae. Attention to local freshwater flow and physiology of selected species in relation to algal blooms, water quality and nutrient loading in aquatic habitats.

Typically offered in Spring only

PB 780  Plant Molecular Biology  (3 credit hours)
Molecular analysis of plant growth and development. Molecular techniques and their application to understanding control of gene expression in plants.

Prerequisite: BCH 451, GN 411
Typically offered in Fall only

PB 795  Special Topics Botany  (1-6 credit hours)
The study of special problems and selected topics of current interest in botany and related fields.

Typically offered in Fall and Spring

PB 801  Seminar  (1 credit hours)
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.

Typically offered in Fall and Spring
PB 820 Special Problems  (1-6 credit hours)
Directed research in some phase of botany other than a thesis problem, but designed to provide experience and training in research. Credits Arranged.

Typically offered in Fall, Spring, and Summer

PB 824 Topical Problems  (1-4 credit hours)
Discussions and readings on problems of current interest in fields of ecology, anatomy and morphology, taxonomy, plant physiology and cell biology. May be repeated with a change in topic for a maximum of six credits.

Typically offered in Fall and Spring

PB 885 Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral Student
Typically offered in Fall, Spring, and Summer

PB 890 Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral Student
Typically offered in Fall, Spring, and Summer

PB 893 Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PB 895 Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PB 896 Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral Student
Typically offered in Summer only

PB 899 Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hours, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral Student
Typically offered in Fall, Spring, and Summer

Plant Pathology (PP)

PP 144/HS 144 Weeds & Diseases of Ornamentals  (3 credit hours)
The objective of this course is to give students a fundamental and practical understanding of weed, disease, and pesticide management in the ornamental industries in North Carolina. Agricultural Institute students only.

Requisite: Agricultural Institute Only
Typically offered in Fall only

PP 150 Introduction to Plant Molecular Biology  (3 credit hours)
Hands-on introduction to modern molecular biology techniques. Isolation of SNA from tobacco leaves, isolating a plant gene through polymerase chain reaction (PCR), cloning DNA fragments in plasmid vectors, bacterial transformation and plasmid DNA purification, restriction digestion and gel electrophoresis, gene transfer and expression of reporter genes in plant cell lines through a biolistic gene gun. Field trips, poster assignment and poster presentation are mandatory. This course is part of the Summer College in Biotechnology and Life Sciences (SCIBLS) and other pre-college, transitional and early-college programs. Students must have no more than 30 credit hours. Department approval required.

Typically offered in Summer only

PP 154/CS 154 Turf Weed and Disease Management  (3 credit hours)
General principles in turfgrass weed and disease development and management programs. Different weeds, their life cycles, management techniques, and factors affecting herbicide application performance will be covered. Students will learn the causes, development, identification and management of turfgrass diseases. Laboratory includes weed identification and herbicide application methods. Certain laboratory exercises will require personal transportation to Lake Wheeler Road Turf Field Lab unless otherwise specified by the lab instructors. The course is restricted to AGI students only.

Requisite: Agricultural Institute Only
Typically offered in Fall only

PP 155 Diseases of Ornamentals and Turfgrasses  (3 credit hours)
Causes, development, identification and management of diseases of greenhouses and landscape ornamentals and turfgrasses. WARFIELD

Requisite: Agricultural Institute Only
Typically offered in Fall only

PP 222 Kingdom of Fungi  (3 credit hours)
Influence and impact of fungi in our world. The role of fungi in history, ecology, medicine, human and plant diseases, industry, food and politics. Mushrooms, molds, mildews and symbiosis.

Prerequisite: Any 100-level course in Biology or 200-level course in Plant Biology
GEP Natural Sciences
Typically offered in Spring only
PP 232  Big Data in Your Pocket: Call it a Smartphone  (3 credit hours)
Data have been, are, and will be collected in every scientific discipline. Data provide a foundation to evaluate hypotheses and advance knowledge. For centuries scientists have collected data and built models separately with methods and principles defined in their disciplines. Modern technological advances have resulted in a data revolution. Data now come fast in all forms and in high volumes, presenting both new challenges and opportunities in many disciplines. In this course we will discuss how data is collected and visually summarized and how modern technology has allowed for the collection of big data, resulting in a revolution in the way we live, work, and think.

GEP Interdisciplinary Perspectives
Typically offered in Fall only
PP 241  The Worm’s Tale: Parasites In Our Midst  (3 credit hours)
This is a 3 credit hour survey course on the impact of parasites on society, including development and exploration, wars and expansion, agriculture, health and medicine, economic impacts, political impacts, and attempts at control/management. From the fiery serpent to the scourge of malaria, parasitic organisms have played a significant, and sometimes pivotal role in the development and progress of human society. This course presents an overview that provides students the necessary information and resources to understand this ubiquitous and critically important group of organisms. Parasites represent a significant hurdle to overcome as global society continue to move forward.

GEP Interdisciplinary Perspectives
Typically offered in Spring only
PP 315  Principles of Plant Pathology  (4 credit hours)
Fundamental principles of plant pathology with emphasis on disease etiology, nature of pathogenesis, ecology of host/parasite interaction, epidemiology of plant diseases, current strategies and practices for integrated disease control.

Typically offered in Fall and Spring
PP 318/FOR 318  Forest Pathology  (3 credit hours)
Major diseases of forest trees and deterioration of wood products emphasizing principles of plant pathiology; diagnosis; nature, physiology, ecology, and dissemination of disease-causing agents; mechanisms of pathogenesis; epidemiology and environmental influences; principles and practices of control.
Prerequisite: PB 200
Typically offered in Fall and Spring
PP 470/CS 470/ENT 470  Advanced Turfgrass Pest Management  (2 credit hours)
Characteristics and ecology of turfgrass weed, insect, and disease pests; identification and diagnosis of turfgrass pests, strategies for managing pests including cultural, mechanical, biological, and chemical methods; development of integrated pestmanagement programs, characteristics and modes of action for herbicides, insecticides, fungicides, and plant growth regulators; behavior and fate of pesticides in soil; and the development and management of pesticide resistant pest populations.
Prerequisite: C- or better in CS 200
Typically offered in Spring only

PP 492  External Learning Experience  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall and Spring

PP 493  Special Problems in Plant Pathology  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall and Spring

PP 495  Special Topics in Plant Pathology  (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer
PP 501/PB 501/MB 501  Biology of Plant Pathogens  (3 credit hours)
Biology of microbes that cause plant diseases. The ecology, genetics, physiology, taxonomy, and mechanisms of parasitism, pathogenicity and virulence of bacteria (and other prokaryotes), fungi (and oomycetes), nematodes, and viruses that cause plant diseases. Prepares graduate students for advanced courses in plant pathology, host-parasite interactions, and provides a knowledge base for students in other disciplines involved with plant pathogens or who seek to broaden their knowledge of microbes.
Prerequisite: PP 315, or PP 318, or an introductory course in microbiology
Typically offered in Fall only
PP 502/CS 502/HS 502  Plant Disease: Methods & Diagnosis  (2 credit hours)
Introduction to the basic principles of disease causality in plants and the methodology for the study and diagnosis of plant diseases caused by fungi. Identification of plant-pathogenic fungi. Research project, disease profiles and field trips are required.
Prerequisite: PP 315
Typically offered in Fall only
PP 506  Epidemiology and Plant Disease Control  (3 credit hours)
Consideration of fundamental concepts and principles of epidemiology as applied to modern strategies of plant disease control. Special consideration given to evaluation of current techniques for control of fungal, bacterial, viral and nematode pathogens in an integrated crop protection system.
Prerequisite: PP 315 or PP 318
Typically offered in Spring only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 530</td>
<td>Agriculture, Ethics and the Environment</td>
<td>3</td>
<td>Typically offered in Fall and Spring. Case studies in ethical theory and moral issues in agriculture and life sciences research including ethical theories, populations, food, ozone depletion, soil quality, sustainable and organic agriculture, plant biotechnology and biodiversity, animal rights and welfare, water quality, pesticides, risk assessment, biologically-based pest management, environmental policy and research ethics. Students are active participants and use role playing to present a forum.</td>
</tr>
<tr>
<td>PP 540</td>
<td>Tropical Plant Pathology</td>
<td>2</td>
<td>Typically offered in Spring only. Class introduces students to agriculture in the tropics and disease on tropical crops including cacao, banana, potato, root vegetables and coffee will be given. Trade issues relevant to US and Central American farmers are discussed. A week long trip Costa Rica in the summer and tours of coffee, banana, pineapple, tropical fruit, cacao and vegetable farms in the country is required. Learn about the diseases, social and political issues facing farmers in the developing world.</td>
</tr>
<tr>
<td>PP 590</td>
<td>Special Topics</td>
<td>1-3</td>
<td>Typically offered in Fall, Spring, and Summer. The study of special problems and selected topics of current interest in plant pathology and related fields.</td>
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<tr>
<td>PP 601</td>
<td>Seminar</td>
<td>1</td>
<td>Typically offered in Fall and Spring. Discussion of assigned phytopathological topics.</td>
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<tr>
<td>PP 610</td>
<td>Special Topics</td>
<td>1-6</td>
<td>Typically offered in Fall, Spring, and Summer. The study of special problems and selected topics of current interest in plant pathology and related fields.</td>
</tr>
<tr>
<td>PP 615</td>
<td>Advanced Special Topics in Plant Pathology</td>
<td>1-6</td>
<td>Typically offered in Fall, Spring, and Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.</td>
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<tr>
<td>PP 620</td>
<td>Special Problems</td>
<td>1-6</td>
<td>Typically offered in Fall and Spring. Investigation of special problems in plant pathology not related to thesis problem. Investigations may consist of original research and/or literature survey.</td>
</tr>
<tr>
<td>PP 630</td>
<td>Special Topics</td>
<td>1-3</td>
<td>Typically offered in Fall and Spring. The study of special problems and selected topics of current interest in plant pathology and related fields.</td>
</tr>
<tr>
<td>PP 650</td>
<td>Seminar</td>
<td>1</td>
<td>Typically offered in Fall and Spring. Discussion of assigned phytopathological topics.</td>
</tr>
<tr>
<td>PP 665</td>
<td>Master's Supervised Teaching</td>
<td>1-3</td>
<td>Typically offered in Fall and Spring. Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.</td>
</tr>
<tr>
<td>PP 690</td>
<td>Master's Examination</td>
<td>1-9</td>
<td>Typically offered in Fall and Spring. For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.</td>
</tr>
<tr>
<td>PP 693</td>
<td>Master's Supervised Research</td>
<td>1-9</td>
<td>Typically offered in Fall and Spring. Instruction in research and research under the mentorship of a member of the Graduate Faculty.</td>
</tr>
<tr>
<td>PP 695</td>
<td>Master's Thesis Research</td>
<td>1-9</td>
<td>Typically offered in Fall and Spring. Thesis research.</td>
</tr>
<tr>
<td>PP 696</td>
<td>Summer Thesis Res</td>
<td>1</td>
<td>Typically offered in Summer only. For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.</td>
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<tr>
<td>PP 699</td>
<td>Master's Thesis Preparation</td>
<td>1-9</td>
<td>Typically offered in Fall and Spring. Original research in plant pathology.</td>
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<tr>
<td>PP 707</td>
<td>Plant Microbe Interactions</td>
<td>3</td>
<td>Typically offered in Spring only. Fundamental concepts and current status of research on the physiology, biochemistry and molecular biology of host-pathogen interactions during plant disease. Topics include recognition, penetration and colonization, pathogenicity and virulence determinants, resistance mechanisms, sign transduction, programmed cell death, and other current topics. Information presented in context of viral-, bacterial-, fungal- and nematode-plan interactions.Credit cannot be received for both PP 507 and PP 707.</td>
</tr>
<tr>
<td>PP 715/MB 715</td>
<td>Applied Evolutionary Analysis of Population Genetic Data</td>
<td>3</td>
<td>Typically offered in Spring only. This course will introduce nonparametric and model-based methods for making inferences on population processes (mutation, migration, drift, recombination, and selection). The goal is to provide a conceptual overview of these methods and hands-on training on how to implement and interpret the results. Sample data sets in computer laboratories will integrate summary statistic, cladistic, coalescent, and bayesian approaches to examine population processes in different pathosystems with specific emphasis on eukaryotic microbes, viruses and bacteria.</td>
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</tbody>
</table>
PP 727/ENT 727 Ecology of Soil Ecosystems (3 credit hours)
This course will focus on the interactions between soil organisms and their environment, and the ecological consequences of these diverse complex interactions. In particular, it will explore the scientific evidence that illustrates links between soil organisms, ecosystem functioning and the quality of air and water systems, and examine why and how the related research was conducted. This course will bring together theory and research trends from distinct subject areas: soil microbiology, entomology and ecosystem ecology.
Prerequisite: One course in: (SSC 332, SSC 511, SSC 521, or SSC 532), or ecology (BO 360 or CS 430), or microbiology (MB 351), or consent of instructor.
Typically offered in Spring only

PP 728 Soilborne Plant Pathogens (3 credit hours)
In-depth study of ecology of soilborne fungal and bacterial pathogens inducing root and wilt diseases in plants. Concepts and principles including but not limited to the rhizosphere, inoculum potential, soil fungistasis, survival, root disease models and biological control.
Prerequisite: PP 501, 502
Typically offered in Fall only

PP 730/PB 730/GN 730/MB 730 Fungal Genetics and Physiology (3 credit hours)
Basic concepts of genetics and physiology of fungi, with emphasis on saprophytic and plant pathogenic mycelial fungi. Current literature on evolution, cell structure, growth and development, gene expression, metabolism, sexual and asexual reproduction and incompatibility systems. Laboratory exercises on mutant isolation, sexual and parasexual analysis, genetic transformation, and RFLP and isozyme analysis.
Prerequisite: BCH 451, BO 775, GN 311 or PP 501
Typically offered in Spring only

PP 755 Plant Disease Resistance: Mechanisms and Applications (3 credit hours)
This class deals with the major concepts in plant disease resistance: Its molecular and biochemical bases, its effectiveness and methods of deployment and conventional and transgenic breeding methods used to incorporate improved disease resistance into crop species.
P: Basic Undergraduate Level Genetics Class
Typically offered in Spring only

PP 790 Special Topics (1-6 credit hours)
The study of special problems and selected topics of current interest in plant pathology and related fields.

PP 795 Advanced Special Topics (1 credit hours)
Critical study of special problems and selected topics of current interest in plant pathology and related fields.

PP 801 Seminar In Plant Pathology (1 credit hours)
Discussion of assigned phytopathological topics.
Typically offered in Fall and Spring

PP 810 Special Topics (1-6 credit hours)
The study of special problems and selected topics of current interest in plant pathology and related fields.
Typically offered in Fall, Spring, and Summer

PP 815 Advanced Special Topics (1-6 credit hours)
Critical study of special problems and selected topics of current interest in plant pathology and related fields.
Typically offered in Fall and Spring

PP 820 Special Problems In Plant Pathology (1-6 credit hours)
Investigation of special problems in plant pathology not related to thesis problem. Investigations may consist of original research and/or literature survey.
Typically offered in Fall and Spring

PP 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

PP 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall only

PP 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

PP 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall and Spring

PP 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

PP 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Summer only

Political Science (PS)

PS 101 Internet Research (1 credit hours)
Tools and techniques for conducting Internet research and electronic literature reviews. Documentation and ethics of using and citing information sources. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled.
Typically offered in Fall, Spring, and Summer
PS 102 Data Analysis (1 credit hours)
Statistical analysis of governmental and survey data. Introduction to data sets and collecting, computerizing and analyzing political and social data.

Typically offered in Fall, Spring, and Summer

PS 103 Designing Political Web Pages (1 credit hours)
Principles of effective internet communication in political professions, for constituency contact and grassroots mobilization, and use of web documents by politicians and political organizations. Design of web page documents and creation of internet directories.

Typically offered in Fall, Spring, and Summer

PS 201 American Politics and Government (3 credit hours)
Analysis of American political institutions and processes, including the constitution, political culture, campaigns and elections, political parties, interest groups, the media, the president, congress, the federal courts, and public policy. Discussion of contemporary and controversial issues in American politics. Emphasis on placing current issues in comparative and historical perspective where relevant.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 202 State and Local Government (3 credit hours)
State and local governments within the context of the American federal system. Special emphasis on federalism, the constitutional/legal relationships between state and local governments, and the institutions, organizational forms, and political processes in American state and local government.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 203 Introduction to Nonprofits (3 credit hours)
Development of nonprofit organizations and the contributions of nonprofits in the U.S., other countries, and the international community; political, social, and economic roles of nonprofits; nonprofit governance; partnerships with government and other nonprofits; types of organizations in the nonprofit sector; contemporary policy issues. Service project with minor transportation costs.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 204 Problems of American Democracy (3 credit hours)
Political problems in America from the perspective of political theory. Democracy, economics and politics, racial and sexual equality, civil disobedience, and individual freedom.

Typically offered in Spring only

PS 231 Introduction to International Relations (3 credit hours)
Evolution of relations among nations and of the roles of the United Nations and other international institutions, including changes in the world political system since the end of the cold war.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 236 Issues in Global Politics (3 credit hours)
Selected problems facing the world community, related political issues, and international responses to them, including international trade, economic development, wars, arms control, terrorism, ethnic conflict, human rights, status of women, population growth, food security, and environmental degradation.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 241 Introduction to Comparative Politics (3 credit hours)
Introductory comparative analysis of a selected variety of political systems always including some developed democracies, some communist states and some developing countries. A minimum familiarity with the American political system is assumed.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Spring only

PS 298 Special Topics in Political Science (1-6 credit hours)
Experimental course at the freshman and sophomore levels.

PS 301 The Presidency and Congress (3 credit hours)
Historical development, selection, and internal organization of the presidency and congress. Discussion of the relations between the branches and the influence of public opinion, interest groups and parties on the federal government. Analysis of the legislative process.

Prerequisite: PS 201
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 302 Campaigns and Elections in the US Political System (3 credit hours)
Campaigns and elections in the United States with emphasis on presidential and congressional primary and general elections. Development of theoretical propositions concerning how and why people vote, how and why candidates campaign, and behavioral reasons underlying candidates’ successes and failures. Special emphasis on the role of the mass media in the electoral process.

Prerequisite: PS 201
GEP Social Sciences
Typically offered in Fall only

PS 303 Race in U.S. Politics (3 credit hours)
Race in American politics with emphasis on the African-American political experience: civil rights legislation, voting rights, political representation, campaigns and party politics, survey attitudes, and public policies including affirmative action.

Requisite: Sophomore Standing or Above
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Summer
PS 305 The Justice System in the American Political Process (3 credit hours)
Criminal justice process and civil justice system in the American judiciary, including court organization and legal professionals such as police, attorneys and judges; formulation and implementation of policies by law enforcement and the courts; impact of political system upon police, attorneys and judges; interaction between public and legal professionals in judicial decision making. Students who have successfully completed PS 306 or PS 311 may not receive credit for PS 305.

GEP Social Sciences
Typically offered in Fall only

PS 306/WGS 306 Gender and Politics in the United States (3 credit hours)
This course explores the role of gender in contemporary American politics. The course examines the historical course of gender politics to see how we have arrived at the present state. It investigates the activities that women and men perform in modern politics—voting, running for office, serving in office, etc., and how women and men perform these activities in different ways. The course also focuses on major areas of public policy that affect women and men in different ways.

Prerequisite: PS 201

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall only

PS 307 Introduction to Criminal Law in the United States (3 credit hours)
Principles underlying the criminal law in the United States and classification of crimes, criminal act, factors affecting criminal responsibility and various types of offenses. Observation of state and federal court sessions.

Typically offered in Fall and Spring

PS 308 Supreme Court and Public Policy (3 credit hours)
The role of the Supreme Court in American politics, with emphasis on the use of litigation as a form of political activity. Readings include relevant court cases as well as descriptions of the Supreme Court in action.

Typically offered in Fall and Spring

PS 309 Equality and Justice in United States Law (3 credit hours)
Equality and justice in American law; federal and state court interpretation of constitutional and statutory law. Topics include racial justice; prisoners’ rights and just punishments; nontraditional families and reproductive technologies; gay rights;

GEP Social Sciences, GEP U.S. Diversity

PS 310 Public Policy (3 credit hours)
Introduction to public policy formulation and analysis, including agenda-setting strategies, problems of legitimation, the appropriations process, implementation, evaluation, resolution, and termination.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 312 Introduction to Public Administration (3 credit hours)
Administration in city, state and national governments: effectiveness and responsiveness, involvement in policy areas, and issues of ethics and responsibilities.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PS 313 Criminal Justice Policy (3 credit hours)
This course covers the basic policies and controversies in criminal justice in the United States. The course will explore how criminal justice policies get made, why they get made, how well or poorly they work, and what we can do better. The course will examine primarily longstanding areas of policy debate, e.g., illegal drugs, prisons, capital punishments, etc., but we will also pay attention to policy debates in the news. The course will also pay special attention to the intersection of race and social class with our modern criminal justice policies.

Prerequisite: PS 201

GEP U.S. Diversity
Typically offered in Fall only

PS 314 Science, Technology and Public Policy (3 credit hours)
Technological innovation and scientific discovery since World War II have led to profound social, political, and economic change. This course explores some of the opportunities and challenges these advances have created and the ways in which society and government seek to limit their negative effects while maximizing gains and promoting further innovation.

GEP Social Sciences

Typically offered in Fall only

PS 320 U.S. Environmental Law and Politics (3 credit hours)
Emergence of the environment as an issue in United States politics. Law and policy pertaining to air and water pollution, land-use, water, energy, toxic substances, and wilderness. Roles of national and state governments, scientists, corporations, and citizens groups in addressing environmental problems

GEP Social Sciences
Typically offered in Fall and Spring

PS 331 U.S. Foreign Policy (3 credit hours)
The content, formulation, and execution of U.S. foreign policy during the postwar period, with concentration on major issues and trends, the instruments for implementing foreign policy, and analysis of the policymaking process.

GEP Social Sciences
Typically offered in Fall and Summer

PS 335 International Law (3 credit hours)
Usefulness and limitations of international law, including obligations and immunities of sovereign states, non-state actors, peaceful settlement of disputes, human rights, laws of war, and recent international war crimes tribunals. Emphasis on individual case decisions in U.S. and international courts.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall and Spring

PS 336 Global Environmental Politics (3 credit hours)
International politics, laws, and policies pertaining to global environmental problems in the realms of population, pollution, climate change, biological diversity, forests oceans, and fisheries.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall and Spring
PS 339 Politics of the World Economy (3 credit hours)
Politics of international trade and payments, including barriers to trade, dispute settlement, multinational corporations, financial crises, international economic institutions and the problems of economic underdevelopment.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

PS 341 European Politics (3 credit hours)
Comparative analysis of the interests, institutions and processes that determine political stability and economic security in Europe, including the political and economic development of Europe, the role of parties and party politics, the institutions and politics of the European Union.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

PS 342 Politics of China and Japan (3 credit hours)
Politics, public policy, and foreign affairs of China and Japan.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall and Spring

PS 343 Government and Politics in South Asia (3 credit hours)
Survey of government structures, politics, foreign policies and economic policies of India, Pakistan, Bangladesh and Sri Lanka. Democratization; religious, ethnic and sectarian conflicts; nuclear proliferation; Kashmir conflict; and economic development.

Typically offered in Fall only

PS 345 Governments and Politics in the Middle East (3 credit hours)
Historical, geographic, religious, and political-economic factors of the Middle East. Particular attention is given to the internal politics of selected countries, as well as issues of international concern.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Spring only

PS 353 Issues in Latin American and Caribbean Politics (3 credit hours)
Introduction to the major issues affecting political and economic development and stability in Latin America and the Caribbean.

GEP Social Sciences
Typically offered in Spring only

PS 361 Introduction to Political Theory (3 credit hours)
Nature and purpose of politics, as treated by such writers as Plato, Aristotle, St. Augustine, Machiavelli, Locke, Rousseau, Mill, Marx, and Nietzsche.

GEP Humanities
Typically offered in Fall and Spring

PS 362 American Political Thought (3 credit hours)
American ideas and institutions as viewed from the perspective of great American political thinkers, such as Frederick Douglass, Thomas Jefferson, James Madison, Alexander Hamilton, Henry David Thoreau, Abraham Lincoln, Franklin Roosevelt, and Malcolm X.

GEP Humanities
Typically offered in Fall, Spring, and Summer

PS 371 Research Methodology of Political Science (3 credit hours)
Research methods in social science and quantitative analysis in political science and public policy including research design, data collection, statistical analysis and computer applications.

Prerequisite: ST 311 or (ST301 and ST302)
Typically offered in Fall, Spring, and Summer

PS 391 Internship in Political Science (1-6 credit hours)
Internship in a governmental agency, interest group, or like organization involves seminar or formal report. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

PS 398 Special Topics in Political Science (3 credit hours)
For topics not part of regular course offerings, or offering of new courses on a trial basis. May be taken up to three times provided the topics are different.

Typically offered in Fall, Spring, and Summer

PS 401 American Political Parties (3 credit hours)
Political Parties are the central linkage mechanism of American Government. They serve to connect the desires and viewpoints of ordinary Americans to actual governing in Washington and statehouses. The course will explore the structure of the party system in America, how it compares to other countries, and the struggle of third parties in America. The course will also explore political parties as organizations working towards electoral victory. The course will examine parties as changing coalitions of voters and place our current partisan polarization in context. The course will conclude by examining how all these aspects of contemporary political parties come together to shape modern American politics and policy.

Prerequisite: PS 201
Typically offered in Spring only

PS 409/AFS 409 Black Political Participation in America (3 credit hours)
African American political participation in the United States; political culture, socialization, and mobilization, with a focus on the interaction between African Americans and actors, institutions, processes, and policies of the American political system.

Typically offered in Fall only

PS 411 Public Opinion and the Media in American Politics (3 credit hours)
Nature, content, origins, and effects of public opinion in the American political system; role of the mass media in articulating and shaping public opinion; issues concerning measurement of public opinion.

Prerequisite: PS 201
Typically offered in Fall only

PS 415 Administration of Justice (3 credit hours)
Politics and administration in the American system of justice. Credit will not be given for both PS 415 and PA 515

Junior standing or above
Typically offered in Fall only
PS 418/WGS 418 Gender Law and Policies (3 credit hours)
Law and policy pertaining to contemporary gender issues. Examination of agenda setting, policy formation, implementation, judicial interpretation and evaluation of selected issues, such as reproductive policies, equal employment and sexual abuse.

Prerequisite: 3 hours of Political Science
GEP U.S. Diversity
Typically offered in Spring only

PS 431 The United Nations and Global Order (3 credit hours)
United Nations in contemporary world politics. Functions and operation of central organs, commissions, and specialized agencies. Role in addressing global issues including peacekeeping, arms control, human rights, economic and social development, and environment.

Prerequisite: PS 231 or PS 236 or PS 335
GEP Global Knowledge
Typically offered in Fall and Spring

PS 432/SOC 432 Violence, Terrorism, and Public Policy (3 credit hours)
The course examines interpersonal and group violence in contemporary societies and the causes for its occurrences. Specific forms of violence that will be examined include domestic violence, gangs, homicide, and terrorism, domestically and internationally. Throughout the course students will use data to critically evaluate policies and practices to prevent and control violence and will examine potential solutions to the problems of violence.

Prerequisite: SOC 300 or PS 371
Typically offered in Fall and Spring

PS 433 Global Problems and Policies (3 credit hours)
Critical analysis of issues and events in world politics, including terrorism, drug trafficking and money laundering, transmission of infectious diseases, democratization, globalization and economic development.

Prerequisite: PS 231 or PS 236 or PS 241
GEP Global Knowledge
Typically offered in Fall and Spring

PS 437 U.S. National Security Policy (3 credit hours)
Formulation and implementation of United States national security policy, including its military, political and economic dimensions. Historical evolution of US policy primarily from the end of World War II through the end of the Cold War and to its contemporary context.

Prerequisite: PS 331
Typically offered in Fall only

PS 443/PS 543 Seminar in Latin American & Caribbean Politics (3 credit hours)
Comparative political development in Latin America and the Caribbean. Emphasis on democratization and implications for US foreign policy.
Credit cannot be given for both PS 443 and PS 543

Prerequisite: Six hours of Political Science including PS 231
Typically offered in Spring only

PS 445/PS 545 Comparative Systems of Law and Justice (3 credit hours)
Legal culture and administration of justice in various countries and in the U.S. Emphasis on the impact of legal ideology on crime, political justice, police administration, corrections and judicial process. Credit will not be given for both PS 445 and PS 545

Junior standing or above
Typically offered in Spring only

PS 462 Seminar in Political Theory (3 credit hours)
A special area in political theory through selected texts, independent research, and seminar reports. Topics vary from year to year, such as ancient and modern political thought, democratic theory, and political theory in literature.

Prerequisite: PS 361 or Consent of Instructor
Typically offered in Spring only

PS 463 Public Choice and Political Institutions (3 credit hours)
Examination of public choice approach to political science. Analysis of political institutions and how they modify human behavior and influence political and policy outcomes. Fulfills department's undergraduate senior seminar requirement.

Prerequisite: Junior standing or Senior standing, Political Science Majors, 12 hours of Political Science Courses
Typically offered in Spring only

PS 464 The Classical Liberal Tradition (3 credit hours)
Analysis of the genesis and development in Europe and North America of liberal ideas such as natural rights, individual liberty, democracy, economic liberalism, religious pluralism, and the rule of law with a particular emphasis on important documents, thinkers, events, and leaders.

Prerequisites: PS 201 or PS 361 or PS 362
Typically offered in Fall only

PS 471 Public Opinion Research Methodology (3 credit hours)
Survey research methodology in public opinion polling, campaign management, media and market research, needs assessment and program evaluation. Topics include questionnaire design, survey sampling, computer applications, and data analysis. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall and Spring

PS 490 Readings and Research in Political Science (1-6 credit hours)
Extensive readings or research in political science under direct faculty supervision. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty

Typically offered in Fall and Spring

PS 492 Honors Readings and Thesis in Political Science (1-6 credit hours)
Independent reading and preparation of an honors thesis in political science. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member

Prerequisite: Admission to Honors Program
Typically offered in Fall, Spring, and Summer

PS 498 Special Topics in Political Science (1-6 credit hours)
Detailed investigation of a topic. Topic and mode of study determined by the student and a faculty member.

Prerequisite: Six hours of Political Science
Typically offered in Fall and Spring
PS 502 The Legislative Process (3 credit hours)
The formulation of public policy from institutional and behavioral viewpoints. Important current legislative problems at congressional and state legislative levels selected and serve as basis for analyzing legislative process.

Prerequisite: Advanced Undergraduate standing including 12 hrs. of PS, Graduate standing or PBS status
Typically offered in Spring only

PS 506 United States Constitutional Law (3 credit hours)
Basic constitutional doctrines, including fundamental law, judicial review, individual rights and political privileges and national and state power. Special attention given to application of these doctrines to regulation of business, agriculture and labor and to rights safeguarded by First, Fifth and Fourteenth Amendments to the Constitution.

Prerequisite: 12 hours of PS or Graduate standing or PBS status
Typically offered in Fall only

PS 507 Civil Liberties in the United States (3 credit hours)
Leading constitutional cases in civil liberties and individual rights along with writings of leading commentators.

Prerequisite: 12 hours of PS or Graduate standing or PBS status
Typically offered in Fall only

PS 530 Seminar in International Relations (3 credit hours)
May be taken for up to six hours credit. In-depth examination of a topic within larger field of international politics to be selected by instructor for each semester from subjects pertaining to interstate relations, international law and organization, regional politics, foreign and security policy or global issues. Students undertake substantial independent research project.

Typically offered in Fall only

PS 531 International Law (3 credit hours)
Sources and subjects of international law, domestic and international jurisdictions, judicial settlement, legal and illegal uses of force and substance of law in selected policy areas.

Prerequisite: Graduate standing or Advanced Undergraduate standing
Typically offered in Fall and Spring

PS 532 Seminar in Global Governance (3 credit hours)
The politics of global governance, with emphasis on the role of intergovernmental organizations, non-governmental organizations, international regimes, and supranational institutions, and the comparative analysis of different governance structures. Includes study of the mechanisms of international cooperation between states and their citizens in a variety of issue areas, such as trade, money, development, humanitarianism, the environment, human rights, and security. Graduate standing.

Typically offered in Fall only

PS 533 Global Problems and Policy (3 credit hours)
International policy processes and policy responses to problems of global scope including role of international law. Consideration given to economic development, human rights and other policy problems selected for specific semesters. Independent research on a global policy problem of student's choice.

Prerequisite: Advanced Undergraduate standing including 12 hours of PS program, Graduate standing or PBS status
Typically offered in Spring only

PS 534 The Politics of Human Rights Policies (3 credit hours)
Human rights policies and politics within the modern global society; the interplay of international organizations, governments and non-governmental actors in promoting and undermining international human rights; examines how domestic politics, sovereignty, cultural norms, religion, geo-political competition, past colonialism, and economic considerations affect efforts to address human rights violations in different countries; human rights issues such as genocide, humanitarian intervention, women and gender issues, refugees, transitional justice or reconciliation, ethnic/racial divisions, human trafficking, etc. Graduate standing.

Typically offered in Fall only

PS 536 Global Environmental Law and Policy (3 credit hours)
International organizations, laws and policies addressing global environmental problems including: population growth, atmospheric pollution, climate change, use of oceans, forests and biodiversity. Relationship between environment and Third World economic development.

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

PS 539 International Political Economy (3 credit hours)
Politics of international trade and payments, with special emphasis on international and domestic determinants of protectionism, international and national political institutions, multinational corporations, debt crises, and dilemmas of economic underdevelopment.

Prerequisite: Advanced Undergraduate standing, Graduate standing or PBS status
Typically offered in Fall only

PS 540 Seminar in Comparative Politics (3 credit hours)
This seminar opens with a survey of the problems and methods of comparative political analysis, after which students assigned a specific, limited subject to be examined within framework of a systematic, analytical scheme appropriate to topic. Specific topics drawn from subjects of political ideologies, political groups, political elites and decision-making institutions and processes.

Prerequisite: One course in comparative politics and one course in PS methodology
Typically offered in Fall and Spring

PS 541 Political Islam (3 credit hours)
Explores the diversity of movements, organizations, and political parties that fall within political Islam, from the extremist, violent fringe to democratically functioning groups. Begins with an overview of the interaction of religion and politics before defining political Islam and exploring major groups practicing it. The course provides a comparative perspective on Islam’s interactions with the political realm, as well as a study of the role it plays in promoting or hindering democratic development.

Prerequisite: Graduate standing
Typically offered in Spring only


PS 542 European Politics (3 credit hours)
Analysis of political institutions and processes in selected European states and the European community and major social, economic and political issues confronting European societies.

Prerequisite: Nine hours of PS program, Graduate standing or PBS status
Typically offered in Spring only

PS 543/PS 443 Seminar in Latin American & Caribbean Politics (3 credit hours)
Comparative political development in Latin America and the Caribbean. Emphasis on democratization and implications for US foreign policy. Credit cannot be given for both PS 443 and PS 543

Prerequisite: Six hours of Political Science including PS 231
Typically offered in Spring only

PS 544 Contemporary African Politics (3 credit hours)
A survey of key themes, trajectories, and trends in contemporary African politics. It analyzes political and economic development on the continent since the dawn of independence in the late 1950s. Although largely focused on Sub-Saharan Africa, the course will nevertheless touch upon linkages and connections with North Africa as well as diasporic influences and inspirations especially in the pan-African struggles for independence and the forging of new sovereign nation-states.

Prerequisite: Graduate standing
Typically offered in Fall only

PS 545/PS 445 Comparative Systems of Law and Justice (3 credit hours)
Legal culture and administration of justice in various countries and in the U.S. Emphasis on the impact of legal ideology on crime, political justice, police administration, corrections and judicial process. Credit will not be given for both PS 445 and PS 545

Junior standing or above
Typically offered in Fall and Spring

PS 546 The Politics of East Asia (3 credit hours)
This course examines the history and key theoretical and policy debates on the politics of East Asia, which in this course includes China, Japan, two Koreas, and Taiwan. Yet, other countries in and beyond the region (the United States, Russia, Southeast Asian nations) and their relations with the five states are an integral part of the course. The class comprises three parts. Part I introduces the modern history of East Asia. Part II examines the contemporary governments of East Asia, including their political systems and the main debates surrounding their politics. Part III focuses on interstate relations of East Asia and Pacific, comprising a series of topics that are both timely and heatedly debated among intellectuals and policymakers. While these topics are mostly country/ countries-specific, they together are important in understanding the regional dynamics of East Asia.

Typically offered in Fall only

PS 547 Russian Politics (3 credit hours)
The course investigates the principal political and societal actors in today's Russia, as well as the key trends in Russia's domestic and foreign policy.

Typically offered in Spring only

PS 560 Nuclear Nonproliferation Policy & Process (3 credit hours)
Policy and processes associated with global nuclear nonproliferation efforts. Special emphasis on the history of the development of the global nonproliferation regime, current challenges, and future threats.

Typically offered in Fall and Spring

PS 561 Nuclear Strategy and Nonproliferation (3 credit hours)
No understanding of world politics is complete without an accounting of the role of nuclear weapons. Observers have credited the nuclear revolution with everything from responsibility for the longest period without a great-power war in modern history to bringing humanity to the precipice of annihilation. This course gives students an understanding of the role that nuclear weapons have played in world politics over the past seven decades. The course explores the ways these weapons have been incorporated into military force structures; the roles they have played in military strategy; and the effort to control their spread, limit deployments and stockpiles, avoid nuclear war, and prevent nuclear terrorism. This course will be of use to graduate students with an interest in international relations, foreign policy, and national security. No prior background in international security or nuclear policy is required.

Typically offered in Fall only

PS 571 Research Methods and Analysis (3 credit hours)
A survey of methods used in behavioral research as applied to field of political science: elements of empirical theory, research design, measurement of variables, sampling procedures, data courses, techniques of data collection, statistical analysis, qualitative methodologies and presentation of research findings.

Prerequisite: Advanced Undergraduate standing including 12 hours of PS program, Graduate standing or PBS status
Typically offered in Fall only

PS 585 Constitutional and Legal Principles for Police Supervisors (3 credit hours)
Intensive look at the constitutional underpinnings and restrictions on laws and government agency policies impacting police agencies. Specific constitutional protections relating to interrogation and search of employees, freedom of speech, freedom of religion and drug testing. Legal risks and liabilities facing police managers and how to reduce these risks.

Typically offered in Fall, Spring, and Summer

PS 590 Special Topics (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

PS 598 Special Topics in Political Science (1-6 credit hours)
Detailed investigation of a topic. Topic and mode of study determined by student and a faculty member.

Prerequisite: Six hours of PS program
Typically offered in Fall and Spring

PS 610 Special Topics (1-6 credit hours)
Detailed investigation of a topic. Topic and mode of study determined by student and a faculty member.

Prerequisite: Six hours of PS program
Typically offered in Fall and Spring
Polymer and Color Chemistry (PCC)

**PCC 101** Introduction to Polymer and Color Chemistry (2 credit hours)
Introduction of topics related to Polymer and Color Chemistry, e.g. fiber and fiber forming polymers, polymerization methods, into to color assessment methods, various chemistry disciplines, molecular interactions, periodic table, acids, bases, solutions, into to and examples of textile coloration and textile finishing techniques.

Corequisite: PCC 104
Typically offered in Fall only

**PCC 104** Introduction to Polymer and Color Chemistry Lab (1 credit hours)
An introduction to hands-on laboratory work for the study of basic polymer principles, dye synthesis, forensic analysis and coloration of fibers.

Corequisite: PCC 101
Typically offered in Fall only

**PCC 106** Polymer Chemistry and Environmental Sustainability (3 credit hours)
Polymers are prevalent in almost every part of our lives. Many polymers are petroleum based and their raw material supply is limited. Using a theme of environmental impact, this course will review the origin and preparation of key industrial raw materials and how they are used in polymer synthesis. Properties of synthetic polymers will be introduces and concepts for establishing sustainable polymers will be discussed.

Prerequisite: CH 101 or CH 103; Corequisite: CH 221 or CH 225
Typically offered in Spring only

**PCC 201** Impact of Industry on the Environment and Society (3 credit hours)
Relationship of society to safety and environmental aspects of manufactured products. Quantifying manufacturing risks. Protective methods, e.g. administrative, engineering, personal, treatment, pollution prevention. Social factors, e.g. political, regulatory, legal, consumer attitudes, public policy, perceptions. Understanding complex social issues, especially situations with conflicting goals. Critical comparison of options for risk reduction, and selecting reasonable (hopefully optimal) courses of action in complex and uncertain situations. Unsolved problems of industry and society (e.g. greenhouse effect). Relationships of ethics, laws and regulations to manufacturing.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

**PCC 274** Introduction to Forensic Science (3 credit hours)
The field of forensic science is the application of science to the law. The primary purpose of this course is to introduce students to the 'real world' of forensics. It will serve as a basis for more advanced forensic courses. Solving crimes are often complex and costly affairs, involving myriad science and engineering disciplines, ethics, legal issues, and strong communication skills. These key areas will be introduced via regular course lectures, guest lectures from faculty members within NC State and other institutions, and guest lectures from current or former field agents and professional forensic scientists.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

**PCC 301** Technology of Dyeing and Finishing (3 credit hours)
Basic principles and procedures for the preparation, dyeing, printing, and finishing of natural and man-made fibers. The chemical nature of dyes and fastness properties and the chemical nature of finishes used to impart specific end-use properties.

Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 304
Typically offered in Fall and Spring

**PCC 302** Technology of Textile Wet Processing (4 credit hours)
Introduction to the science and technology used in textile wet processing. Topics include preparation, dyeing, printing and finishing of textiles, basics of color generation and measurement. Emphasis mainly on cotton, wool, nylon and polyester. Laboratory includes experiments in wet processing and a project on statistical analysis of fabric defects.

Prerequisite: (TT 105 or MT 105 or PCC 101) and TMS 211 and CH 101 and (PY 211 or PY 205).
Typically offered in Fall, Spring, and Summer

**PCC 304** Technology of Dyeing & Finishing Laboratory (1 credit hours)
Laboratory experience involving the preparation, dyeing, printing, and finishing of natural and man-made fibers.

Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 301
Typically offered in Fall and Spring

**PCC 350** Introduction to Color Science and Its Applications (2 credit hours)
Basic principles and applications of color science. Physical, physiological and psychophysical aspects of color, color perception, color specification, color measurement and color control.

Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 354
Typically offered in Spring only

**PCC 354** Intro to Color Science Laboratory (1 credit hours)
An introduction to hands-on laboratory work for the color measurement and perception of colored materials.

Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 350
Typically offered in Spring only

**PCC 404** Introduction to the Theory and Practice of Fiber Formation (3 credit hours)
Flow behavior of polymeric materials as related to the formation of fibers by melt, dry and wet extrusion. Elementary theories of drawing and heat setting. Application of fiber-forming theories to synthetic and cellullosic fibers. Offered in Fall only.

Prerequisite: TE 200 and (CH 201 or CH 203) and ((PY 208 and PY 209) or PY 212) and (MA 231 or MA 241)
Typically offered in Fall and Spring

**PCC 410** Textile Preparation and Finishing Chemistry (3 credit hours)
Topics in textile wet processing. Chemical mechanisms and unit operations in fabric preparation and finishing.

Prerequisite: PCC 301
Typically offered in Fall only
PCC 412 Textile Chemical Analysis (2 credit hours)
Application of analytical techniques for analysis to fibers, textile chemicals and textile processes; atomic absorption, ultraviolet, visible, near-infrared and infrared spectrophotometry; chromatography; interfacial tension; calorimetric, gravimetric and complexometric analyses. Emphasis on interpretation of data and solving problems of analysis for quantitate and characterization purposes.
Prerequisite: PCC 301 and (CH 331 or CH 433 or TE 303); Corequisite: PCC 414
Typically offered in Spring only

PCC 414 Textile Chemistry Analysis Lab (1 credit hours)
Laboratory course in the application of analytical techniques for analysis of fibers, textile chemicals and textile processes; atomic absorption, ultraviolet, visible, near-infrared and infrared spectrophotometry; chromatography; interfacial tension; calorimetric, gravimetric and complexometric analyses. Emphasis on interpretation of data solving problems of analysis for quantitatove and characterization purposes.
Prerequisite: PCC 301 and (CH 331 or CH 433 or TE 303); Corequisite: PCC 412
Typically offered in Spring only

PCC 420 Textile Dyeing and Printing (3 credit hours)
Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing.
Prerequisite: PCC 301
Typically offered in Spring only

PCC 442 Theory of Physico-Chemical Processes in Textiles II (3 credit hours)
Second semester of a two-semester sequence. Ideal and non-ideal solutions, colligative properties. Electro chemistry, dyeing isotherms, chemical kinetics, surface chemistry, theory of repellency and other special topics.
Prerequisite: TE 303 or CH 331 or CH 433
Typically offered in Fall only

PCC 461 Chemistry of Polymeric Materials (3 credit hours)
Polymers are a critical component of most products used by society today. Knowledge of their formation and properties is key to development of the materials of the future. The formation and properties of the major polymers are the primary focus areas of this course, including Step-growth and Chain-growth polymerization, formation techniques for preparation of synthetic fibers and the fundamental relationships between chemical structure and physical properties of natural and synthetic polymers.
Prerequisite: (CH 220 and TE 200) or CH 223 or CH 227; Corequisite: PCC 464
Typically offered in Fall only

PCC 462 Characterization and Physical Properties of Polymers (3 credit hours)
Properties unique to polymers are related to their high molecular weight, long and flexible chains, or polymers physics. The detailed molecular structures of polymer, pr polymer chemistry, are characterized and utilized to establish structure-property relations. An inside/outside approach connects their microstructures to their local conformational flexibilities, which impact their global responses, such as sizes and shapes and conformational entropies, to both their environments and the stresses placed upon them.
Prerequisite: PCC 461
Typically offered in Fall and Spring

PCC 464 Chemistry of Polymeric Materials Laboratory (1 credit hours)
Polymers are a critical component of most products used by society today. Understanding their formation and properties is key to development of the materials of tomorrow. This laboratory course is focused on preparation of the major synthetic polymers u
Prerequisite: (CH 220 and TE 200) or CH 223 or CH 227; Corequisite: PCC 461
Typically offered in Fall only

PCC 466 Polymer Chemistry Laboratory (3 credit hours)
Synthesis and characterization of polymers; thermodynamics of rubber elasticity and gelation; spectroscopic, thermal and scattering techniques for polymer analysis. The processing of polymers into fibers and films.
Prerequisite: (CH 331 or TE 303 or CH 433) and Senior Standing
Typically offered in Spring only

PCC 471/MT 471 The Chemistry of Synthetic and Natural Bipolymers (3 credit hours)
Introduction to natural and synthetic biopolymers used for biomedical applications. Goals and challenges of biomaterials selection for biomedical engineering. Polymer concepts of polymerization and characterization. Sources/synthesis, chemical and physical properties and degradation mechanisms are described. Polymer classes include: polysaccharides, proteins, polysters, polyurethanes, polyanhydrides and polyethers.
Prerequisite: CH 220 or 221 or 225
Typically offered in Spring only

PCC 474 Forensic Chemistry Laboratory (3 credit hours)
Forensic chemistry is the application of chemistry to the law. It is a key part of crime scene investigations. In this course, students work in teams and discover standard methods of crime scene processing, latent evidence processing and analysis of materials and chemicals germane to forensic trace evidence. Advanced analytical chemistry techniques will be learned and applied to solve a 'crime' with suspects. Students will attempt to solve the crime and will present their analytical evidence in a courtroom setting with cross-examination.
Prerequisite: (CH 220 or CH 223 or CH 227) and TMS 211
Typically offered in Fall only
PCC 490 Undergraduate Research in Polymer and Color Chemistry (1-6 credit hours)
Faculty-supervised individual research for undergraduates in PCC. Students must find an advisor from within the department with whom to work on a regular basis. Intended for PCC majors. Individualized/Independent Study and Research courses require a Co
Prerequisite: PCC 301 and PCC 461/CH 461 and (TE 303 or CH 331 or CH 433).
Typically offered in Fall and Spring

PCC 491 Seminar in Polymer and Color Chemistry (1 credit hours)
Familiarizes student with the principal sources of polymer and color chemistry literature and emphasizes importance of keeping abreast of developments in the field. Emphasizes fundamentals of technical writing. Arranged. Intended for PCC majors
Prerequisite: Senior standing
Typically offered in Fall, Spring, and Summer

PCC 492 Special Topics in Polymer and Color Chemistry (3 credit hours)
Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.
Typically offered in Fall, Spring, and Summer

Poultry Science (PO)

PO 111 Poultry Production (3 credit hours)
Introduction to poultry science and production. Domestication of key poultry species, embryology and hatchery management, anatomy and physiology, poultry rations, housing refinements, and diseases relative to the production of poultry meats and eggs. STAFF
Requisite: Agricultural Institute Only
Typically offered in Fall only

PO 150 Poultry Management (3 credit hours)
Principles and practices of commercial market turkey, broiler, and roaster management. Includes breeding, nutrition, housing, related production parameters, and an examination of contracts and grower-company relationships.
Requisite: Agricultural Institute Only
Typically offered in Spring only

PO 162/VMP 162 Livestock and Poultry Disease Management (3 credit hours)
Basic principles of disease and disease management in livestock and poultry. Disease prevention through sanitation and vaccination. Diseases of horses, pigs, ruminants, poultry, and disease prevention programs for each species
Requisite: Agricultural Institute Only
Typically offered in Spring only

PO 201A/PO 201 Poultry Science and Production (3 credit hours)
Fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing.
Co-requisite: PO 202
GEP Natural Sciences
Typically offered in Fall and Spring

PO 202/PO 202A Poultry Science and Production Laboratory (1 credit hours)
This laboratory course will cover the fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing. This course includes field trips for which transportation will be provided.
Corequisite: PO 201
GEP Natural Sciences
Typically offered in Fall and Spring

PO 202A/PO 202 Poultry Science and Production Laboratory (1 credit hours)
This laboratory course will cover the fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing. This course includes field trips for which transportation will be provided.
Corequisite: PO 201
GEP Natural Sciences
Typically offered in Fall and Spring

PO 212 Poultry and People: Why did the chicken cross the world? (3 credit hours)
Poultry species play a vital role in modern society. This course engages students to develop research skills including information literacy, data collection, and developing arguments based on evidence. Specific course topics are developed by students during each course offering. General course content will include, but is not limited by the following topics: History of Domestication, Religious Symbolism, Social and Culinary Practice, and Modern Poultry Production (post-1950) commercial and hobby. Delivery of this course will be inquiry based and focus on utilizing research techniques to gather information, develop a hypothesis, collect information, interpret the results, and report findings in multiple formats.
GEP Interdisciplinary Perspectives
Typically offered in Fall only

PO 215 Applied Avian and Aquaculture Nutrition (3 credit hours)
Comparison of poultry and aquaculture digestive systems, nutrient requirements, formulation and nutritional management, influence of growth and production curves, consumption patterns, and feeding management in commercial poultry and aquaculture industries. Feed manufacturing and government regulations.
Prerequisite: CH 101 and CH 102
Typically offered in Spring only
PO 290  Poultry Seminar  (1 credit hours)
Exploration of topics related with current and future potential to influence the poultry industry. Guest lectures from industry representatives will include: vertically integrated poultry production, primary breeders, marketing, animal health, veterinary medicine as it relates to poultry, allied equipment manufacturers, and management of poultry companies. Special emphasis on summer internships and career services.
Prerequisite: Sophomore standing
Typically offered in Fall only

PO 322/ANS 322/FS 322 Muscle Foods and Eggs  (3 credit hours)
Processing and preserving fresh poultry, red meats, seafood, and eggs. Ante- and post-mortem events as they affect quality, yield, and compositional characteristics of muscle foods. Principles and procedures involved in the production of processed meat items.
Prerequisite: ZO 160, BIO 181 or BIO 183
Typically offered in Fall only

PO 340 Live Poultry and Poultry Product Evaluation, Grading, and Inspection  (3 credit hours)
To provide students with experience handling live poultry as well as working with an learning about USDA grades and evaluation of poultry meat, meat products, and eggs. Develop an understanding of product specifications.
Prerequisite: PO 201
Typically offered in Fall only

PO 404/PO 504 Avian Anatomy and Physiology  (4 credit hours)
Principles of avian physiology integrating physiological functions and anatomical structures of organs and organ systems. Practical problems associated with poultry production. The importance of maximizing growth and productivity via exploitation of env
Prerequisite: PO 201
Typically offered in Fall only

PO 406/PO 506 Physiological Aspects of Poultry Management  (3 credit hours)
Application of physiological principles to modern poultry management and research. Poultry physiology will be related to practical and research management topics including nutrition, housing, ventilation, disease, heat stress, and lighting programs. Students cannot receive credit for both PO 406 and PO 506.
Prerequisite: PO 201, Corequisite: PO 407
Typically offered in Fall only

PO 407 Physiological Aspects of Poultry Management Laboratory  (1 credit hours)
Practical experience with poultry husbandry, animal environment management, and feeding in a research environment Laboratory exercises include feeding and nutrition programs, weighing birds, lighting management and infrastructure, biosecurity and sanitation, vaccinations, hatching egg management, brooding, ventilation programs and infrastructure, housing design and infrastructure, SOP development, human safety and health training, and animal care training. Laboratory exercises will prepare students for both commercial poultry industry and animal research management careers. Co-requisite with PO 406. Personal transportation to Chicken Educational Unit required.
Prerequisite: PO 201, Corequisite: PO 406
Typically offered in Fall only

PO 410 Production and Management of Game Birds in Confinement  (3 credit hours)
Management principles associated with the successful propagation and rearing of game birds, ornamental birds and waterfowl in confinement. Housing and pen requirements, nutrition, disease control and regulatory issues included.

PO 411 Agrosecurity  (3 credit hours)
This course is designed to increase the awareness of the issues and vulnerabilities of the IS agricultural system, the importance of agriculture in the US economy, and the importance of protecting it from disease and/or attack. This course is organized to integrate and assimilate knowledge across multiple disciplines including agriculture, animal health, human health, infectious diseases, business, economics, and public policy. Students will identify and analyze the interactions between these disciplines in light of increasing population and concentrated agriculture’s increased vulnerability to major disruptions in food production. Students will also analyze where potential links in the food chain are susceptible to disruptions by individuals (or natural disasters), the consequences of these disruptions, and how to minimize the associated risks by developing case studies and strategies for defending against specific threats. Students must have junior standing.

Typically offered in Spring only

PO 412 Emerging Topics in Poultry Science  (3 credit hours)
This course is designed to allow students to merge science taught in previous Poultry Science courses with topics considered of interest or emerging in the poultry industry. Students will utilize science and critical thinking skills to solve real world

Typically offered in Spring only

PO 415/PO 515/NTR 515/ANS 515/ANS 415/ANS 415 Comparative Nutrition  (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.
Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

PO 421 Commercial Egg Production  (3 credit hours)
Principles and current practices of commercial egg production. The Commercial Egg Industry as it is currently evolving and operating in the US. We will examine the development of the industry as it has progressed through integration, consolidation, and expansion. We will also look at the outside influences on the industry such as federal government, European Economic Community (EEC) perspective, animal welfare and consumer desire for naturally raised poultry and poultry products.
Prerequisite: PO 201
Typically offered in Spring only

PO 424 Poultry Meat Production  (3 credit hours)
Principles and current practices of vertically integrated broiler and turkey production; encompassing management, nutrition, poultry health, environmental, and related areas.
Prerequisite: PO 201
Typically offered in Spring only
PO 425/NTR 525/ANS 525/PO 525/NTR 425/ANS 425/ FM 425  Feed Manufacturing Technology  (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.
Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall and Spring

PO 426/FM 426  Feed Manufacturing Technology Laboratory  (1 credit hours)
Laboratory associated with feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture. PO/ANS/FM 425 is a required course for the Poultry Science Technology Concentration (TPS); the Feed Milling Minor (FEM); and the Feed Mill Certificate.
Corequisite: PO 425 or ANS 425 or FM 425 and FEM minor or 11PLTRYBS
Typically offered in Spring only

PO 433/PO 533  Poultry Processing and Products  (3 credit hours)
Poultry processing, further processing, and resulting products as affected by basic muscle composition and function during the conversation of muscle to meat. Microbiology of spoilage and pathogenic organisms, and the regulatory and HACCP programs designed to minimize problems. Overall business functions of poultry processing to understand profit/loss factors, and skills necessary for communication and management. Various sections on sanitary design/construction, pest control, wastewater treatment, and further processed egg products. Credit for both PO 533 and PO 433 is not allowed. Transportation to field trips will be provided. Non-scheduled class time for field trips or out-of-class activities may be required for this class. Transportation to scheduled labs at Lake Wheeler CEU/Poultry Processing Lab will be provided by students.
Prerequisite: PO 201
Typically offered in Fall only

PO 435  Poultry Incubation & Breeding  (4 credit hours)
Principles and current practices of modern poultry incubation and breeding production systems. Students will be able to describe basic elements of breeding management and production practices, to apply those elements to specific scenarios, and to strengthen their ability to interpret and make critical judgements relative to the breeding of poultry, production of hatching eggs, and the subsequent incubation and hatching process.
Prerequisite: PO 201
Typically offered in Spring only

PO 466/BIT 466/BIT 566/PO 566  Animal Cell Culture Techniques  (2 credit hours)
Introduction to animal cell culture techniques. Aseptic technique for vertebrate cell culture, media formulation, primary cell culture, long-term maintenance of cell lines, application of molecular techniques to in vitro situations. Half semester course, first part.
Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only

PO 492  External Learning Experience  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes facilities and resources which are external to the campus. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

PO 493  Special Problems in Poultry Science  (1-6 credit hours)
A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Contact and arrangements with prospective employers must be initiated by student and approved by a faculty adviser, the prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

PO 495  Special Topics in Poultry Science  (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

PO 504/PO 404  Avian Anatomy and Physiology  (4 credit hours)
Principles of avian physiology integrating physiological functions and anatomical structures of organs and organ systems. Practical problems associated with poultry production. The importance of maximizing growth and productivity via exploitation of env
Prerequisite: PO 201
Typically offered in Fall only

PO 506/PO 406  Physiological Aspects of Poultry Management  (3 credit hours)
Application of physiological principles to modern poultry management and research. Poultry physiology will be related to practical and research management topics including nutrition, housing, ventilation, disease, heat stress, and lighting programs. Students cannot receive credit for both PO 406 and PO 506.
Prerequisite: PO 201, Corequisite: PO 407
Typically offered in Fall only

PO 510  Poultry Product Safety: An On-Farm Model  (3 credit hours)
Typically offered in Spring only

PO 515/NTR 515/ANS 415/NTR 415/PO 415  Comparative Nutrition  (3 credit hours)
Principles of nutrition, including the classification of nutrients and the nutrient requirements of and metabolism by different species for health, growth, maintenance and productive functions.
Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223 or CH 227
Typically offered in Fall, Spring, and Summer

PO 524/ZO 524/PHY 524  Comparative Endocrinology  (3 credit hours)
Basic concepts of endocrinology, including functions of major endocrine glands involved in processes of growth, metabolism and reproduction.
Prerequisite: BIO 421 or PO 405
Typically offered in Spring only
PO 525/NTR 425/ANS 425/FM 425/PO 425/NTR 525/FM 525/ANS 525 Feed Manufacturing Technology (3 credit hours)
Feed mill management, feed ingredient purchasing, inventory, storage, and quality evaluation, computerized feed formulation, feeding programs for poultry and swine, feed mill design, equipment, maintenance, operation, safety, state and federal regulations pertaining to feed manufacture.

Prerequisite: ANS(NTR,PO) 415 or ANS 230 or ANS 225
Typically offered in Fall, Spring, and Summer

PO 533/PO 433 Poultry Processing and Products (3 credit hours)
Poultry processing, further processing, and resulting products as affected by basic muscle composition and function during the conversation of muscle to meat. Microbiology of spoilage and pathogenic organisms, and the regulatory and HACCP programs designed to minimize problems. Overall business functions of poultry processing to understand profit/loss factors, and skills necessary for communication and management. Various sections on sanitary design/construction, pest control, wastewater treatment, and further processed egg products. Credit for both PO 533 and PO 433 is not allowed. Transportation to field trips will be provided. Non-scheduled class time for field trips or out-of-class activities may be required for this class. Transportation to scheduled labs at Lake Wheeler CEU/Poultry Processing Lab will be provided by students.

Prerequisite: PO 201
Typically offered in Fall only

PO 566/PO 466/BIT 466/BIT 566 Animal Cell Culture Techniques (2 credit hours)
Introduction to animal cell culture techniques. Aseptic technique for vertebrate cell culture, media formulation, primary cell culture, long-term maintenance of cell lines, application of molecular techniques to in vitro situations. Half semester course, first part.

Prerequisite: BIT 410 or BIT 510 or BCH 454
Typically offered in Spring only

PO 580/FM 580 Feed and Ingredient Quality Assurance (3 credit hours)
The course will teach students the principles of feed and ingredient quality assurance and how to develop a comprehensive quality assurance program. The course will include the development of an approved supplier list, ingredient specifications, feed manufacturing quality assurance procedures, and risk based feed safety programs.

Prerequisite: NTR(FM) 525
Typically offered in Fall only

PO 590 Special Problems in Poultry Science (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

PO 601 Seminar (1 credit hours)
Preparation for research, research perspectives, rising concerns in poultry production, orientation for graduate studies in poultry science. Required of all graduate students in the Department of Poultry Science.

Typically offered in Spring only

PO 620 Special Problems (1-6 credit hours)
Specific problems of study assigned in various phases of poultry science.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

PO 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PO 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring only

PO 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring and Summer

PO 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Spring and Summer

PO 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

PO 695 Master's Thesis Research (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PO 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

PO 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
**PO 757/IMM 757 Comparative Immunology** (3 credit hours)
Compare and contrast the immune system structure and function of animal species of agricultural and veterinary significance with that of humans and traditional biomedical model organisms. Discuss key evolutionary differences, how different species use different mechanisms to achieve the same outcomes, and the clinical implications for these differences.

Prerequisite: MB 751 or MB 441 or BIO 414
Typically offered in Spring only

**PO 775/NTR 775 Mineral Metabolism** (3 credit hours)
Requirements, function, distribution, absorption, excretion and toxicity of minerals in humans and domestic animals. Interactions between minerals and other factors affecting mineral metabolism or availability. Emphasis on mechanisms associated with mineral functions and the metabolic bases for the development of signs of deficiency.

Prerequisite: ANS(NTR,PO) 415, BCH 451 and ZO 421
Typically offered in Fall only

**PO 801 Graduate Seminar In Poultry Science** (1 credit hour)
Preparation for research, research perspectives, rising concerns in poultry production, orientation for graduate studies in poultry science. Required of all graduate students in the Department of Poultry Science.
Typically offered in Spring only

**PO 820 Special Problems In Poultry Science** (1-6 credit hours)
Specific problems of study assigned in various phases of poultry science.

Prerequisite: Graduate standing
Typically offered in Fall and Summer

**PO 850 Doctoral Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

**PO 890 Doctoral Preliminary Examination** (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Spring only

**PO 893 Doctoral Supervised Research** (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

**PO 895 Doctoral Dissertation Research** (1-9 credit hours)
Dissertation Research

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

**PO 896 Summer Dissertation Research** (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

**PO 899 Doctoral Dissertation Preparation** (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

**Professional Writing (WRT)**

**WRT 111 Expository Writing** (3 credit hours)
Emphasis on writing process including audience analysis, topic selection, thesis support and development, editing and revision. Upon completion, students should be able to prepare unified, coherent, well-developed essays using standard written English. AGI majors only. C-Wall course; prerequisite for WRT 114, professional Writing, Research and Reporting.

Requisite: Agricultural Institute Only
Typically offered in Fall and Spring

**WRT 114 Professional Writing, Research and Reporting** (3 credit hours)
Emphasis placed on research, listening, critical thinking, analysis, interpretation and design used in oral and written presentations. Upon completion, students should be able to work individually and collaboratively to produce well-designed and professionally written and oral presentations. Restricted to AGI majors; C-Wall course.

Prerequisite: WRT 111
Typically offered in Fall and Spring

**Psychology (PSY)**

**PSY 200 Introduction to Psychology** (3 credit hours)
Survey of basic principles for the understanding of behavior and experience including development, learning, cognition, biological foundations, perception, motivation, personality, behavior abnormalities, measurement of individual differences, and social processes. The value of scientific observation and experimentation to the development of psychological understanding is emphasized.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

**PSY 208 Psychobiology of Success** (3 credit hours)
Exploration of what happens within your body when you experience stress, techniques to alter your body's response, ways to manage your thoughts and emotions to enhance your performance. Development of an understanding of why your physiology and your background do not have to determine your future. Across all topics, students will critically examine biological, psychological, and medical evidence regarding stress responses, stress management and optimizing functioning.

GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Summer only
PSY 240 Introduction to Behavioral Research I (3 credit hours)
Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PSY or HRD Majors, PSY 200, Corequisite: PSY (ST) 241
Typically offered in Fall and Spring

PSY 241 Introduction to Behavioral Research I Lab (1 credit hour)
Students design, analyze and report a variety of simple experiments. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PSY or HRD Majors, PSY 200, Corequisite: PSY (ST) 240
Typically offered in Fall and Spring

PSY 242 Introduction to Behavioral Research II (3 credit hours)
Continuation of PSY (ST) 240. Ethics of Research in Psychology. Techniques for the development of research proposals. Statistical techniques for data analysis including non-parametrics, one-way and two-way ANOVA and introduction to correlation and regression. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PSY or HRD Majors, PSY (ST) 240, Corequisite: PSY (ST) 243
Typically offered in Fall and Spring

PSY 243 Introduction to Behavioral Research II Lab (2 credit hours)
Design and analysis of a major research project. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PSY or HRD Majors, PSY (ST) 240, Corequisite: PSY (ST) 242
Typically offered in Fall and Spring

PSY 242 Introduction to Psychological Research (3 credit hours)
This course is an introduction to the principles of scientific research. Students will develop and test research hypotheses in accordance with methods approved by the American Psychological Association. Methods of analyzing data and the interpretation of research findings will be stressed. Students will work in teams to collect, analyze, report, and provide a professional presentation of a group research project. Psychology majors and minors must take the course under the graded option.
Prerequisite: PSY 200
Typically offered in Fall and Spring

PSY 243 Introduction to Psychological Research (3 credit hours)
Continuation of PSY (ST) 240. Ethics of Research in Psychology. Techniques for the development of research proposals. Statistical techniques for data analysis including non-parametrics, one-way and two-way ANOVA and introduction to correlation and regression. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: PSY or HRD Majors, PSY 200, Corequisite: PSY (ST) 241
Typically offered in Fall and Spring

PSY 244 Introduction to Psychological Research (3 credit hours)
Psychology majors and minors must take the course under the graded option.

PSY 307 Industrial and Organizational Psychology (3 credit hours)
Surveys the application of psychological theories and methods to problems involving people in working settings. Topics include: organizational and management theory; work motivation and job satisfaction; job and organizational analysis; performance evaluation; personnel recruitment, selection, and placement; and personnel training and development.
Prerequisite: PSY 200 or PSY 201
Typically offered in Fall, Spring, and Summer

PSY 311 Social Psychology (3 credit hours)
Theory and research on how individuals respond and are responded to in social situations. Topics include attitude formation and change, affiliation, attraction, self and interpersonal perception, interpersonal relationships, aggression, helping behavior, intergroup behavior, and group dynamics.
Prerequisite: PSY 200 or PSY 201
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PSY 312 Applied Psychology (3 credit hours)
Covers diverse areas of psychological practice, related methods and ethical issues. Includes illustrative cases of psychological practice in health, education, work settings, law, sports, consumer markets, and cross-cultural settings. Explores professional roles and contributions in the contexts of social, organizational and technological change.
Prerequisite: PSY 200 or PSY 201
Typically offered in Fall and Spring

PSY 313 Positive Psychology (3 credit hours)
Positive psychology is the scientific study of positive experience, positive individual traits, and the institutions and practices that facilitate their development. This course reviews the history of positive psychology and the contributions this new field has made to several traditional research areas in psychology. Among other issues, the course will address the questions such as: What is happiness and how should we measure it? What determines subjective well-being? Can (and should) we deliberately increase happiness? (Restricted to psychology majors)
Prerequisite: PSY 200
Typically offered in Fall only

PSY 340 Ergonomics (3 credit hours)
Concepts from ergonomics, environmental psychology, and cognitive psychology related through design examples to problems of everyday living. Criteria of efficiency, comfort and safety evaluated relative to the design of activity, products, and the environment. Topics include: visual and auditory perception, information processing, physical activity, noise and lighting, work space design, workload, and product design.
Prerequisite: PSY 200 or PSY 201
Typically offered in Fall and Spring
PSY 345/AFS 345  Psychology and the African American Experience  (3 credit hours)
Historical and cultural examination of the psychological experiences of African American experience from pre-American times to the present. Focus on mental health, personality, identity development, racism, oppression, psychological empowerment and an African-centered world view. Discussion of contemporary issues within the African American community.
Prerequisite: PSY 200 or PSY 201
GEP U.S. Diversity
Typically offered in Fall and Spring

PSY 360  Community Psychology Principles and Practice  (3 credit hours)
This course provides an introduction to the field of community psychology. The aim of this course is to help empower students to contribute to effective social change in their communities. Community psychology focuses upon person-environment interactions and the ways individuals navigate between different social contexts (e.g., schools, neighborhood, community, and society). Community psychologists employ a variety of methodological approaches to understand the social issues facing communities today such as juvenile violence, homelessness, HIV-AIDS, and domestic violence.
Prerequisite: PSY 200
Typically offered in Fall and Spring

PSY 370  Personality  (3 credit hours)
Major personality theories. Definition of personality associated with each theory as well as the assumptions and principles used in accounting for human behavior. Theories evaluated considering recent research.
Prerequisite: PSY 200
Typically offered in Fall and Spring

PSY 376  Developmental Psychology  (3 credit hours)
Behavioral development during the life span, including study of current theories and project work with persons at various stages of the life cycle.
Prerequisite: PSY 200 or EDP 304
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

PSY 400  Perception  (3 credit hours)
Anatomy and physiology of the major sensory systems, their relationship to central structures of the brain, important and/or common pathological conditions. Basic issues and techniques of psychophysics. Perceptual phenomena and theory, with an emphasis on topics in two-and three-dimensional spatial perception, including the perceptions of size, depth and motion. Consideration of perceptual phenomena in practical settings.
Prerequisite: PSY 200 or PSY 201, Junior/Senior
Typically offered in Fall and Spring

PSY 406/WGS 406  Psychology of Gender  (3 credit hours)
Current theory and research on perceived and actual biological, social, cognitive, personality and emotional similarities and differences of men and women throughout the lifespan. The construction and consequences of gender in our society and others. Credit will not be given for both PSY/WGS 406 and PSY/WGS 506.
Prerequisite: PSY 200 or WGS 200
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

PSY 410  Learning and Motivation  (3 credit hours)
Introduction to the primary laboratory research areas in learning and motivation: classical conditioning, operant conditioning, verbal learning, drive theory, and the role of motives. Emphasis upon research on conditioning and its motivational processes as the foundations for techniques in behavior modification. Examination of both the uses and limitations of current information on learning and motivation.
Prerequisite: PSY 200, Junior standing
Typically offered in Fall and Spring

PSY 411  The Psychology of Interdependence and Race  (3 credit hours)
The Psychology of Interdependence and Race is designed to explore how interpersonal relationships are structured and how two-person interactions within those structures are influenced by race. Drawing on the major social psychological theory of interperson
Prerequisite: PSY 311
Typically offered in Fall and Spring

PSY 416  Psychology of Emotion  (3 credit hours)
Introduction to the classic and contemporary theories of emotion, with strong emphasis on how data provide evidence to test theory. Biological, cognitive, social, and cultural foundations are explored.
Prerequisite: PSY 200
Typically offered in Fall and Spring

PSY 420  Cognitive Processes  (3 credit hours)
Introduction to research and theory in cognition, including such topics as memory, acquisition and use of language, reading, problem-solving, reasoning, and concepts.
Prerequisite: PSY 200, Junior standing
Typically offered in Fall, Spring, and Summer

PSY 425/PHI 425  Introduction to Cognitive Science  (3 credit hours)
Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language. Students cannot receive credit for both PHI/PSY 425 and PHI/PSY 525.
Prerequisite: One upper-level PHI, PSY, CSC or Linguistics course. Credit is not allowed for PHI 425 and PHI/PSY 525.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

PSY 430  Biological Psychology  (3 credit hours)
Biological mechanisms of behavior, including elementary neuroanatomy and neurophysiology, sensory and motor processes, and their application to motivation, learning, and psychological processes.
Prerequisite: PSY 200 and (BIO 105/106 or BIO 181)
Typically offered in Fall and Spring
PSY 431 Health Psychology (3 credit hours)
Introduction to health psychology. This course provides an overview of the field of health psychology, which is concerned with how behavior and psychological states influence physical health (i.e., how people stay healthy, why people become ill, and how people respond to illness). Application of psychological theory and research methods to such topics as: pain, stress and coping, helplessness and control, reactivity to stress, the effectiveness of behavioral interventions in health, illness prevention, health maintenance, recovery from injury and chronic pain, adjustment to chronic illness, treatment compliance.
Prerequisite: PSY 200 and (PSY 230 or PSY 240/242 OR equivalent research methods course).
Typically offered in Fall and Spring

PSY 436 Introduction to Psychological Measurement (3 credit hours)
The basic principles of psychological measurement, including elementary statistical concepts, reliability, and validity. Emphasizes measurement in the science of psychology. Application of measurement principles to a wide variety of measurement problems.
Prerequisite: PSY 240-241
Typically offered in Spring only

PSY 465 Advanced Methods in Psychology (3 credit hours)
Provides students with practical experience in psychological research. Emphasis will be on hands-on training in analyzing data to develop practical problem-solving skills important in psychology research as well as in other related careers working with
Prerequisite: PSY 230 and ST 311
Typically offered in Fall, Spring, and Summer

PSY 470 Abnormal Psychology (3 credit hours)
Prerequisite: PSY 200 or 304 or EDP 304
Typically offered in Fall, Spring, and Summer

PSY 475 Child Psychology (3 credit hours)
Theories, methods, and phenomena of child psychology and application of this information to the enhancement of child development. Multiple aspects of development, including physical, cognitive/intellectual, and social/emotional development, from conception to adolescence. Emphasis on recent research findings in developmental psychology.
Prerequisite: PSY 200 or 304 or EDP 304; PSY 376
Typically offered in Fall and Spring

PSY 476/EDP 476 Psychology of Adolescent Development (3 credit hours)
Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.
Prerequisite: PSY 200 or EDP 304
Typically offered in Fall, Spring, and Summer

PSY 491/PSY 590 Special Topics in Psychology (3 credit hours)
Exploration in depth of advanced areas and topics of current interest in psychology.
Prerequisite: PSY 200
Typically offered in Fall and Spring

PSY 495 Community-Based Applied Psychology (4 credit hours)
Service learning course that covers one or more areas of psychological practice, including relevant research methods, community engagement principles and practices, and ethical issues. Includes learning about psychological practice in at least one of the following settings: health, education, work settings, law, sports, community-based setting, consumer markets, and/or cross-cultural settings. Explores professional roles and contributions in the contexts of social, education, organizational and/or technological change. An internship liability insurance fee is required.
Prerequisite: PSY 200 and PSY 230
Typically offered in Fall and Spring

PSY 498 Psychology Honors Seminar (3 credit hours)
Seminar and independent study under faculty direction. Provides the undergraduate psychology honors students with an opportunity to practice skills in designing, conducting, and evaluating research. The student, working closely with a faculty advisor, designs a research approach to a particular body of literature, accumulates appropriate data, and analyzes and evaluates the data. Must take two semesters
Prerequisite: HRD and PSY honors students
Typically offered in Fall and Spring

PSY 499 Individual Study in Psychology (1-6 credit hours)
Individual research project (literature review, experiment, survey, field study) open to any undergraduate, under the direction of a Psychology Department faculty member.
Corequisite: PSY 495 for HRD majors during their work semester
Typically offered in Fall, Spring, and Summer

PSY 500 Visual Perception (3 credit hours)
Detailed consideration of anatomy and physiology of visual system (both peripheral and central components). Modern quantitative approaches to psychophysical problems of detection, discrimination, scaling. Examination of chief determinants of visual perception, including both stimulus variables and such organismic variables as learning, motivation and attention. Discussion of perceptual theory and processes emphasizes several topics in two- and three-dimensional spatial perception.
Prerequisite: Graduate standing
Typically offered in Fall only

PSY 502 Physiological Psychology (3 credit hours)
Physiological foundations of behavior, basic vertebrate neuroanatomy and neurophysiology.
Prerequisite: Twelve hours of PSY including PSY 200, 400,410
Typically offered in Spring only

PSY 504 Evolutionary Psychology (3 credit hours)
Emphasis upon use of evolutionary theory to understand the interaction of genetic and environmental influences on human behavior and thought. Topics include human mating, kinship, parenting, cooperation, aggression, cognition, and morality.
Typically offered in Fall and Spring
PSY 508  Cognitive Processes  (3 credit hours)
Emphasis upon the results from research on a number of complex processes (e.g., remembering, concept learning, problem solving, acquisition and use of language) and the theories that have been proposed to explain these results.

Prerequisite: Graduate standing or PBS status  
**Typically offered in Fall only**

PSY 510  Advanced Problems In Psychology  (1-3 credit hours)
Offers opportunities to explore various areas of psychology. Sections: Section D, developmental psychology; Section X, experimental psychology; Section I, industrial-organizational and vocational psychology; Section S, social psychology.

Prerequisite: Graduate standing  
**Typically offered in Fall and Spring**

PSY 511  Advanced Social Psychology  (3 credit hours)
A survey of theory and research in social psychology through reading and discussion of primary source materials. In addition, the course deals with issues of methodology, ethical questions in social psychological research and application of research findings to the world at large.

Prerequisite: Graduate standing or PBS status  
**Typically offered in Fall only**

PSY 525/PHI 525  Introduction To Cognitive Science  (3 credit hours)
Philosophical foundations and empirical fundamentals of cognitive science, an interdisciplinary approach to human cognition. Topics include: the computational model of mind, mental representation, cognitive architecture, the acquisition and use of language. Students cannot receive credit for both PHI/PSY 425 and PHI/PSY 525.

Prerequisite: Graduate standing. Credit is not allowed for PHI 525 and PHI/PSY 425.  
**Typically offered in Spring only**

PSY 535  Tests and Measurements  (3 credit hours)
A study of the principles of psychological testing including norms and units of measurement, elementary statistical concepts, reliability and validity. In addition, some attention devoted to the major types of available tests such as general intellectual development, tests of separate abilities, achievement tests, measures of personality and interest inventories.

Prerequisite: Six hours of PSY program  
**Typically offered in Fall and Spring**

PSY 540/ISE 540  Human Factors In Systems Design  (3 credit hours)
Introduction to problems of the systems development cycle, including human-machine function allocation, military specifications, display-control compatibility, the personnel sub-system concept and maintainability design. Detailed treatment given to people as information processing mechanisms.

Prerequisite: IE 452 or PSY 340, Corequisite: ST 507 or 515  
**Typically offered in Spring only**

PSY 541  Overview of Human Factors Psychology  (3 credit hours)
An overview of Human Factors Psychology covering a large number of tools, topics, and exercises important for the field of human factors. Includes topics fundamental to human factors research, such as attention, decision making, and motor control, as well as specific domains within human factors, such as information technology, healthcare, aging, and transportation, with particular emphasis on the methods used for study of these areas. A group project will give students experience with the usability evaluation process.

**Typically offered in Fall only**

PSY 558  Psychology and the African Experience  (3 credit hours)
An ethnographic approach to the psychology of peoples of African descent through examination of the influence of historical and cultural phenomena. Specific attention to understanding the Africentric world view and issues of mental health, personality and identity development, racism, oppression and empowerment.

Prerequisite: Six hours PSY program  
**Typically offered in Spring only**

PSY 582/EDP 582  Adolescent Development  (3 credit hours)
Current theories and research on development during adolescence. Topics include: physical growth, cognitive changes, relationships with peers, parents and teachers, quest for identity and independence, morality and sexuality.

Prerequisite: 6 hours in PSY  
**Typically offered in Spring and Summer**

PSY 584  Advanced Developmental Psychology  (3 credit hours)
A survey of the role of growth and development in human behavior, particularly during the child and adolescent periods. This course pays particular attention to basic principles and theories in the area of developmental psychology.

Prerequisite: Nine hrs. of PSY, including PSY 376, PSY 475 or PSY 476  
**Typically offered in Fall only**

PSY 590/PSY 491  Special Topics in Psychology  (3 credit hours)
Exploration in depth of advanced areas and topics of current interest in psychology.

Prerequisite: PSY 200  
**Typically offered in Fall and Spring**

PSY 591  History and Systems Of Psychology  (1-3 credit hours)
Aim of this course is to acquaint students with the history of psychology and psychological systems and to give students some practice in taking different approaches to a particular problem area.

Prerequisite: PSY 200, 400, 410, 420, Consent of Instructor or Graduate standing  
**Typically offered in Spring only**

PSY 641  Psychological Clinic Practicum  (1-12 credit hours)
Clinical participation in interviewing, counseling, psycho-therapy and administration of psychological tests. Practicum to be concerned with adults and children.

Prerequisite: Twelve hrs. in grad. PSY, which must include clinical skill courses PSY 722 and PSY 723.  
**Typically offered in Fall and Spring**
PSY 651  Internship In Psychology  (1-6 credit hours)
Supervised work experience in an appropriate setting with professional supervision in the field from a doctoral level psychologist with credentials and/or experience in the appropriate specialty in psychology. Experience consists of full time for one semester.

Prerequisite: Approval of advisory committee
Typically offered in Fall and Spring

PSY 680  Directed Study Psychology  (1-6 credit hours)
Research project for graduate students supervised by members of the graduate faculty. Research to be elected on basis of interest of student and not to be part of thesis or dissertation research. Credits Arranged.

Typically offered in Fall, Spring, and Summer

PSY 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PSY 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PSY 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PSY 696  Summer Thesis Research  (1 credit hour)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

PSY 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits arranged.

Prerequisite: Master's student
Typically offered in Fall and Spring

PSY 704  Learning and Motivation  (3 credit hours)
A systematic analysis of some of the major classes of variables determining behavioral change. Learning variables analyzed within their primary experimental setting, and emphasis upon the diversity of the functions governing behavior change rather than upon the development of some comprehensive theory. Examination of both learning and motivational variables as they contribute to changes in performance within the experimental setting.

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

PSY 705  Affect and Cognition  (3 credit hours)
Critical examination of research and theory dealing with the intersection of affect and cognition. Topics will include the impact of emotion, mood and other aspects of affective experience on memory, decision making, judgment, and reasoning. Developmental and individual difference will be explored, as will the neuropsychological underpinnings of observed relationships.

Prerequisite: Six Hours of Graduate Level PSY
Typically offered in Spring only

PSY 706/WGS 706  Psychology of Gender  (3 credit hours)
Current theory and research on perceived and actual biological, social, cognitive, personality, and emotional similarities and differences of men and women throughout lifespan. Construction and consequences of gender in our society and others.

Typically offered in Fall and Spring

PSY 710  Special Topics In Psychology  (1-3 credit hours)
Course provides opportunity for exploration in depth of advanced topical areas which, because of their degree of specialization, are not generally involved in other courses; for example, multivariate methodology in psychology, computer simulation, mathematical model building. Some new 700-level courses will first be offered under this title during developmental phase and as such may involve lectures and/or laboratories.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

PSY 714  Social Psychology: Small Groups Research  (3 credit hours)
Surveys the literature and research pertaining to social psychological processes in and between groups. Course content includes basic principles of group formation, role differentiation, communication, influence, norms, social exchange, equity, cooperation/conflict, decision making and pro-social behavior. Environmental factors affecting group behavior also considered. In conjunction with each substantive topic, suitable methodologies for research considered.

Prerequisite: PSY 511
Typically offered in Spring only

PSY 721  Area Seminar In School Psychology  (1-6 credit hours)
The following topics dealt with: (1) the development of school psychology as a professional area, (2) methods of inquiry, (3) scientific and theoretical bases, (4) contemporary issues, (5) ethical questions, (6) relationship to other areas within psychology.

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

PSY 722  Individual Intelligence Measurement  (4 credit hours)
Theoretical approaches to and individual assessment of intellectual functioning, child development, adaptive behavior, and visual motor functioning. Administration, scoring, and interpretation of current standardized instruments and nonstandardized assessment. Written communication of findings.

Prerequisite: PSY 535 and consent of school psychology coordinator
Typically offered in Fall only
PSY 723  Personality Measurement  (3 credit hours)
Theory and practicum in individual personality testing of children and adults with emphasis on projective techniques, other personality measures, report writing and case studies.
Prerequisite: PSY 722
Typically offered in Spring only

PSY 724  Psychological Intervention I  (3 credit hours)
Designed to examine theories, research, techniques, ethics and professional responsibilities related to approaches to psychological intervention. Types of psychological intervention include behavior modification, milieu approaches, crisis intervention techniques and group process methods, in addition to more intensive relationship approaches. A close integration of experiences, content and supervision emphasized in a variety of professional settings with a wide range of personal problems and age groups.
Prerequisite: PSY 723
Typically offered in Fall only

PSY 725  Psychological Intervention II  (3 credit hours)
The primary purpose of this course is to provide students opportunities to acquire information, conceptual frameworks, interpersonal skills and a sense of ethical responsibility, all basic to their further development as practicing psychologists. A major effort in the course made to help the student increase his/her interpersonal skills as a means of promoting the psychological growth and effectiveness of others.
Prerequisite: PSY 724
Typically offered in Spring only

PSY 727  Psychological Consultation  (3 credit hours)
Introduction to psychological consultation with emphasis on school setting. Presentation of various consultation models and theoretical bases. Development of skills in practice of consultation.
Prerequisite: Nine hrs. grad. PSY or ED
Typically offered in Spring only

PSY 740/ISE 740  Engineering Psychology of Human-computer Interaction  (3 credit hours)
Exploration of usability of computer technology. Theory and practice of user-centered design for HCI applications. Course focuses on current usability paradigms and principles, psychology of users, iterative and participatory design processes, system requirements specification, prototyping, user support systems, usability evaluation and engineering, interface design guidelines and standards. Application domains include, universal design, virtual reality, and scientific data visualization.
Prerequisite: IE (PSY) 540 or CSC 554
Typically offered in Spring only

PSY 745/ISE 745  Human Performance Modeling  (3 credit hours)
Prerequisite: ST 507 or 515 or equivalent; IE (PSY) 540, CSC 554 or IE (PSY) 744

PSY 750  The Psychology of Inequality  (3 credit hours)
The following topics dealt with: (1) inequality and social justice as key areas of inquiry for Applied Social and Community Psychology, (2) methods of inquiry for social change, (3) contemporary issues, (4) ethical questions, (5) relationship to other areas within psychology.
Typically offered in Fall only

PSY 751  Intervention Planning & Evaluation  (3 credit hours)
Review of the literature, methods and research issues in the field of program intervention, planning and evaluation. Goal-setting, needs assessment, information systems, subjective probability, human resource accounting, decision processes, incentive programs, human productivity and related subjects. Focus on planning and evaluation methods for communities and organizations.
Prerequisite: Graduate standing or PBS status, Corequisite: ST 507
Typically offered in Spring only

PSY 752  Action Research In Psychology  (3 credit hours)
Action research models in psychology and their relationships to research methods. Research in field settings and implications for ethics and social responsibility, internal and external validity, experimenter and volunteer effects and problems of measurement.
Prerequisite: ST 511, Corequisite: ST 508
Typically offered in Spring only

PSY 753  Principles and Practice Of Ecological/Community Psychology  (3 credit hours)
Introduction to community psychology and its attempt to redefine social problems according to an ecological frame-of-reference with emphasis on humanitarian values, cultural diversity, the promotion of a psychological sense of community among individuals and groups, and the need for psychologists to engage in systematic community research and action.
Typically offered in Fall only

PSY 757  Innovation and Technology  (3 credit hours)
Social science theory and research on innovation process and consequences of deploying and implementing technologies. Interactions between social and technical systems: R&D management; social/administrative technology; adoption and dissemination; public policy; computer-mediated communications; implementation; and intended and unintended outcomes for individuals, organizations and society.
Prerequisite: 3 hrs. grad. ST or research methods
Typically offered in Fall only
PSY 758 Special Topics in Applied Social and Community Psychology (3 credit hours)
Exploration of advanced specialized topics in Applied Social and Community Psychology to enhance in-depth graduate training in specific applied theories and methods. Seminar content will rotate, with attention to the development and evaluation of interventions to address important problems in individuals' well-being in society, particularly those faced by underrepresented groups. Graduate standing is required.

Prerequisite: 6 credit hours in GRAD PSY

Typically offered in Fall and Spring

PSY 760 Psychometrics (3 credit hours)
Theoretical and statistical approaches to understanding psychological measurement. Topics include detailed coverage of reliability, validity, and factor analysis.

Prerequisite: Six hours of graduate statistics, including linear regression

Typically offered in Fall only

PSY 761 Advanced Psychometrics: Item Response Theory (3 credit hours)
Item Response Theory approaches to advanced test construction and scoring; the investigation of test bias via item response theory methods.

Prerequisite: PSY 760

PSY 762 Quasi-Experimental Evaluation Design (3 credit hours)
An introduction to quasi-experimental design as applied to HRD program evaluation: (1) Methods of assessing informational needs, (2) recognition of internal and external validity threats, (3) design of quasi-experiments to minimize threats and (4) use of results by program decision makers.

Prerequisite: ST 507

Typically offered in Spring only

PSY 764 Industrial Psychology (3 credit hours)
Issues in psychology literature surrounding the person, organization, and job. Work analysis and design, recruitment, selection, training, and performance appraisal of employees. Emphasis on scientist-practitioner model throughout the course. Graduate standing or PBS status.

Typically offered in Fall only

PSY 766 Personnel Selection Research (3 credit hours)
A survey of theoretical, methodological and research literature on personnel selection. Topics include organization, task and person analyses, validation strategies, utility and equal opportunity issues and selection strategies. Emphasis on research.

Prerequisite: Six hrs. of grad. ST, PSY 760

Typically offered in Fall only

PSY 767 Training Research (3 credit hours)
A survey of conceptual and research literature on training. Topics include needs assessments, learning, transfer, maintenance, criterial and evaluation issues, as well as a review of research on specific training techniques. Emphasis on research methods and findings, not skill development in specific training techniques.

Prerequisite: Six hrs. of grad. PSY and six hrs. of grad. ST

Typically offered in Fall only

PSY 768 Organizational Psychology I (3 credit hours)
A survey of the application of behavioral science, particularly psychology and social psychology literature and research to organizational and management problems. Topics include work motivation and attitudes, job design, employee organizational commitment and work engagement.

P: ST 511 and 512

Typically offered in Spring only

PSY 769 Work Motivation (3 credit hours)
Theory and research in work motivation. An in-depth examination of motivation theory as it pertains to the study of individual behavior in work settings.

Prerequisite: PSY 768

Typically offered in Spring only

PSY 770 Organization Development and Change (3 credit hours)
A survey of theory and research in organization development. Attention directed to: (1) methods of diagnosing need for organizational change, (2) techniques currently used to implement and evaluate organizational change, (3) professional ethics and other issues dealing with client-consultant relationship. Emphasis on developmental approaches originating from psychology and allied fields.

Prerequisite: PSY 768

Typically offered in Spring only

PSY 777 Organizational Psychology II (3 credit hours)
A survey of the applications of behavioral science, particularly psychology and social psychology literature and research to organizational and management problems. Topics will pertain to the role of leadership in individual, team, and organizational performance.

Typically offered in Fall only

PSY 775 Methodological Issues In Developmental Psychology (3 credit hours)
Methodological issues, research designs and statistical techniques in developmental psychology. Role and meaning of age as a research variable. Interpretation of research reports. Ethical issues.

Prerequisite: PSY 584 and 3 hrs. of grad. statistics

Typically offered in Spring only

PSY 786 Cognitive Development (3 credit hours)
Examination of research and theory in cognitive development. Primary focus on childhood, but implications for the entire life span addressed. Application of cognitive developmental principles in creating interventions and educational programs also discussed.

Prerequisite: PSY 584

Typically offered in Spring only

PSY 787 Social Development (3 credit hours)
Survey of current theory and research on the development of social behavior systems, including attachment, aggression, gender-role behavior, prosocial behavior. Attention to the role of social class, race and culture, and to contemporary phenomena such as day care, single-parent and dual-career families, child abuse.

R: Psychology Graduate Status or Permission of Instructor

Typically offered in Spring only
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
<th>Prerequisite(s)</th>
<th>Typically Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSY 788</td>
<td>Adulthood and Aging: Cognitive and Intellectual Change</td>
<td>3</td>
<td>Critical examination of theory and research associated with the study of cognitive and intellectual change in adulthood and aging. Memory and learning, information processing, language, intelligence, social cognition and expertise.</td>
<td>PSY 584 or PSY 508</td>
<td>Fall only</td>
</tr>
<tr>
<td>PSY 789</td>
<td>Socio-Emotional Processes In Adulthood and Aging</td>
<td>3</td>
<td>Current theory and research on social, emotional and personality development during adulthood and aging. Generally including self-concept and identity, interpersonal relations (friendship, marriage, parenting, work), control, coping and life satisfaction. Attention to gender, culture and contemporary issues in adult development and aging.</td>
<td>PSY 584</td>
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<tr>
<td>PSY 792</td>
<td>Psychology Of Families and Parenting</td>
<td>3</td>
<td>Special topics in the area, including family influences on cognitive development, effects of parental divorce on children, single-parenting, step-families, child abuse and ethnic/cultural differences in family functioning. A critical examination of traditional and contemporary parenting approaches and an introduction to family therapy.</td>
<td>Nine hrs. grad. PSY or ED</td>
<td>Fall only</td>
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<tr>
<td>PSY 795</td>
<td>Stress and Coping</td>
<td>3</td>
<td>Discussion of current research findings and theories in area of psycho-social stress. Topics include: biology of the stress response, methodology, physical, behavioral and psychological reactions to stress, and relationships between personality and social support to the development of stress-related disorders.</td>
<td>Two grad. PSY courses</td>
<td>Fall only</td>
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<tr>
<td>PSY 809</td>
<td>Psychology Colloquium</td>
<td>1</td>
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<td>PSY 820</td>
<td>Special Topics In Psychology</td>
<td>1-6</td>
<td>Course provides opportunity for exploration in depth of advanced areas and topics of current interest.</td>
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<tr>
<td>PSY 841</td>
<td>School Psychology Practicum</td>
<td>1-6</td>
<td>Clinical participation in interviewing, counseling, psycho-therapy and administration of psychological tests. Practicum to be concerned with adults and children.</td>
<td>Twelve hrs. in grad. PSY, which must include clinical skill courses PSY 722 and PSY 723</td>
<td>Fall and Spring</td>
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<tr>
<td>PSY 846</td>
<td>Practicum in Industrial/Organizational Psychology</td>
<td>3</td>
<td>Procedures and techniques used by Industrial and Organizational Psychologists in the field. Students write work proposals, conduct interventions in field, and codument results. Review one or more I/O procedure step-by-step.</td>
<td>PSY 764</td>
<td>Fall and Spring</td>
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<tr>
<td>PSY 851</td>
<td>Internship In Psychology</td>
<td>1-6</td>
<td>Supervised work experience in an appropriate setting with professional supervision in the field from a doctoral level psychologist with credentials and/or experience in the appropriate specialty in psychology. Experience consists of full time for one semester.</td>
<td>Master's degree in PSY and approval of advisory committee</td>
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<tr>
<td>PSY 880</td>
<td>Directed Study In Psychology</td>
<td>1-6</td>
<td>Research project for graduate students supervised by members of the graduate faculty. Research to be elected on basis of interest of student and not to be part of thesis or dissertation research. Credits Arranged</td>
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<tr>
<td>PSY 885</td>
<td>Doctoral Supervised Teaching</td>
<td>1-3</td>
<td>Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.</td>
<td>Doctoral student</td>
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<tr>
<td>PSY 890</td>
<td>Doctoral Preliminary Exam</td>
<td>1-9</td>
<td>For students who are preparing for and taking written and/or oral preliminary exams.</td>
<td>Doctoral student</td>
<td></td>
</tr>
<tr>
<td>PSY 893</td>
<td>Doctoral Supervised Research</td>
<td>1-9</td>
<td>Instruction in research and research under the mentorship of a member of the Graduate Faculty.</td>
<td>Doctoral student</td>
<td></td>
</tr>
<tr>
<td>PSY 895</td>
<td>Doctoral Dissertation Research</td>
<td>1-9</td>
<td>Dissertations on all topics.</td>
<td>Doctoral student</td>
<td></td>
</tr>
<tr>
<td>PSY 896</td>
<td>Summer Dissertation Research</td>
<td>1</td>
<td>For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.</td>
<td>Doctoral student</td>
<td>Summer only</td>
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Public Administration (PA)

PA 311  Public Policy Analysis and Evaluation  (3 credit hours)
This course will be an introductory course for the study of policy analysis, i.e. the systematic study of political-issue problems and alternative policy choices. An individual semester-long project will be completed by each student that identifies a policy issue of interest to the student and various alternatives to implement or improve the policy. Students will measure outcomes of their alternative choices and choose a course of action based on anticipated outcomes.

Typically offered in Fall and Spring

PA 322  Human Resource Management in Public Sector  (3 credit hours)
PA 322 is a fundamental, comprehensive course designed to provide a view of the major influence human resources management has in a productive public sector organization. Specifically, it examines the challenges of managing complex work systems in the political and institutional environments. Emphasis is given to the challenges facing the public sector in attracting and developing human assets in an environment of conflicting goals, stakeholder obligations and a highly aware electorate. With theoretical concepts established, the focus will shift to practical implementation tools to include recruitment, retention, compensation, and evaluation techniques.

Typically offered in Spring only

PA 410  Public Administration for Police Supervisors  (3 credit hours)
Introduces law enforcement supervisors to the subject of Public Administration as a field of intellectual inquiry and as a field of professional activity. Students will learn how important founding principles such as federalism, separation of powers, equity, and democratic accountability impact police organizations today. The more practical concerns of police administrators including budgeting and financial management, labor-management relations, and personnel law are also considered. Available only to distance education students enrolled in the AOMP.

Typically offered in Fall, Spring, and Summer

PA 411  Managing Police Organizational Behavior  (3 credit hours)
This course is designed to prepare police managers to develop more efficient and effective organizations. Particular attention is given to improving leadership and interpersonal communication skills through self assessment. Students will also study group dynamics, team building, and the importance of employee empowerment within a law enforcement context. Problem-solving tools and assessments utilized by police agencies to facilitate organizational change are also considered. Available only to distance education students enrolled in the AOMP.

Typically offered in Fall, Spring, and Summer

PA 412  Management Skills & Practices for Police Supervision  (3 credit hours)
The purpose of this course is to introduce law enforcement supervisors to management skills that can enhance their individual and organizational effectiveness. Students will learn collaborative leadership, conflict resolution, staff development, group problem solving, delegation and coaching. The skills taught in this class are considered theoretically (through reading assignments and lectures), experientially (through role plays, assessment center exercises, and management inventories), and analytically (through written analyses and class discussions). Available only to distance education students enrolled in the AOMP.

Typically offered in Fall, Spring, and Summer

PA 420  State and Local Economic Development Policy  (3 credit hours)
In many communities, both rural and urban, the most immediate policy problem confronting public leaders is how to improve the local economy. The purpose of this course is to introduce public leaders to the tasks and challenges in policy development for improving the economies of communities. This course introduces students to the strategies for attracting and retaining public and private investments in a local economy. An individual semester long project will be completed by each student that presents an original economic development strategy, program or project for a specific community (city/town or county).

Typically offered in Spring only

PA 498  Special Topics in Public Administration  (3 credit hours)
Offered as needed to engage professional literature not normally available in regular course offerings or for new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

PA 507  The Public Policy Process  (3 credit hours)
Application of current theories of the public policy process to current issues in public policy and management. Emphasis on the dominant theories of the process, including policy streams, advocacy coalitions, punctuated equilibrium, institutional and rational choice models. Graduate standing or seniors with instructor's permission.

Typically offered in Spring only

PA 509  Applied Political Economy  (3 credit hours)
Principles governing the interaction of politics and markets, and their application to public policy and public administration. Economic and political market failure, dilemmas of public choice and effects of political institutions. Case studies of public policy-making.

Prerequisite: EC/ARE 401

Typically offered in Fall only

PA 510  Public Administration Institutions and Values  (3 credit hours)
Exploration of the critical roles public administration plays in the American constitutional system of government with emphasis on public institutions, policy making and implementation, intergovernmental and intersectoral relations, public service values, administrative discretion, and ethical responsibilities and decision-making.

Typically offered in Fall and Spring
Typically offered in Fall and Spring

PA 511 Public Policy Analysis (3 credit hours)
Methods and techniques of analyzing, developing and evaluating public policies and programs. Emphasis given to benefit-cost and cost-effectiveness analysis and concepts of economic efficiency, equity and distribution. Methods include problem solving, decision making and case studies. Examples used in human resource, environmental and regulatory policy.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

PA 512 The Budgetary Process (3 credit hours)
Examination of generalized budgetary process used at all levels of government in the U. S. Understanding of the process based upon comprehension of institutions involved, roles of politicians and professionals and the objectives of budgetary systems. Focus also upon budgetary reforms and on Planning-Programming-Budgetary and Zero-Based Budgeting as management tools.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Summer

PA 513 Public Organization Behavior (3 credit hours)
Major conceptual frameworks developed to understand organization behavior. Motivation, leadership, group dynamics, communication, socio-technical systems, work design and organizational learning. Application of theories and concepts to public sector organizations.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

PA 514 Management Systems (3 credit hours)
Use of management systems by public and nonprofit organizations to monitor and manage their programs. Results-based management approaches, including strategic planning, goal setting, and output/outcome measurement. Ways of increasing managerial effectiveness through the use of structural changes, process improvements, project planning tools, performance-based budget systems, and individual and group rewards.

Prerequisite: Six hours of graduate PA course work
Typically offered in Fall and Spring

PA 515 Research Methods and Analysis (3 credit hours)
A focus on behavioral approach to study of political and administrative behavior. Topics including philosophy of social science; experimental, quasi and non-experimental research design; data collection techniques; basic statistical analysis with computer applications.

Prerequisite: ST 311
Typically offered in Fall and Spring

PA 516 Effective Communications for Public Administrators (3 credit hours)
Focus on professional written and oral skills and the applications needed by public and nonprofit administrators. This includes drafting, editing, and presenting factual and persuasive materials. Use of visual aids, handling question and answer sessions, dealing with media, and holding effective meetings. Composing memos, position papers, and press releases. The course develops competency to communicate and interact productively with a diverse and changing workforce and citizenry.

Typically offered in Fall and Spring

PA 517 MPA Capstone (3 credit hours)
Students will demonstrate their achievement of core competencies developed through their MPA course of study. The course will include three key components: (1) Academic Portfolio; (2) Capstone Project; and (3) Reflection Essay. Students will develop a professional academic portfolio in which they identify activities and assignments from their course of study that demonstrate their attainment of the program's expected learning outcomes. Students will complete a hands-on, supervised course project focusing on a major public service problem or issue and that demonstrates practical application of core competencies. Students will prepare a reflection essay of what they learned in the MPA program during their preparation for a public service career.

P: PA 510, PA 511, PA 512, PA 513, PA 514, PA 515 and PA 516.
Typically offered in Fall, Spring, and Summer

PA 520 Seminar in Urban Management (3 credit hours)
A seminar focusing on analytical techniques and managerial principles required for policy formation and implementation in a complex urban governmental environment. Specific topics including urban planning and community development, housing, intergovernmental relations, organizational roles and decision making, budgeting and selected urban services (for example: police, transportation).

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

PA 521 Government and Planning (3 credit hours)
The planning function at all levels of government in the U. S., with particular attention to problems posed for planning by rapid growth of metropolitan areas. Overview of community development, urban spatial structure, housing economics and land use planning.

Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

PA 522 Intergovernmental Relations in the United States (3 credit hours)
Examination of distinctive features of intergovernmental relations in the U. S. Topics stressed including historical adaptations of federalism, emerging role of the administrator, contemporary trends in intergovernmental relations and assessment of contemporary trends from federal, state and local perspectives.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

PA 523 Municipal Law (3 credit hours)
A focus on the legal nature of cities as municipal corporations and the legal context in which local governments operate. Specific topics covered including incorporation, ethics, public access to meetings and records, annexation, land use, development, planning, liability, financing, contracting, and personnel actions.

Prerequisite: Graduate standing
Typically offered in Fall only

PA 525 Organizational Development and Change Management (3 credit hours)
This course provides an introduction to the applied skills and knowledge necessary for helping public and nonprofit organizations and agencies effectively manage change. Students will gain knowledge and skills in organizational assessment, action research, systems change, and the stages of change management. Graduate standing only.

Typically offered in Spring only
PA 530  **Financial Management in the Public Sector** (3 credit hours)  

Prerequisite: Graduate standing or PBS status  
*Typically offered in Spring only*  

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PA 531  **Human Resource Management in Public and Nonprofit Organizations** (3 credit hours)  
Analysis of major Human Resource practices used by public and nonprofit organizations. Techniques examined include organization (strategy, job analysis, job evaluation, and compensation), staffing (recruitment, retention, testing, and hiring), performance management (appraisal and training & development), and employee relations (grievance & discipline mediation & negotiation, and labor relations).  

Prerequisite: Graduate standing or PBS status  
*Typically offered in Fall and Spring*  

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PA 532  **Contract Negotiation and Mediation in the Public and Nonprofit Sectors** (3 credit hours)  
Three inter-related leadership skills - negotiation, contracting, and mediation-essential for achieving organizational success. Skills for negotiating with partners, for facilitating among colleagues, for crafting and monitoring contracts for equipment, services, or performance, and for using alternate dispute resolution techniques, primarily mediation.  

Prerequisite: Graduate standing or Management Development Certificate Program and 6 hours of 500-level course work  
*Typically offered in Spring only*  

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PA 535  **Problem Solving for Public and Nonprofit Managers** (3 credit hours)  
The course introduces a problem solving model specific to public and nonprofit organizations. The model is based on meeting three criteria: effectiveness, efficiency, and equity. Students learn to apply the model in interpersonal and group interactions. The course relies heavily on self-assessment to enable the students to recognize their problem solving propensities and the strengths and limitations of those tendencies.  

Prerequisite: PA 513  
*Typically offered in Fall only*  

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PA 536  **Management of Nonprofit Organizations** (3 credit hours)  
Strategies for developing board leadership, staffing, and managing volunteers, working in multi-cultural environments, developing partnerships with other organizations, conducting government relations. Legal requirements and constraint on nonprofits: incorporation, lobbying, and tax policies.  

Restriction: PBS status for Graduate Standing  
*Typically offered in Fall and Summer*  

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PA 538  **Nonprofit Budgeting and Financial Management** (3 credit hours)  
Nonprofit budgeting and financial management practices, including budgeting, financial analysis, cash flow forecasting, internally controlling financial transactions, borrowing, external auditing, investing, managing risk, purchasing and inventory control.  

*Typically offered in Spring only*  

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PA 539/COM 539  **Fund Development** (3 credit hours)  
Identifies and assesses techniques and best practices of fund development, annual giving, capital campaigns, endowments. Topics include setting achievable goals, organizing and staffing a fund development campaign, and identifying donors. Discusses links between fund development and organization mission and governance, ethical issues, and government regulations. PBS status or Graduate standing.  

*Typically offered in Fall only*  

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PA 540  **Grant Writing for Public Administrators** (3 credit hours)  
Survey of funding environment; how to identify foundations, corporation and government funding sources, write proposals, and evaluate proposals.  

*Typically offered in Fall only*  

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PA 541  **Geographic Information Systems for Public Administration** (3 credit hours)  
Introduction to management of spatial data in relation to public administration databases, including preparation of maps, tables, and data graphics related to geographic information systems in the public sector. Use of ArcView and a variety of other GIS computer applications.  

Prerequisite: Graduate standing, PBS status, Advanced Undergraduate standing with 12 hours in PS program  
*Typically offered in Spring only*  

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PA 545  **Administrative Law** (3 credit hours)  
Case law of exercise of administrative power, judicial and legislative control of administrative action, legal rights of public employers and legal procedures of administrative tribunals.  

Prerequisite: Graduate standing or PBS status  

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PA 546  **Seminar in Program Evaluation** (3 credit hours)  
Combination of seminar and field research techniques to study evaluation of public programs. Focus on political and administrative problems associated with program evaluation. Examination of availability and appropriateness of various quantitative methods.  

Prerequisite: Graduate standing and 6 hours of 500-level courses  
*Typically offered in Spring only*  

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PA 550  **Environmental Policy** (3 credit hours)  
Focus on formation and impact of environmental policy in the U. S. Examination on decision-making processes at all levels of government. Comparisons between political, economic, social and technological policy alternatives. Emphasis upon application of policy analysis in environmental assessment and consideration on theoretical perspectives on nature of the environmental crisis.  

Prerequisite: Advanced Undergraduate standing including 12 hours of PS program, Graduate standing or PBS status  
*Typically offered in Fall only*  

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PA 552  **Science and Technology Policy** (3 credit hours)  
This course explores multiple methodologies and disciplinary perspectives to examine the public policies involving or affected by science and technology (S&T). Course themes include the history and evolution of S&T policy, current national and international S&T policy systems and the interactions and conflicts within and surrounding them, and responsible governance of S&T.  

Prerequisite: GraduateStanding or PBS Status  
*Typically offered in Spring only*
PA 553 Disaster, Crisis and Emergency Management and Policy (3 credit hours)
Study of the policies designed to prepare for, respond to, mitigate, and recover from natural and technological hazards, disasters, accidents, or terrorist attacks. Surveys government, nonprofit, and private sector activities in hazards, disasters, emergency and crisis management and policy.

Prerequisite: PS 311 or Graduate standing
Typically offered in Fall and Spring

PA 555 Administration of Criminal Justice (3 credit hours)
Politics and administration in American criminal justice system. Emphasis upon interrelationships between ideology, organization and policy outputs in analysis of major problems confronting the system today. Topics including intergovernmental relations, discretionary justice, impact of judicial decisions on criminal justice administration and management trends in criminal justice bureaucracies. Credit for both PS 555 and PA 555 is not allowed.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

PA 580 Independent Study (1-3 credit hours)
Independent research or readings by graduate students under direct supervision of individual faculty members. Students' work evaluated, based on reports, papers and exams.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

PA 598 Special Topics in Public Administration (1-6 credit hours)
Detailed investigation of contemporary topics in fields of public administration. Topic and mode of study determined by program faculty.

Prerequisite: Advanced Undergraduate standing including 12 hours in PS program, Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

PA 635 Readings and Research (1-3 credit hours)
To enable graduate students to pursue a subject of particular interest to them by doing extensive readings or research in that subject under direct, individual faculty supervision.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

PA 650 Internship in Public Affairs (1-6 credit hours)
Exposure of the student to environment and value systems of the public organization through a supervised work experience. Involving application of substantive knowledge and analytical skills to organizational problems. Credit will vary with nature of th

Prerequisite: Minimum 9 hours graduate work
Typically offered in Fall, Spring, and Summer

PA 651 Advanced Practical Training (1-3 credit hours)
Substantive knowledge and analytical skills applied to projects under agency supervision. Participation in monthly on-campus meetings. Credit will not be given for placements in current or previous work unit. Credit will not be given for both PA 650 and PA 651. Credit will vary with number of work hours. Must have MPA, current or previous professional work experience.

Prerequisite: 12 graduate credit hours
Typically offered in Fall, Spring, and Summer

PA 655 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

PA 668 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Spring and Summer

PA 689 Non-Thesis Masters Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring and Summer

PA 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

PA 714 Public Administration Research Methods and Traditions (3 credit hours)
This course explores a variety of topics, ranging from the philosophy of social science to tailoring a literature review. The goal of this course is to approach the public administration research craft from a variety of perspectives, though their underlying epistemic assumptions are often not made explicit. The course also incorporates material on the responsible conduct of research.

Typically offered in Fall only

PA 715 Quantitative Policy Analysis (3 credit hours)
Application of quantitative tools to conduct public policy and administrative research. Course identifies and uses secondary data, including U.S. Census Data, to empirically assess social and economic policies. Emphasis is on the correct selection, use and interpretation of data to answer public policy questions and to understand the strengths and limitations of quantitative analysis.

Prerequisite: ST 407, ST 511, ST 513
Typically offered in Fall only
PA 761 Foundation of Public Administration (3 credit hours)
Intellectual foundation of public administration and its development as a discipline. Boundaries between public administration and large political process, external political control, factors producing administrative influence and the bases of administrative ethics.

Prerequisite: Graduate standing
Typically offered in Fall only

PA 762 Public Organization Theory (3 credit hours)
Examination of fundamental questions guiding organization research in public administration with emphasis on reconciling democracy and organization. Analysis of classical bureaucratic systems, rational choice, cognitive and organizational economic, and nonlinear and chaos theories.

Prerequisite: Graduate standing
Typically offered in Spring only

PA 763 Public Policy Process (3 credit hours)
Examination of public policy process at federal level in the United States. Analysis of constitutional foundations of this process and the role of governmental institutions, political culture, parties, interest groups, and public opinion in policy making. Case studies of policy making and implementation in selected policy areas.

Prerequisite: Graduate standing
Typically offered in Spring only

PA 764 Budgeting and Financial Management (3 credit hours)
Examination of budgetary and financial management processes in governmental and nonprofit agencies. Budgetary and financial management theory, practice, and unanswered research questions.

Prerequisite: PA 512
Typically offered in Spring only

PA 765 Quantitative Research in Public Administration (3 credit hours)
Review of quantitative procedures commonly applied in public administration with emphasis on applications found in leading journals in the discipline. Exploration of data acquisition, appropriate research design, selection of procedures, data assumptions of procedures, and common errors in the research process and in statistical analysis.

Prerequisite: PA 515; ST 507
Typically offered in Spring only

PA 766 Advanced Quantitative Research in Public Administration (3 credit hours)
Review of advanced quantitative procedures commonly applied in public administration research with emphasis on multivariate models found in leading journals in the discipline. Illustrative topics include the application of specialized regression models, generalized linear models, event history models, mixed and multilevel models, and structural equation models topics in public administration.

Prerequisite: PA 765
Typically offered in Fall only

PA 770 Contemporary Public Management (3 credit hours)
Current public management practices, including evaluation of their underlying theoretical assumptions and of empirical evidence about their effectiveness. Causes of recent shifts in public management theory; political implications of management choices; privatization in theory and practice; managerial use of performance measurement systems; customer feedback systems; worker incentive structures.

Prerequisite: PA 514
Typically offered in Spring only

PA 771 Seminar on Nonprofit Organizations (3 credit hours)
Course provides the necessary theoretical foundation to design scholarly research on nonprofit organizations, voluntary action, and the nonprofit sector. Topics focus on the historical and philosophical roots of the nonprofit sector, the theories used to frame scholarly research and answer contemporary research questions. Students assume a leadership role in shaping the course content. Doctoral students only.

PA 780 Independent Study (1-3 credit hours)
Independent research or readings by graduate students under direct supervision of individual faculty members. Students' work evaluated, based on reports, papers and exams.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

PA 785 Special Topics in Public Administration and Policy (1-6 credit hours)
In depth exploration of specialized or emerging topics in public administration or public policy. Student presentations on readings and research projects. Also used to test and develop new courses.

Typically offered in Fall and Spring

PA 803 Advanced Research Design (3 credit hours)
Philosophy and objectives of social scientific research with focus on basic and applied research, need for hypothesis development and testing as a basis of scientific research, inductive and deductive reasoning. Emphasis on preparation of research design of dissertation, published articles, and technical presentations. Students will present a research prospectus that will serve as the basis for their dissertation.

Prerequisite: Doctoral student in Public Administration; PA 765.
Corequisite: At least two graduate methodology or statistics courses
Typically offered in Fall only

PA 810 Special Topics in Public Administration (1-6 credit hours)
Detailed investigation of contemporary topics in fields of public administration. Topic and mode of study determined by program faculty.

Prerequisite: Advanced Undergraduate standing including 12 hours in PS program, Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

PA 835 Readings and Research (1-3 credit hours)
To enable graduate students to pursue a subject of particular interest to them by doing extensive readings or research in that subject under direct, individual faculty supervision.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer
PA 885 Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

PA 890 Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Summer only

PA 893 Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PA 895 Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

PA 896 Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

PA 899 Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Religious Studies (REL)

REL 200 Introduction to the Study of Religion  (3 credit hours)
Historical, theoretical, and methodological introduction to the study of religion. Critical analysis of development of the discipline of Religious Studies. Preparation for all advanced study in Religious Studies theory and method, as well as training to study religious traditions of the world.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 210 Religious Traditions of the World  (3 credit hours)
Major Eastern and Western religious traditions with attention to their basic teachings and practices as well as to the historical, geographical, social, and political settings in which they have arisen and developed.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 220 Religion in the Contemporary World  (3 credit hours)
Engagement of diverse religious traditions with the contemporary world. Examination of topics such as religion and the environment, science, women and gender, the state, justice and conflict.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 230 Asian Religions  (3 credit hours)
Asian religious traditions in comparative perspective. Religious and cultural history through literature, film, and art of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Afghanistan, China, Japan, Korea, and other countries in the region. Doctrine, practice, teaching tales, and issues of change and conflict.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 288 Special Topics in Religious Studies  (3 credit hours)
Selected studies in religion that do not appear regularly in the curriculum. Topics will be announced for each semester in which the course is offered.

REL 309/SOC 309 Religion and Society  (3 credit hours)
Religious beliefs, practices and organizations addressed as social phenomena. Structural functionalism, conflict and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religions to family, government, and economy and to social divisions, conflict and change.

P: 3 credits in SOC at the 200 level
GEP Humanities, GEP Social Sciences
Typically offered in Fall and Spring

REL 311 Introduction to the Old Testament  (3 credit hours)
Study of Old Testament books [=Hebrew Bible, HB], examining their content, background and development. Comparisons of the biblical material with other Ancient Near Eastern literature. Assessment of contributions from archaeology and literary studies for clarifying the text. No prior knowledge of the subject matter is required.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

REL 312 Introduction to the New Testament  (3 credit hours)
Literary and historical study of the New Testament in its Jewish and Greco-Roman contexts. Special attention to distinctive characteristics of the Gospels and their relationships, early controversies with Judaism and the emergence of church structure and teaching.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall, Spring, and Summer

REL 314 Introduction to Intertestamental Literature  (3 credit hours)
Intertestamental literature in the context of Jewish history, institutions and beliefs of the Intertestamental Period (ca. 300 B.C.-ca. 100 A.D.)

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 317 Christianity  (3 credit hours)
Development of Christianity from its origins to the present; events, persons, ideas, beliefs and practices which were most significant in this development.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring
REL 320/HI 320  Religion in American History  (3 credit hours)
Representative people, movements and thought in the major religions within the context of American society and culture.

GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

REL 323  Religious Cults, Sects, and Minority Faiths in America  (3 credit hours)
Religious cults, sects and minority faiths in America, including Mormonism, Christian Science and Jehovah’s Witnesses. Also covers such alternate groups as the holiness-charismatic movement and the Unification Church. Origins, development and teachings of these groups within the context of American culture and religion.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

REL 327  Issues in Contemporary Religion  (3 credit hours)
Responses of contemporary Western religious thinkers to critics of religion and to challenges posed by the 20th century including the Nazi Holocaust, social injustice (liberation theologies - black, feminist, Third World), ecological crisis, threat of nuclear warfare, and conflicts between religions.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 331  The Hindu Tradition  (3 credit hours)
Basic religio-philosophical concepts, social institutions, and individual practices of Hindu civilization from earliest Vedic times to the present. Focus on major traditions: Action (karma), Knowledge (jnana), and Devotion (bhakti), with emphasis on disciplines (yoga), myth, symbol, art.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 332  The Buddhist Traditions  (3 credit hours)
History and structure of the Buddhist tradition analyzed through the “three jewels”: the Buddha, the Monastic Community (sangha), and the Teachings (dharma). Emphasis on fundamental religio-philosophical concepts, social history and ritual practices of Southern Buddhism, early Mahayana development, and Tantric ideals. Growth of the traditions in China and Japan.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

REL 333  Chinese Religions  (3 credit hours)
Survey of Chinese religions from prehistoric times to present. Confucianism, Daoism, primary Buddhist schools in China, spirit possession, divination and popular religious worship.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

REL 334  Japanese Religions  (3 credit hours)
Survey of various strands of Japanese religious life from prehistoric times until present. Kami worship; primary Buddhist schools in Japan; Japanese Christianity; Confucianism; and New Religions.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 340  Islam  (3 credit hours)
Introductory survey of the Islamic religious tradition. Examination of the primary historical, literary, and theological sources for Islamic religious thought in global contexts. Topics include the Prophet Muhammad, the development of the early Muslim community, Islamic religious practice, Sunni and Shi’i Islam, Sufism, theology, law and Islamic art and architecture.

GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 343/AFS 343  African American Religions  (3 credit hours)
History of religions among Americans of African descent from the period of the development of the transatlantic slave trade to the present. Exploration of the complex ways religion has shaped the lifeworld of African Americans.

GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

REL 350  Introduction to Judaism  (3 credit hours)
A survey of Jewish religious traditions from the bible through the present day. Evolution of major religious ideas through classical texts including torah, Talmud, philosophical and mystical literature, and contemporary fiction.

GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 402/HI 402  Early Christianity to the Time of Eusebius  (3 credit hours)
Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox C

Prerequisite, one of: REL 312, REL 317, or HI 207.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

REL 407/HI 407  Islamic History to 1798  (3 credit hours)
The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art and architecture, Islam in Spain, India, Asia and Africa, the Crusades, the Ottomans, Islam and Europe. Credit will not be given for both REL/HI 407 and REL/HI 507.

Prerequisite: 3 hrs HI or REL 300 or above
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only
REL 408/HI 408 Islam in the Modern World (3 credit hours)
Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world. Students cannot receive credit for both REL/HI 408 and REL/HI 508.

Prerequisite: 3 hours of history or religious studies
GEP Global Knowledge, GEP Humanities
Typically offered in Fall only

REL 412 Advanced Readings in the Christian Gospels (3 credit hours)
Close study of the varieties of gospel writings, both canonical and non-canonical, in early Christianity. Analysis of the constituent features of the gospels (parables, healing narratives, sermons), and their "pre-history"; the use of the gospels in the reconstruction of the life and ministry of Jesus; and critical methods in gospel research. Students may not receive credit for both REL 412 and REL 512.

P: REL 312 or REL 317
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 413 The Life and Letters of the Apostle Paul (3 credit hours)
Intensive study of the apostle Paul and his writings in their historical, literary and religious contexts. Sources for the life and ministry of Paul; the structure and theology of the Pauline and deutero-Pauline epistles; the influence and image of Paul in early Christianity; and contemporary controversies and issues in the study of Paul. Students may not receive credit for both REL 413 and REL 513.

P: REL 312 or REL 317
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring

REL 423 Religion and Politics in America (3 credit hours)
Issues and problems in religion and politics in the United States since 1900. Historical, theoretical, sociological, and cultural approaches to religion and politics. Inquiry into the relation between religion and the state. Responses of religious traditions to American social and political issues. Students cannot receive credit for both REL 423 and REL 523.

Prerequisite for REL 423: one 300-level course in religion, philosophy, or history
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

REL 424 Religion and Politics in Global Perspective (3 credit hours)
An interdisciplinary investigation of interfaces between religion and politics in select global hotspots. Possible topics include governmental systems, constitutional law, war, disaster, and development. Prerequisites: For REL 424, 3 credits in one or more of the following: ANT, COM, HI, IS, PS, REL, SOC; for REL 524, graduate standing.

Prerequisite: 3 credits in one or more of the following: ANT, COM, HI, IS, PS, REL, SOC
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 471/STS 471 Darwinism and Christianity (3 credit hours)
Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in aneval

Prerequisite: One course in religious studies, biological sciences, philosophy of science, or history of science. Credit is not allowed for both REL 471 and REL 571.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

REL 472/WGS 472 Women and Religion (3 credit hours)
Historical, literary, and theological sources dealing with portrayals of women and women's religious experience in several religious traditions of the world through different historical periods, from ancient to modern. Impact of feminist theory on the academic study of religion; methodological issues surrounding the study of women's religious history; role of religion in shaping attitudes toward women and their status in society. Students cannot receive credit for both REL/WGS 472 and REL/WGS 572.

Prerequisite: one course in religious studies or women's and gender studies
GEP Humanities
Typically offered in Spring only

REL 473/WGS 473/REL 573/WGS 573 Religion, Gender, and Reproductive Technologies (3 credit hours)
Examines comparative religious ethics concerning gender marriage, parenthood, children, and the relationship of human beings to the "natural". Relates these views to new and emerging reproductive and genetic technologies. Compares the internally diverse perspectives of three major religious traditions with regard to their interpretations of these technologies. Analyzes the impact of particular uses of these technologies on the rights of women and girls. Students cannot earn credit for both REL 473 and REL 573.

Prerequisite: One 3 cr course in Philosophy (PHI) or Religious Studies (REL) or Women's and Gender Studies (WGS)
Typically offered in Fall only

REL 482 Religion and Conflict (3 credit hours)

Prerequisite: A 300 or above level Religion course
GEP Global Knowledge, GEP Humanities
Typically offered in Spring only

REL 489 Interpretations of Religion (3 credit hours)

P: One course in religion, philosophy, anthropology, history, or sociology.
GEP Global Knowledge, GEP Humanities
Typically offered in Fall and Spring
REL 491 Advanced Readings in Theological and Religious Literature (3 credit hours)
Critical analysis of advanced theological works; close reading of primary texts; methods of interpretation (hermeneutics). Course may be used for individualized study programs by arrangement with the instructor.
Prerequisite: 300-level course in Religion

REL 496 Seminar in Religious Studies (3 credit hours)
Advanced research and writing in selected topics; application of contemporary and historical methods for the study of religion; hermeneutic theory. Open primarily to Religious Studies majors and minors.
Prerequisite: 300-level course in Religion

REL 498 Special Topics in Religious Studies (1-6 credit hours)
Detailed investigation of selected topics in religion. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study programs.
Prerequisite: 6 hours REL

REL 502/HI 502 Early Christianity to the Time of Eusebius (3 credit hours)
Growth and diffusion of early Christianity from the end of the first century up to the time of Eusebius and the conversion of Constantine (early fourth century); Christianity in its Greco-Roman environment; Roman policy towards Christianity; heterodox C
Prerequisite: Graduate standing
Typically offered in Fall only

REL 507/HI 507 Islamic History to 1798 (3 credit hours)
The history of the Islamic Near East to 1798. Topics include the East Mediterranean before Islam, Muhammad and the development of Islam, sources of Muslim civilization, Islamic law, science, philosophy, art and architecture, Islam in Spain, India, Asia and Africa, the Crusades, the Ottomans, Islam and Europe. Credit will not be given for both REL/HI 407 and REL/HI 507.
Prerequisite: Graduate Standing
Typically offered in Fall only

REL 508/HI 508 Islam in the Modern World (3 credit hours)
Evolution of modern Islam from 17th century to the present. Primary emphasis on North Africa, the Middle East and South Asia. Pre-modern Islamicate empires, reform and revival. Historical origins of current issues in the Islamic world. Students cannot receive credit for both REL/HI 408 and REL/HI 508.
Prerequisite: Graduate Standing
Typically offered in Fall only

REL 512 Advanced Readings in the Christian Gospels (3 credit hours)
Close study of the varieties of gospel writings, both canonical and non-canonical, in early Christianity. Analysis of the constituent features of the gospels (parables, healing narratives, sermons), and their "pre-history"; the use of the gospels in the reconstruction of the life and ministry of Jesus; and critical methods in gospel research. Students may not receive credit for both REL 412 and REL 512.
Prerequisite: Graduate standing
Typically offered in Fall and Spring

REL 513 The Life and Letters of the Apostle Paul (3 credit hours)
Intensive study of the apostle Paul and his writings in their historical, literary and religious contexts. Sources for the life and ministry of Paul; the structure and theology of the Pauline and deutero-Pauline epistles; the influence and image of Paul in early Christianity; and contemporary controversies and issues in the study of Paul. Students may not receive credit for both REL 413 and REL 513.
Prerequisite: Graduate standing
Typically offered in Spring only

REL 523 Religion and Politics in America (3 credit hours)
Issues and problems in religion and politics in the United States since 1900. Historical, theoretical, sociological, and cultural approaches to religion and politics. Inquiry into the relations between religion and the state. Responses of religious traditions to American social and political issues. Students cannot receive credit for both REL 423 and REL 523.
Prerequisite for REL 523: graduate standing
Typically offered in Spring only

REL 524 Religion and Politics in Global Perspective (3 credit hours)
An interdisciplinary investigation of interfaces between religion and politics in select global hotspots. Possible topics include governmental systems, constitutional law, war, disaster, and development.
Prerequisites: For REL 424, 3 credits in one or more of the following: ANT, COM, HI, IS, PS, REL, SOC; for REL 524, graduate standing.
R: Graduate Standing
Typically offered in Spring only

REL 571/STS 571 Darwinism and Christianity (3 credit hours)
Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in an evo
Prerequisite: Graduate standing. Credit is not allowed for both REL 571 and REL 471.
Typically offered in Fall only

REL 572/WGS 572 Women and Religion (3 credit hours)
Historical, literary, and theological sources dealing with portrayals of women and women's religious experience in several religious traditions of the world through different historical periods, from ancient to modern. Impact of feminist theory on the academic study of religion; methodological issues surrounding the study of women's religious history; role of religion in shaping attitudes toward women and their status in society. Students cannot receive credit for both REL/WGS 472 and REL/WGS 572.
Prerequisite: Graduate Standing
Typically offered in Spring only
**REL 573/WGS 573/REL 473/WGS 473  Religion, Gender, and Reproductive Technologies**  (3 credit hours)
Examines comparative religious ethics concerning gender marriage, parenthood, children, and the relationship of human beings to the "natural". Relates these views to new and emerging reproductive and genetic technologies. Compares the internally diverse perspectives of three major religious traditions with regard to their interpretations of these technologies. Analyzes the impact of particular uses of these technologies on the rights of women and girls. Students cannot earn credit for both REL 473 and REL 573.

Prerequisite: One 3 cr course in Philosophy (PHI) or Religious Studies (REL) or Women’s and Gender Studies (WGS)
Typically offered in Fall only

**REL 582 Religion and Conflict**  (3 credit hours)

Restriction: Graduate Standing
Typically offered in Spring only

**REL 589 Interpretations of Religion**  (3 credit hours)

Prerequisite: Graduate standing
Typically offered in Fall and Spring

**REL 598 Special Topics in Religious Studies**  (1-6 credit hours)
Detailed investigation of selected topics in religion. Topics determined by faculty members in consultation with head of the department. Course may be used for individualized study programs. Students cannot receive credit for both REL 498 and REL 598

Typically offered in Fall, Spring, and Summer

**Science, Technology and Society (STS)**

**STS 210/WGS 210  Women and Gender in Science and Technology**  (3 credit hours)
Interdisciplinary introduction to the reciprocal relationships between scientific/technological research and contemporary understanding of gender. Special emphasis on social factors influencing scientists and engineers in their professions.

*GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer*

**STS 214  Introduction to Science, Technology, and Society**  (3 credit hours)
Introduction to the field of Science, Technology, and Society (STS), including most important STS scholars, major schools of thought, and important theoretical and empirical issues in STS.

*GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer*

**STS 257/ARS 257  Technology in the Arts**  (3 credit hours)
The interaction between technology and the arts with an emphasis on developments in Western art of the twentieth century. Historical and emerging issues include: sound and film recordings, the addition of sound to films, the impact of films and television on theater, the impact of radio, computer applications to music, the visual arts, and literature.

*GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring*

**STS 301 Science and Civilization**  (3 credit hours)
An inquiry into the scientific achievement and cultural impact of three different, but interrelated, models (or paradigms) of understanding the world and man's place in it; the Ancient-Medieval model of Aristotle, Ptolemy and Aquinas; the 17th century model of Newtonian physics; and the emerging, but fragmentary, 20th century model based upon the new physics of Einstein, Planck and Heisenberg.

Requisite: Sophomore Standing or Above
*GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring*

**STS 302 Contemporary Science, Technology and Human Values**  (3 credit hours)
Interdisciplinary evaluation of recent and potential influences of current scientific and technological developments on US and non-US societies. Emerging social, ethical, and intellectual issues include: The adequacy of contemporary scientific frameworks; the relations among science, technology, and society; the social consequences of scientific and technological applications, and human prospects and possibilities.

Prerequisite: Sophomore standing
*GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer*

**STS 304 Ethical Dimensions of Progress**  (3 credit hours)
Multidisciplinary examination of traditional western notion of progress, focusing on ethical issues raised by concept of progress, and connections between science, technology and society. Places relationships such as engineering and social responsibility within the context of present day redefinitions of the notion of progress.

*GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring*

**STS 322 Technological Catastrophes**  (3 credit hours)
Interdisciplinary examination of the human, organizational and technical factors contributing to the causes and impacts of recent technological accidents such as the Bhopal chemical leak, the space shuttle Challenger explosion, the Chernobyl nuclear accident, and the Exxon Valdez oil spill. Evaluation of risk assessment, risk perception and risk communication strategies. Consideration of options for living with complex technological systems.

Prerequisite: Sophomore standing
*GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer*


**STS 323 World Population and Food Prospects** (3 credit hours)
Examination of the dynamics of population size and food needs, production, distribution and utilization. Consequences of inadequate nutrition and food choices, efforts to increase the compatibility of effective food production systems and alternate crops and cropping systems examined.

GEP Global Knowledge, GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

**STS 325/PHI 325 Bio-Medical Ethics** (3 credit hours)
Interdisciplinary examination and appraisal of emerging ethical and social issues resulting from recent advances in the biological and medical sciences. Abortion, euthanasia, physician-assisted suicide, compromised infants, aids, reproductive technologies, and health care. Focus on factual details and value questions, fact-value questions, fact-value interplay, and questions of impact assessment and policy formulation.

GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

**STS 402 Peace and War in the Nuclear Age** (3 credit hours)
An interdisciplinary examination of contemporary wars and international conflict, arms, races, nuclear strategy and defense policy, arms control, theories and strategies of peace.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

**STS 403 Seminar in Science, Technology, and Society** (3 credit hours)
Capstone course for the Science, Technology, and Society (STS) major. Review of the principal theoretical and empirical issues of the field. Research project focused on each student's STS specialty.

Prerequisite: STS 214, STS or STB Majors
Typically offered in Fall and Spring

**STS 405 Technology and American Culture** (3 credit hours)
Interdisciplinary study of the role of technology in American culture that examines the social, ideological, economic, and institutional contexts of technological change in nineteenth and/or twentieth-century America. Explores cultural impacts of transformative technological innovations, such as electricity, trains, telephones, radios, cars, airplanes, and computers, as reflected in popular cultural products such as magazines, newspaper articles, advertising, literature, music, museum exhibits, and/or film.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

**STS 471/REL 471 Darwinism and Christianity** (3 credit hours)
Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in an evolving universe.

Prerequisite: One course in religious studies, biological sciences, philosophy of science, or history of science. Credit is not allowed for both REL 471 and REL 571.
GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Fall only

**STS 490 Issues in Science, Technology, and Society** (3 credit hours)
Examination of a significant issue, method, or historical episode in the area of science, technology, and society.

Prerequisite: Junior standing.
Typically offered in Fall and Spring

**STS 491 Independent Study in Science, Technology, and Society** (3 credit hours)
Independent investigation and discussion of a selected topic in science, technology, and society. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

**STS 571/REL 571 Darwinism and Christianity** (3 credit hours)
Evolutionary biology and Christianity. Darwin's evolutionary theory; neo-Darwinism; conflicts between evolutionary theory and Christian thought; methodological parallels and differences between science and religion; proposals for divine action in an evolving universe.

Prerequisite: Graduate standing. Credit is not allowed for both REL 571 and REL 471.
Typically offered in Fall only

### Social Sciences (SSGE)

**SSGE 295 Social Sciences Special Topics** (3 credit hours)
Special topics course offering for the general education Social Sciences category.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

### Social Sciences and Global Knowledge (SSGK)

**SSGK 295 Social Sciences and Global Knowledge Special Topics** (3 credit hours)
Special topics course offering for the general education Social Sciences and Global Knowledge categories. This course may be used for the Global Knowledge (GK) co-requisite and/or for the Social Sciences (SS) requirement.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

### Social Sciences and U.S. Diversity (SSUS)

**SSUS 295 Social Sciences and U.S. Diversity Special Topics** (3 credit hours)
Special topics course offering for the general education Social Sciences and U.S. Diversity categories. This course may be used for the U.S. Diversity (USD) co-requisite and/or for the Social Sciences (SS) requirement.

GEP Social Sciences, GEP U.S. Diversity
Social Work (SW)

SW 201 Introduction to Social Work (4 credit hours)
This course, the basis for all other social work courses, provides an introduction to generalist practice and an overview of social work practice in a variety of settings. Successful completion of this course is a prerequisite for all advanced SW courses. This course is designed to acquaint students with social services typical of most American communities: what they are, who uses them, their impact, who pays for them, and who works in them. 40-hour pre-professional placement required, intern liability insurance required. Transportation to and from agency and/or community settings is the responsibility of the student.

GEP U.S. Diversity
Typically offered in Fall and Spring

SW 260 Introduction to Gerontology: An Interdisciplinary Field of Practice (3 credit hours)
An integrative seminar in introducing students to gerontology as an interdisciplinary field of practice. This course provides an overview of topics such as the demography of older adults and the physical, cognitive, and psychosocial aspects of aging. The course also covers health care and social policies that impact older persons and caregivers along with the aging network of services. Students will discuss forms of oppression such as ageism, sexism, racism, able-body(ism), and homophobia that impacts work with older people as well as strategies to promote social and economic justice.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Summer only

SW 290 The Development of Social Welfare and Social Work in the U.S. (3 credit hours)
This course reviews the major policy and program developments in American social welfare and the emergence and development of professional social work. Emphasis will be on the socio-cultural context of policy and programs, and the ideas and ideals that shape social welfare. In addition, the basic elements of social policy development will be considered. This course provides the history, mission, philosophy, and evolution of social welfare policies and services that form the foundation of social welfare, particularly as they relate to poverty, racism, and efforts to address the needs of oppressed and marginalized populations.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

SW 300 Research Methods in Social Work (3 credit hours)
Course provides an overview of the principles and methods of basic social work research. Substantive research knowledge, quantitative and qualitative research methodology are highlighted. Research ethics within the context of social work purposes and values are emphasized. Course exposes students to how high quality research in social work is designed and conducted and how it can assist in making important decisions about the design and implementation of projects, programs, and policies that address the social needs of diverse groups.

P: ST 311; R: Social Work Majors/Minors
Typically offered in Fall, Spring, and Summer

SW 307 Social Welfare Policy: Analysis and Advocacy (3 credit hours)
Course enables students to understand the processes by which social welfare policies are developed and implemented as well as the ways in which people can intervene to affect these processes. Students have the opportunity to review recent developments in national and state social welfare policies and programs in major areas such as poverty, welfare, social security, housing, health and mental health care, and child welfare. The course focuses on the development of students’ policy analysis and advocacy skills.

Prerequisite: SW 290
Typically offered in Fall, Spring, and Summer

SW 310 Human Behavior Theory for Social Work Practice (3 credit hours)
Designed to introduce theory regarding human life/development for students intending to practice social work. Students learn to recognize ways in which diversity characterizes and shapes the human experience and is critical to the formation of identity, the extent to which a culture’s structures and values may oppress, marginalize, alienate, create or enhance privilege and power. Course surveys major theoretical frameworks and normative developmental variations. Students learn to apply these theories and knowledge from the liberal arts to understand biological, psychological, social, cultural, and spiritual development. Transportation to and from agency and/or community setting is the responsibility of the student.

Prerequisite: SW 201
Typically offered in Fall, Spring, and Summer

SW 312 Multicultural Social Work (3 credit hours)
Course prepares students to work with diverse groups of people locally and globally defined by gender, ethnicity, race, national origin, sexual orientation, income, physical and mental ability, age and religion. Emphasis is placed on defining and developing skills for culturally competent social work generalist practice with these populations through students’ self-examination, experiential learning, and critical reading of class material. This course helps students develop competencies in critical self-reflection, multicultural values and ethics, knowledge, awareness and skills in a variety of ways so that they can work against manifestations of social injustice. Students are expected to provide their own transportation as needed.

GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

SW 320 Social Work Practice I (4 credit hours)
First of a three-course sequence. Practice I presents the generalist social work practice method and focuses on interviewing skills, engaging clients in the helping process, and integrating theory and social work practice. It addresses ethical and professional standards and emphasizes understanding and applying systems and ecological frameworks to practice situations. It examines strengths-based assessment, the phases of the helping relationship, and the dynamics of change in interpersonal helping relationships, within a framework of human rights, social justice, and diversity. 40-hour preprofessional placement required; intern liability insurance required. Transportation to and from agency and/or community settings is the student’s responsibility.

Corequisite: Social Work Majors, and a prerequisite or corequisite of SW 310
Typically offered in Fall, Spring, and Summer
SW 405 Social Work Practice II (4 credit hours)
Second of a three-course sequence (Practice I, II, and III). Practice II examines generalist social work roles and techniques with families and groups. Building on the foundation of interview and engagement skills presented in Practice I, it focuses on assessment, planning, and intervention with individuals, families, and small groups within a framework of human rights, social justice, and diversity. 40-hour preprofessional placement is required, intern liability insurance is required. Transportation to and from agency and/or community settings is the student's responsibility.

Prerequisite: Social Work Majors, SW 320, Corequisite: SW 480/SW 408
Typically offered in Fall and Spring

SW 408 Social Work Practice III (3 credit hours)
Course prepares students for practice will organizations, communities, policy structures, and institutions that are viewed as both tools and targets for change efforts. Course emphasizes multiculturalism, diversity, and social justice in relation to social systems. It is designed to provide social work practitioners with the means to help organizations and communities empower themselves to make change through networking, political participation, leadership development, mobilization, utilization of resources, and other strategies and techniques. Transportation to and/or from community settings is the responsibility of the student.

Prerequisite: Social Work Majors, SW 320, Corequisite: SW 405, SW 480
Typically offered in Fall and Spring

SW 412/SW 512 Social Work in Schools (3 credit hours)
Models and roles relevant to school social work practice. Cooperative work with school personnel in the identification, prevention and treatment of social, emotional and behavioral problems of children and interventive techniques with parents and community groups. For individuals preparing for social work practice in the public schools and for school social workers seeking licensure. Credit not given for both SW 412 and SW 512. Instructor Permission Required.

Typically offered in Fall, Spring, and Summer

SW 413 African American Families: History, Tradition, and Community (3 credit hours)
Characteristics, traditions, history and strengths of African American families and their relationship to other social institutions, social advocacy and social policy development. African-centered worldview and relevant theory pertaining to best practice with African American families.

Prerequisite: Sophomore standing
Typically offered in Summer only

SW 415/SW 515 Child Welfare (3 credit hours)
Generalist perspective on the practice of public child welfare. History of child welfare, practices in child welfare, and current trends in child welfare programs. Skills needed to practice in child protective services, adoption, and foster care with specific attention to the North Carolina child welfare system. Application of cultural diversity and cultural competency integrated throughout as it relates to child welfare issues.

Prerequisite: SW 201
Typically offered in Fall, Spring, and Summer

SW 416/SW 516 Addiction Recovery and Social Work Practice (3 credit hours)
Knowledge and skills in identifying Alcohol and Other Drugs (AOD) problems, screening, assessment, intervention, referral, and prevention: history of AOD problems and treatment, AOD classification, effects and signs/symptoms of AOD, models of addiction, diversity, assessment, diagnosis, intervention, treatment modalities, mutual-help groups, family dynamics, prevention, and ethical considerations. Students cannot receive credit for both SW 416 and SW 516

Prerequisite: SW 310
Typically offered in Fall, Spring, and Summer

SW 417/SW 517 Direct Practice with Older Adults (3 credit hours)
Physical, psychological, social, and cultural theories of the aging process as it relates to social work practice, social policy, and services for working with older adults and their families. Emphasis on mental and physical well-being, diversity, social and economic justice, intergenerational issues, policy and programs. Credit is not allowed for both SW 417 and SW 517.

Typically offered in Fall and Spring

SW 418 Child Welfare Seminar (1 credit hour)
Best practice seminar for participants in the NC Child Welfare Education Collaborative Program. Seminars focus on current issues in child welfare practice and policy. Topics vary from semester to semester. Students arrange own transportation for occasion.

Prerequisite: Students are Participants in the NC Child Welfare Education Collaborative Program
Typically offered in Fall and Spring

SW 420 The Legal Aspects of Social Work (3 credit hours)
Legal environment of the social work profession. Relationships among legal processes, the delivery of social work services and client problems.

Prerequisite: Social Work Majors and Social Work Minors
Typically offered in Fall and Spring

SW 423/SW 523 Social Work with Soldiers, Veterans, and Their Families (3 credit hours)
A basic overview of military life and the issues and challenges faced by military personnel, their families, friends, and community. The course provides a foundational guide to help professionals working with military families and to understand and address these issues and challenges.

R: Junior or Senior standing. Sophomores and Non-Degree may enroll with instructor approval.
Typically offered in Fall and Spring
SW 425/SW 525 Hunger and Homelessness (3 credit hours)
This course will familiarize students with the history and experience of hunger and homelessness in contemporary American society. The course includes discussion, narrative readings, experiential exercises, movie reviews, field trips, and other media to expose students to issues of food insecurity and housing instability. Students will critique ideas of what it means to be "poor" and be exposed to the lives of individuals who do not have access to adequate food, housing, healthcare, and other basic needs. American social welfare policy, including governmental and local programs that address these issues, will be discussed. Students are responsible for transportation.

Restricted: Junior or Senior Standing. Sophomores and Non-Degree Students may enroll with instructor approval.

GEP U.S. Diversity
Typically offered in Fall and Spring

SW 440/SW 540 International Learning Experience in Social Work (6 credit hours)
A seven week learning experience in Guatemala. Through this course, the student will develop a global perspective of social welfare and social work practice, will learn about the people and culture of the Lake Atitlan area of Guatemala, will learn the variety of resources available in response to social need, and will enhance or develop Spanish language competence. All costs associated with learning opportunities and activities for this course are included in the cost of the program.

GEP Global Knowledge
Typically offered in Summer only

SW 480 Preparation for Field Work (1 credit hours)
Introduction to aspects of field placement process and necessary skills for a successful internship. Application, interview, ethical practice, documentation, supervision and learning contract.

Prerequisite: Social Work Majors, SW 320, Corequisite: SW 405, SW 408
Typically offered in Fall and Spring

SW 490 Field Seminar (3 credit hours)
Weekly integrative seminar taken in conjunction with SW 491, Community-Based Field Internship. Field seminar provides students the opportunity to discuss and reflect upon their practice of social work skills through dialogue and discourse facilitated by a faculty member who develops a professional environment for students to discuss and reflect upon their agency-based field placement experience. Through organized group discussion and assignments, students use critical reflection pedagogy to discuss their application of professional social work.

Prerequisites: Social Work Majors, SW 405, SW 408, and SW 480; Corequisite: SW 491
Typically offered in Fall, Spring, and Summer

SW 491 Community-Based Field Practicum (9 credit hours)
This nine-credit course is a co-requisite for, and is taken in conjunction with, SW 491 during the BSW student's final semester. Students must complete a range of 450 to 480 hours of supervised field agency practicum in an approved community-based agency. It serves as a direct practice component of the culmination of knowledge gained in the BSW courses. Field placement provides students the opportunity to practice social work skills under the supervision of a professional social worker and apply evidence-informed practices, with emphasis on social and economic justice, in their work with individuals, families, groups, organizations, and communities.

"Corequisite: SW 490"
Typically offered in Fall, Spring, and Summer

SW 495 Special Topics in Social Work (3 credit hours)
Detailed investigation of a topic in social work. Topic and mode of study determined by faculty member.

Typically offered in Fall, Spring, and Summer

SW 498 Independent Studies in Social Work (1-6 credit hours)
Independent or small group study of a social work practice or social welfare area. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty

Prerequisite: Junior standing or Senior standing, Social Work Majors or Social Work Minor, Nine credits in social work courses
Typically offered in Fall, Spring, and Summer

SW 500 Advanced Standing Seminar (4 credit hours)
Orients advanced standing students to the Department and the MSW Program; provides connection between the BSW curriculum and advanced MSW curriculum; assures attainment of CSWE Foundation Curriculum Competencies; provides opportunities to demonstrate/evaluate practice skills of engagement, assessment, intervention, and evaluation; assists students with successful entry into advanced MSW program of study and advanced field placement. For graduate students in the advanced standing program.

Corequisite: SW 505
Typically offered in Summer only

SW 501 Social Work Policy, Services and Programs (3 credit hours)
Provides students with an understanding of and critical perspective on the development of social systems, social policy and the profession of Social Work in the United States. Examination of the history, mission, philosophy, and evolution of social welfare polices and services that form the foundation of social welfare, particularly as they relate to poverty, racism, and efforts to address the needs of oppresses and marginalized populations.

Typically offered in Spring only

SW 505 Human Behavior and the Social Environment: Social Justice (3 credit hours)
Theoretical and experiential knowledge related to oppression, privilege, and social and economic justice. Particular attention is given to persons and groups most affected by oppression and mechanisms that advance the achievement of a more just society.

Typically offered in Fall and Summer
SW 506 Human Behavior and the Social Environment: Individuals, Families, and Groups (3 credit hours)
An overview of normative individual and family development trajectories through the life cycle and survey of major theoretical frameworks and normative development variations: Theories of individual, familial, and group interaction and ways that informal groupings and support networks function to maintain individual and family well-being and stability. Admission to the MSW program or permission of the instructor.

Typically offered in Fall only

SW 510 Research Methods for Social Work (3 credit hours)
Social work research methods, interpretation of empirical research findings within the context of social work practice. Major activities include 1) identification of the steps of the research process, 2) utilization of mixed methodologies, 3) assessment of empirical research studies, and 4) discussion of human diversity and ethical issues in research design and implementation. Admission to the MSW Program and ST 311 or equivalent.

Prerequisite: ST 311
Typically offered in Spring only

SW 512/SW 412 Social Work in Schools (3 credit hours)
Models and roles relevant to school social work practice. Cooperative work with school personnel in the identification, prevention and treatment of social, emotional and behavioral problems of children and interventive techniques with parents and community groups. For individuals preparing for social work practice in the public schools and for school social workers seeking licensure. Credit not given for both SW 412 and SW 512.
Instructor Permission Required.

Typically offered in Fall and Spring

SW 515/SW 415 Child Welfare (3 credit hours)
Generalist perspective on the practice of public child welfare. History of child welfare, practices in child welfare, and current trends in child welfare programs. Skills needed to practice in child protective services, adoption, and foster care with specific attention to the North Carolina child welfare system. Application of cultural diversity and cultural competency integrated throughout as it relates to child welfare issues.

Prerequisite: SW 201
Typically offered in Fall, Spring, and Summer

SW 516/SW 416 Addiction Recovery and Social Work Practice (3 credit hours)
Knowledge and skills in identifying Alcohol and Other Drugs (AOD) problems, screening, assessment, intervention, referral, and prevention: history of AOD problems and treatment, AOD classification, effects and signs/symptoms of AOD, models of addiction, diversity, assessment, diagnosis, intervention, treatment modalities, mutual-help groups, family dynamics, prevention, and ethical considerations. Students cannot receive credit for both SW 416 and SW 516.

Prerequisite: SW 310
Typically offered in Fall, Spring, and Summer

SW 517/SW 417 Direct Practice with Older Adults (3 credit hours)
Physical, psychological, social, and cultural theories of the aging process as it relates to social work practice, social policy, and services for working with older adults and their families. Emphasis on mental and physical well-being, diversity, social and economic justice, intergenerational issues, policy and programs. Credit is not allowed for both SW 417 and SW 517.

Typically offered in Fall and Spring

SW 518 Child Welfare Seminar (1 credit hours)
Best practice seminar for participants in the NC Child Welfare Education Collaborative Program. Seminars focus on current issues in child welfare practice and policy. Topics vary from semester to semester. Students arrange own transportation for occasion

Typically offered in Fall and Spring

SW 519 Evaluation of a Social Work Intervention (2 credit hours)
Second of three courses in social work research. Evaluating social work practice and health and human services programs within different research paradigms. Prepares students for collecting, analyzing, and reporting qualitative and quantitative data; includes laboratory experience. Restricted to students who have completed all foundation courses in the MSW program.

P: SW 505 & SW 510
Typically offered in Fall only

SW 520 SW Generalist Practice I (3 credit hours)
Provides the foundation knowledge and skills needed to engage and assess individuals, families and groups. Examines underlying theories and models of research-informed practice and evidence-based social work interventions with particular emphasis on the ecological systems model from a strengths perspective. Presents the phases and dynamics of change in interpersonal helping relationships within a framework of human rights, social justice, and diversity. Restricted to students admitted to the MSW program.

C: SW 505 and SW 651
Typically offered in Fall only

SW 521 SW General Practice II (3 credit hours)
Prepares students for Social Work practice within organizations, communities and policy structures. Emphasizes multiculturalism, diversity, and social justice in relation to social systems. Restricted to students admitted to the MSW program.

P: SW 505 & SW 520; C: SW 652
Typically offered in Spring only

SW 523/SW 423 Social Work with Soldiers, Veterans, and Their Families (3 credit hours)
A basic overview of military life and the issues and challenges faced by military personnel, their families, friends, and community. The course provides a foundational guide to help professionals working with military families and to understand and address these issues and challenges.

R: Junior or Senior standing. Sophomores and Non-Degree may enroll with instructor approval.
Typically offered in Fall and Spring
SW 524 Portrayals of Social Welfare in Urban Life (3 credit hours)
This course provides an in-depth analysis of social policy development in the urban context and the multi-dimensional nature of environments, communities, and individuals. Popular media (newspaper and journal articles, film, television, and textbooks) will proxy as a microcosm of contemporary social welfare problems and purported solutions. Following an ethical and social justice paradigm, this course will examine the portrayals of the urban experience and the attendant social problems of life (crime, drugs, economic bifurcation, educational system, and the media) in an economically depressed or struggling major metropolitan area.

Typically offered in Fall, Spring, and Summer

SW 525/SW 425 Hunger and Homelessness (3 credit hours)
This course will familiarize students with the history and experience of hunger and homelessness in contemporary American society. The course includes discussion, narrative readings, experiential exercises, movie reviews, field trips, and other media to expose students to issues of food insecurity and housing instability. Students will critique ideas of what it means to be "poor" and be exposed to the lives of individuals who do not have access to adequate food, housing, healthcare, and other basic needs. American social welfare policy, including governmental and local programs that address these issues, will be discussed. Students are responsible for transportation.

Restricted: Junior or Senior Standing. Sophomores and Non-Degree Students may enroll with instructor approval.

GEP U.S. Diversity
Typically offered in Fall and Spring

SW 540/SW 440 International Learning Experience in Social Work (6 credit hours)
A seven week learning experience in Guatemala. Through this course, the student will develop a global perspective of social welfare and social work practice, will learn about the people and culture of the Lake Atitlan area of Guatemala, will learn the variety of resources available in response to social need, and will enhance or develop Spanish language competence. All costs associated with learning opportunities and activities for this course are included in the cost of the program.

GEP Global Knowledge
Typically offered in Summer only

SW 550 Advanced Social Work Practice with Families (3 credit hours)
Theories, concepts, and skills needed for practice with diverse, at-risk family populations. Includes overview of historical and current social work approaches to family intervention as well as skill development in contemporary intervention methods. Focuses on understanding families within their cultural and community contexts, and presents several family intervention models useful for helping families build on their strengths to cope with a variety of family constellations, changes, and challenges.

Prerequisite: SW 652, Corequisite: SW 654
Typically offered in Spring only

SW 551 Social Work Practice with Children and Adolescents (3 credit hours)
Focuses on assessment and intervention strategies for clinical practice with children and adolescents. Explores issues common to these client groups.

Prerequisite: SW 521 and SW 652
Typically offered in Fall only

SW 557 SW Program Development and Grant Writing (3 credit hours)
This course provides a comprehensive introduction to program development and grant writing in social work. The course examines the major steps in the process including problem identification, needs assessment, program planning, and resource identification and development. It is designed to provide a hands-on approach to developing grant writing and other resource development skills. Restricted to students who have completed all foundation courses in a related graduate program.

Typically offered in Spring and Summer

SW 560 Advanced Policy Practice with Organizations and Communities (3 credit hours)
Second of two courses on social policy. Examines how social workers collaborate with organizations and communities to intervene in social policy. Strategies for policy practice include values clarification, legislative advocacy, analytic advocacy, and implementation advocacy. These strategies build upon concepts and skills from community development, social planning, and community organizing. Emphasis is given to working with economically disadvantaged and historically disempowered communities. Restricted to students who have completed all foundation courses in the MSW program.

Prerequisite: SW 501 & SW 521
Typically offered in Spring and Summer

SW 561 Social Work Administration and Supervision (3 credit hours)
Addresses the theoretical frameworks and functions of managing human service organizations. Explores personal and professional values and ethical dilemmas in exercising leadership in the management of culturally diverse community groups, boards and committee meetings. Issues of staff development, team building, group decision-making, problem solving strategies, legal structure, governance, funding, accountability systems, and human resources will be discussed. Restricted to students who have completed all foundation courses in the MSW program.

Prerequisite: SW 521 & SW 652
Typically offered in Fall and Summer

SW 571 Community Mental Health (3 credit hours)
Focuses on social work practice in the field of Mental Health. Reviews policy and practice as it pertains to the promotion of mental health, the prevention of mental illnesses, and the delivery of psychosocial treatment. Strategies and practice for use at the individual, family, group, organizational, community, and societal levels are explored. Master of social work required.

Prerequisite: SW 691

SW 580 Social Work Professional Seminar (4 credit hours)
Capstone course taken in the final semester of the MSW program intended to help students integrate all coursework in preparation for graduation and professional practice. Directs students to apply promising practices to their professional work and

Prerequisite: SW 653
SW 581  Advanced Social Work Practice with Individuals  (3 credit hours)
Prepares the student for advanced generalist practice with individuals who are experiencing a range of complex life challenges. Focus on traditional and emerging social work practice theories used by social workers to assist individuals in experiencing

Prerequisite: SW 521 and SW 652
Typically offered in Fall only

SW 582  Advanced Social Work Practices with Groups  (3 credit hours)
Focuses on advanced social work practice with groups. Uses ecological systems and empowerment perspectives to explore major theories of social work practice with groups. Critical examination of contemporary issues in designing and evaluation group inter

Prerequisite: SW 521 and SW 652; Corequisite: SW 653
Typically offered in Fall only

SW 583  Advanced Social Work Practice with Family Systems  (3 credit hours)
Theories, concepts, and skills needed for practice with diverse, at-risk families. Overview of historical and current social work approaches to family intervention as well as skill development in contemporary methods. Focuses on understanding families within their cultural and community contexts and presents several family intervention models useful for helping families build on their strengths to cope with a variety of family constellations, changes, and challenges experienced throughout their lifespan. Restricted to students who have completed all foundation courses in the MSW program.

Prerequisite: SW 521 and SW 652; Corequisite: SW 654
Typically offered in Spring only

SW 590  Social Work Capstone  (2 credit hours)
Integration of ecological systems and empowerment perspectives with concepts of intersectionality and covert and overt oppression in group and organizational life leading to design and implementation of a capstone project reflecting mastery of all curri

Typically offered in Spring only

SW 595  Special Topics in Social Work  (3-6 credit hours)
In-depth exploration of specialized or emerging topics in social work or social welfare. Topic of current interest and mode of study determined by faculty member. Also used to test and develop new courses.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

SW 630  Independent Study in Social Work  (1-3 credit hours)
An independent study addressing an area of social work practice or social welfare.

Prerequisite: Master of Social Work, SW 510
Typically offered in Fall, Spring, and Summer

SW 651  Social Work Field Internship I  (5 credit hours)
First course in a two-course foundation sequence that provides students the opportunity to use generalist practice social work skills in a field agency under the supervision of an MSW social work practitioner.

C: SW 505 & SW 520
Typically offered in Fall only

SW 652  Social Work Field Internship II  (5 credit hours)
Second course in a two-course foundation field internship sequence that provides students the opportunity to use generalist practice social work skills in a field agency under the supervision of an MSW social work practitioner.

Prerequisite: SW 520 and SW 651. Corequisite: SW 521
Typically offered in Spring only

SW 653  Advanced Social Work Field Internship I  (5 credit hours)
First course in the advanced field internship sequence that provides students the opportunity to use advanced generalist practice social work in a field agency under the supervision of an MSW social work practitioner.

C: SW 512 or 557 or 561 or 581 or 582
Typically offered in Fall only

SW 654  Advanced Social Work Field Internship II  (5 credit hours)
Second course in the advanced field internship sequence that provides students the opportunity to use advanced generalist practice social work skills in a field agency under the supervision of an MSW social work practitioner.

Prerequisite: SW 653; Corequisite: SW 560 or SW 561 or SW 583 or SW 590
Typically offered in Spring only

Sociology (SOC)

SOC 202  Principles of Sociology  (3 credit hours)
Introduction to sociology. Analyses of key processes and institutions including interaction, inequality, organization, socialization, and social change. Addresses experiences and outcomes of diverse groups in U.S. society. Includes core sociological concepts, methods, theories.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

SOC 203/SOC 203A  Current Social Problems  (3 credit hours)
Examination of social problems linked to structures of economic, political, gender and racial inequality; including poverty, disease, racism, sexism, unemployment, psychological distress, educational failure, environmental destruction and violence. Possible solutions viewed from a variety of perspectives. Includes core sociological concepts, methods and theories.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

SOC 203A/SOC 203  Current Social Problems  (3 credit hours)
Examination of social problems linked to structures of economic, political, gender and racial inequality; including poverty, disease, racism, sexism, unemployment, psychological distress, educational failure, environmental destruction and violence. Possible solutions viewed from a variety of perspectives. Includes core sociological concepts, methods and theories.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

SOC 204/WGS 204  Sociology of Family  (3 credit hours)
Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer
Typically offered in Fall, Spring, and Summer

GEP Social Sciences

SOC 205 Jobs and Work (3 credit hours)
Work experience in terms of intrinsic and extrinsic rewards for worker. Work experience as intersection of occupation, industry, organization, region, and time period. Research skills for comparing job options to individual goals. Includes core sociological theories, concepts and methods.

GEP Social Sciences
Typically offered in Fall and Spring

SOC 206 Social Deviance (3 credit hours)
Social processes in the creation and maintenance of deviant populations: classification, objectification of social meanings, functions of deviant groups and social outcomes of the deviance-ascrption process. Includes core sociological concepts, methods, theories.

GEP Social Sciences
Typically offered in Fall, Spring, and Summer

SOC 207 Language and Society (3 credit hours)
Introduction to the intersections of language, society and the individual, and the role of language in social interaction, socialization, ideologies, inequality and social change. Focus on language variation related to race, class, gender, and other social identities. Includes core sociological and sociolinguistics concepts, methods, theories.

GEP Interdisciplinary Perspectives, GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

SOC 211 Community and Health (3 credit hours)
Course introduces students to the fields of community sociology and population health. It focuses on how structural characteristics of communities influence health disparities, as well as the sociocultural, economic, political, and environmental determinants of physical and mental health and well-being.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

SOC 212 Race in America (3 credit hours)
Introduction to race and racism in the United States. Analysis of the key role that racism has played in US history and how racism has shaped opportunities and outcomes for people living in the US.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

SOC 220/GEO 220 Cultural Geography (3 credit hours)
Investigates the world’s past and present cultural diversity by studying spatial patterns of population, language, religion, material and non-material culture, technology and livelihoods, communities and settlements and political organization and interaction.

GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

SOC 241/SOC 241A Sociology of Agriculture and Rural Society (3 credit hours)
Application of sociological concepts, methods, theories and styles of reasoning to major social problems facing rural America. Changing structure of agriculture; social impact of agricultural technology; rural community growth and decline; rural industrialization, rural poverty, natural resources and environmental issues in rural America. Includes core sociological concepts, methods, theories.

GEP Social Sciences
Typically offered in Fall and Spring

SOC 241A/SOC 241 Sociology of Agriculture and Rural Society (3 credit hours)
Application of sociological concepts, methods, theories and styles of reasoning to major social problems facing rural America. Changing structure of agriculture; social impact of agricultural technology; rural community growth and decline; rural industrialization, rural poverty, natural resources and environmental issues in rural America. Includes core sociological concepts, methods, theories.

GEP Social Sciences
Typically offered in Fall and Spring

SOC 261/ANT 261 Technology in Society and Culture (3 credit hours)
Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks in U.S. and non-U.S. societies associated with technological innovations. Special attention to the role of scientists and engineers in socio-cultural change. Topical case studies apply course concepts and principles. Core sociological and anthropological concepts, methods, theories.

GEP Global Knowledge, GEP Interdisciplinary Perspectives, GEP Social Sciences
Typically offered in Fall, Spring, and Summer

SOC 295 Special Topics in Sociology (1-3 credit hours)
Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

Typically offered in Fall, Spring, and Summer

SOC 300 Social Research Methods (4 credit hours)
Basic methods of social research, research design, sampling, data collection, measurement, and analysis; the relationship between theory and research. Laboratory exercises on computer applications.

P: SOC 202 ; C: ST 311
GEP Social Sciences
Typically offered in Fall, Spring, and Summer

SOC 301 Human Behavior (3 credit hours)
The development of personality as a consequence of social interactions and behavior of individuals in social contexts. Processes of learning, socialization, social perception, organization, stability and change of attitudes, norms, norm-formation and conformity, social roles and role strain, interpersonal attraction, and intergroup and intragroup relations.

P: 3 credits in 200-level SOC
GEP Social Sciences
Typically offered in Fall and Spring
SOC 304/WGS 304  Gender and Society  (3 credit hours)

P: 3 credits in SOC at the 200-level
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

SOC 305/AFS 305  Racial and Ethnic Relations  (3 credit hours)
Study of the nature of the relationships among racial and ethnic groups in societies around the world but with emphasis on the United States. Explores topics such as inequalities of wealth, power, and status, racism, conflict, and social boundaries among groups. Current trends in intergroup relations are discussed.

Prerequisite: 3 cr. in SOC, 200 level
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

SOC 306  Criminology  (3 credit hours)
Study of processes whereby behavior is defined as crime and persons are identified as criminals. Includes a sociological investigation of agencies of law enforcement, adjudication, corrections and prevention; patterns of criminal behavior; explanations of variations in criminality with emphasis on sociocultural and sociopsychological theories.

Prerequisite: 3 cr. in SOC, 200 level
GEP Social Sciences
Typically offered in Fall and Spring

SOC 309/REL 309  Religion and Society  (3 credit hours)
Religious beliefs, practices and organizations addressed as social phenomena. Structural functionalism, conflict and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religions to family, government, and economy and to social divisions, conflict and change.

P: 3 credits in SOC at the 200 level
GEP Humanities, GEP Social Sciences
Typically offered in Fall and Spring

SOC 311  Community Relationships  (3 credit hours)
Institutions, organizations and agencies found in modern communities; social problems and conditions with which they deal; their interrelationships and trends toward comprehensive planning.

Prerequisite: 3 cr. in SOC, 200 level
GEP Social Sciences
Typically offered in Fall and Spring

SOC 342  International Development  (3 credit hours)
Sociological explanations of global patterns of development, with an emphasis on how the global political economy has evolved over time and how this contributes to social, economic, and environmental changes. Focus on the Global South in particular. Contemporary issues (such as migration and global food insecurity) will be included.

P: 3 credits in 200-level SOC
GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

SOC 350  Food and Society  (3 credit hours)
Relationships among individuals, groups, and organizations in the production, consumption, and distribution of food. Influences of gender, class, race, and ethnicity. Impacts of laws and regulations, markets, and social movements.

Prerequisite: 3 credits of a 200-level Sociology
GEP Social Sciences
Typically offered in Spring only

SOC 351  Population and Planning  (3 credit hours)

Prerequisite: 3 credits in SOC at the 200 level
GEP Global Knowledge, GEP Social Sciences
Typically offered in Fall only

SOC 381  Sociology of Medicine  (3 credit hours)
Use of theory and empirical studies to understand the social etiology of disease health practices, practitioners, and institutions, and the special area of mental health. Historical as well as contemporary examples of social influences on, and effects of, health throughout the world, but especially in the United States. Core sociological concepts, methods, theories.

Prerequisite: 200 level Sociology
GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

SOC 395  Special Topics in Sociology  (1-3 credit hours)
Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis. This course is repeatable innumerable times as long as a different topic is addressed each time.

Prerequisite: 3 credits of a 200-level Sociology
Typically offered in Fall, Spring, and Summer

SOC 400  Theories of Social Structure  (3 credit hours)
Contributions of Durkheim, Marx, Weber and others to contemporary macro-level sociological theories. Origins and development of functionalist and conflict approaches. Theories of social solidarity, class structure, the state, bureaucratization, ideology. Uses of original works.

Prerequisite: 3 cr. in SOC, 200 level
Typically offered in Fall and Spring

SOC 401  Theories of Social Interaction  (3 credit hours)
Contributions of Weber, Simmel, Mead, Homans, Goffman and others to contemporary micro-level sociological theories. Origins and development of symbolic interaction, ethnemethodology, exchange theory and dramaturgy. Theories of the self, social construction of reality, emotions, interpersonal relationships. Interrelationship of theory and research; use of original works.

Prerequisite: 3 cr. in SOC, 200 level
Typically offered in Fall, Spring, and Summer

SOC 402  Urban Sociology  (3 credit hours)
Urban social structures emphasizing determinants and consequences of changes in urban places and life styles. Current urban problems and various approaches to urban social planning.

Prerequisite: SOC 300
SOC 404 Families and Work (3 credit hours)
Sociological analysis of the interplay between economy and family. How men and women make decisions regarding work and family. Theory and research techniques appropriate to the student of work/family conflicts.
Prerequisite: SOC 200 level, SOC 300
Typically offered in Spring only

SOC 405 Racism in the U.S. (3 credit hours)
The course will examine the nature of racism in American society and its correlates: prejudice, discrimination, racial conflict, and racial oppression. Emphasis on the history and development of racism in the U.S. as well as its impact on minority groups. Sociological explanations for the emergence and continuation of racism.
Prerequisite: SOC 300

SOC 407/WGS 407 Sociology of Sexualities (3 credit hours)
Prerequisite: 3 hours SOC 200 level, 300 level
Typically offered in Fall only

SOC 410 Sociology of Organizations (3 credit hours)
Application of sociological theories to study of organizational structures and processes. Special attention to control and coordination, relations with other organizations, and decision making.
Prerequisite: 3 cr. in SOC, 200 level, SOC 300

SOC 413 Criminal Justice Field Work (4 credit hours)
Supervised observation and experience in a criminal justice agency. Study of relationships between ongoing programs and relevant political and sociological theory and research. Weekly seminars, small groups and individual conferences. Presentation of an integrative report.
Prerequisite: SOC 306 and PS 305, Senior standing in Criminal Justice option
Typically offered in Fall, Spring, and Summer

SOC 414 Social Class (3 credit hours)
The universality of social inequality, its bases and consequences. Relationship of social inequality to social class, life chances, life styles and social mobility. Theories and research methods pertinent to the study of social class.
Prerequisite: SOC 300

SOC 418 Sociology of Education (3 credit hours)
Prerequisite: SOC 300
Typically offered in Fall only

SOC 425 Juvenile Delinquency (3 credit hours)
Prerequisite: 3 cr. in SOC 200-level; SOC 300
Typically offered in Fall and Spring

SOC 427 Sociology of Law (3 credit hours)
Sociological concepts, theories and research of law as social control. Social forces behind the creation, maintenance and application of law in American Society.
Prerequisite: 3 cr. in SOC 200-level; SOC 300
Typically offered in Fall only

SOC 428 Formal Institutions of Social Control (3 credit hours)
Development, structure and behavior of formal institutions of social control in the United States (police, courts, corrections); divergent philosophies of punishment that guide the juvenile and adult criminal justice system, dimensions of inequality that influence processing decisions and effectiveness of formal institutions in controlling violations of legal norms.
Prerequisite: 3 hours SOC 200 level; SOC 300
Typically offered in Spring only

SOC 432/PS 432 Violence, Terrorism, and Public Policy (3 credit hours)
The course examines interpersonal and group violence in contemporary societies and the causes for its occurrences. Specific forms of violence that will be examined include domestic violence, gangs, homicide, and terrorism, domestically and internationally. Throughout the course students will use data to critically evaluate policies and practices to prevent and control violence and will examine potential solutions to the problems of violence.
Prerequisite: SOC 300 or PS 371
Typically offered in Fall and Spring

SOC 434/PS 434 Social Change (3 credit hours)
Sources, processes and consequences of social change on macro and micro levels. Applications of classical and contemporary theories to historical and modern examples of social change in international, national, regional, community, and institutional settings. Examples of empirical studies and appropriate methodologies for each level of analysis.
Prerequisite: 3 cr. in SOC, 200 level; SOC 300
Typically offered in Spring only
**SOC 445 Inequality, Ideology, and Social Justice** (3 credit hours)
Systematically addresses the question of why people believe what they do about the legitimacy of inequality; explores the role of self-interest, secular and religious values, considers specific types of ideology such as meritocracy, racism, sexism, colonialism; applies various theories to explain patterns of belief; looks at the role of media and propaganda in shaping beliefs.
Prerequisite: 3 hours of 200-level SOC and SOC 300
Typically offered in Fall only

**SOC 450 Environmental Sociology** (3 credit hours)
Systematic relations between natural environment and human societies. Dependency on the natural world. Population technology, cultural and economic influences on ecosystems. Development of environmentalism and alternative models for understanding threats and potentials. current environmental issues and considerations of their global contexts.
Prerequisite: 3 hours of 200-level SOC and SOC 300
Typically offered in Fall only

**SOC 457 Corporate Power in America** (3 credit hours)
Examines the nature, distribution, and exercise of power in U.S. society. Emphasizes corporate power and its relationship to government. Topics include membership in the upper class and the power elite, media and shaping of public opinion, the culture of politics, formation of political consciousness, and the emergence of oppositional and reactionary social movements.
Prerequisite: (SOC 202 or SOC 203) and SOC 300
Typically offered in Spring only

**SOC 465 Social Aspects of Mental Health** (3 credit hours)
A survey of the role of social environment and life experiences in mental health and mental disorder, focusing on the link between social inequality and emotional inequality. Topics include the social construction of mental illness and the classification process, social distribution of mental health, explanations of mental health differences. Special emphasis on adolescent and adult traumas that shape the life course.
Prerequisite: SOC 300
Typically offered in Spring only

**SOC 492 External Learning Experience** (1-6 credit hours)
A learning experience in sociological research that utilizes facilities and resources which are external to the campus. Students are placed with organizations to apply sociological concepts in planning or conducting a research project. Contact the Sociology.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

**SOC 493 Special Problems in Sociology** (1-6 credit hours)
A learning experience in sociological research that utilizes campus facilities and resources. Arrangements must be initiated by the student and approved by the instructor prior to the experience. Contact the Sociology & Anthropology undergraduate coordinator.
Prerequisite: Sophomore standing
Typically offered in Fall, Spring, and Summer

**SOC 495 Special Topics in Sociology** (1-3 credit hours)
Offered as needed to present materials not normally available in regular course offerings or for new courses on a trial basis.

**SOC 498 Independent Study in Sociology** (1-6 credit hours)
A detailed investigation of a topic in sociology. Topic and mode of study determined by the faculty member(s) in consultation with the department head. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled." 
Prerequisite: Six hours SOC above the 200 level
Typically offered in Fall, Spring, and Summer

**SOC 508 Social Organization** (3 credit hours)
Introduction to study of social structure. Focus on inequality, work, organizations, the economy, the state. Classic writings and their impacts.
Prerequisite: SOC 400 or SOC 701

**SOC 509 Population Problems** (3 credit hours)
Examination of population growth, rates of change and distribution. Emphasis on functional roles of population, i.e., age, sex, race, residence, occupation, marital status and education. Stress on population dynamics fertility, mortality and migration. Analysis on population policy in relation to national and international goals stressing a world view.
Prerequisite: SOC 202

**Sociology (SOC)**

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**SOC 2080 Special Topics in Sociology**

**SOC 2090 Special Problems in Sociology**

**SOC 2091 The Community**

**SOC 2270 Developing Societies**

**SOC 2280 Population Problems**

**SOC 2290 Corporate Power in America**

**SOC 2300 Social Aspects of Mental Health**

**SOC 2310 Inequality, Ideology, and Social Justice**

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**SOC 501 Independent Study in Sociology** (1-3 credit hours)

**SOC 502 Social Organization** (3 credit hours)

**SOC 503 Social Structure** (3 credit hours)

**SOC 504 Social Movements** (3 credit hours)

**SOC 505 Social Change** (3 credit hours)

**SOC 506 Social Control** (3 credit hours)

**SOC 507 Social Process** (3 credit hours)

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**SOC 601 Independent Study in Sociology** (1-3 credit hours)

**SOC 602 Seminar** (1-3 credit hours)

**SOC 603 Special Topics in Sociology** (1-3 credit hours)

**SOC 604 Special Problems in Sociology** (1-3 credit hours)

**SOC 605 The Community** (3 credit hours)

**SOC 606 Developing Societies** (3 credit hours)

**SOC 607 Population Problems** (3 credit hours)

**SOC 608 Social Aspects of Mental Health** (3 credit hours)

**SOC 609 Social Aspects of Mental Health** (3 credit hours)

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**SOC 609A Independent Study in Sociology** (1-3 credit hours)

**SOC 609B Seminar** (1-3 credit hours)

**SOC 609C Special Topics in Sociology** (1-3 credit hours)

**SOC 609D Special Problems in Sociology** (1-3 credit hours)

**SOC 609E The Community** (3 credit hours)

**SOC 609F Developing Societies** (3 credit hours)

**SOC 609G Population Problems** (3 credit hours)

**SOC 609H Social Aspects of Mental Health** (3 credit hours)
SOC 642 Practicum In Sociology  (1-6 credit hours)
Opportunity for student under supervision of graduate advisory committee chair and organization/agency supervisor to develop and demonstrate competency in the area of graduate specialization through application of sociological knowledge to practicalprob
Prerequisite: Graduate standing in the Master of Sociology program and nine hrs. of SOC at the 500-600 level
Typically offered in Fall, Spring, and Summer

SOC 685 Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

SOC 690 Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam. Credits Arranged
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

SOC 693 Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

SOC 695 Master's Thesis Research  (1-9 credit hours)
Thesis Research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

SOC 696 Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

SOC 699 Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits arranged
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

SOC 701 Classical Sociological Theory  (3 credit hours)
The interdependence of theory and research in sociology; major theoretical classics in the discipline and how they provide foundations for subsequent developments and for analysis in substantive areas.
Requisite: Admission to SOC Graduate Program
Typically offered in Fall only

SOC 702 Contemporary Sociological Theory  (3 credit hours)
Works by major figures representing leading schools of sociological theory in the post-World War II period studied as primary sources. Underlying assumptions made explicit, the structure of the theory, including propositions, examined critically and discussion of relationships with other theoretical perspectives.
Prerequisite: SOC 701

SOC 705 Historical Materialism Approaches to Social Theory  (3 credit hours)
This sociological theory course will cover the development of Marxist social thought from the 19th century to the present. We will explore themes, arguments, and debates during this era, concentrating on theoretical developments and syntheses in the historical materialist traditions, and explore their relevance and application for sociological research. Issues and topics will be broadly organized around theories of class, gender, race, power, ideology, culture, capitalist development, science, social crises, social change, and social justice.
Typically offered in Spring only

SOC 707 Quantitative Sociological Analysis  (3 credit hours)
Introduction to application of common quantitative methodologies in sociology including multiple regression and path analysis. Emphasis on selecting appropriate analytical techniques, model estimation and sociological interpretation of findings.
Prerequisite: Graduate standing
Typically offered in Spring only

SOC 708 Advanced Sociological Analysis  (3 credit hours)
Examination of advanced analysis techniques adaptable to needs of sociological research. Special attention given to causal analysis, analysis of change and aggregate versus individual level data analyses. Consideration of sociological examples. Attention to emerging issues and techniques.
Prerequisite: SOC 711, ST 507 or ST 711
Typically offered in Fall only

SOC 710 Teaching Sociology  (3 credit hours)
The objective of this course is for students to further their skills in teaching sociology. Students will plan an undergraduate course, construct a teaching philosophy, evaluate a variety of teaching techniques, and demonstrate an understanding of teaching as a sociological phenomenon.
Prerequisite: Admission to sociology graduate program
Typically offered in Spring only

SOC 711 Research Methods In Sociology I  (3 credit hours)
Issues in philosophy of science, causation, relationship of theory and research. Qualitative, experimental and survey design methodologies.
Requisite: Admission to SOC Graduate Program
Typically offered in Spring only

SOC 712 Advanced Survey Research Methods  (3 credit hours)
Advanced survey methodology including research design, sampling, questionnaire development and surveys using the World Wide Web. Designing and executing substantive and methodological studies using surveys to pereralize behavioral and social constructs and to test hypotheses.
Prerequisite: SOC 711 and SOC 707
Typically offered in Spring only
SOC 713 Applied Research (3 credit hours)
Studies research process with emphasis upon its application to action problems. Stress upon development of research design to meet action research needs.
Prerequisite: Admission to SOC Graduate Program
Typically offered in Fall only

SOC 715 Qualitative Sociological Methods and Analysis (3 credit hours)
Survey of qualitative sociological research methods. Practice in research design and evaluation, multiple forms of data gathering and data analysis. Theoretical and epistemological issues as related to qualitative sociology, with special attention to ritual and feminist epistemological debates.
Prerequisite: Graduate standing
Typically offered in Fall only

SOC 721 Deviant Behavior (3 credit hours)
Topics include: the inevitability of deviance and its social utility; cross-cultural variations in appearance and behavioral cues for labeling the deviant; descriptive and explanatory approaches to kinds and amounts of deviance in contemporary American society; social change, anomie and social disorganization theories; the process of stigmatization; formal and informal societal responses to deviance and the deviant; social action implications.
Prerequisite: Six hrs. SOC or ANT or Graduate standing or PBS status

SOC 722 Social Control (3 credit hours)
Examination of need, functions, utilization and effects of both informal and formal social control mechanisms. Emphasis and critical evaluation of theoretical perspectives on social control and the empirical support for these positions.
Prerequisite: Six hrs. SOC above 200 level or Graduate standing or PBS status

SOC 723 Research On Crime and Deviance (3 credit hours)
Major topics including an examination of conceptual problems and research issues and methods in study of crime and deviance; an assessment of current research on crime causation and deviance processes; an examination of research on social control processes and agencies; and an assessment of social action and evaluative research. A variety of substantive topics dealt with in the context of above topical areas including: delinquency, drug usage, mental illness, obesity, stuttering, suicide, prostitution, homicide and rape.
Prerequisite: SOC 721

SOC 725 Gender and Crime (3 credit hours)
This seminar will provide an overview of the literatures on gender, crime and violence. The course framework and readings emphasize the social structures of gender, social constructions of gender, symbolic meaning systems, and intersections of race, class and gender. We will examine theoretical approaches and empirical research that informs our understanding of the gendered commission of offending.
Typically offered in Fall and Spring

SOC 727 Comparative Societies (3 credit hours)
Sociological analysis of societies around the world with particular reference to North and South America. Special emphasis given to cultural and physical setting, population composition, levels of living, relationship of the people to the land, structure and function of major institutions and forces making for change.
Prerequisite: Six hrs. SOC

SOC 731 Survey of Family Sociology (3 credit hours)
Examination of structural and demographic continuities and changes for American families in general and within major subgroups (e.g., race, ethnicity, social class). Consideration of historical and cross-cultural comparisons. Assessment of the impact of families upon their members and the dynamics of marital and family relationships.
Prerequisite: Graduate standing
Typically offered in Fall only

SOC 732 Contemporary Family Theory and Research (3 credit hours)
Emphasis on contemporary research, theory and methodological techniques used by sociologists studying families. Critical examination of where field is now and where it appears to be heading. Primarily for graduate students designing or doing research about families.
Prerequisite: SOC 731

SOC 736 Social Stratification (3 credit hours)
The theoretical background, methodological approaches and analysis of the consequences of systems of stratification. Emphasis on static and dynamic qualities of stratification systems on relations within and between societies. Attention to the integrative and divisive quality of stratification as expressed in life styles, world views, etc.
Requisite: Admission to SOC Graduate Program
Typically offered in Fall only

SOC 737/WGS 737 Sociology Of Gender (3 credit hours)
Theories about the development and maintenance of gender. Historical development of gender stratification. How individuals "do gender" in their daily lives. Contemporary research and substantive readings about gender in public and intimate relation
Prerequisite: Graduate student, SOC 736 or 731
Typically offered in Fall only

SOC 738 Race and Ethnic Inequality (3 credit hours)
Theoretical and methodological approaches and critical debates on race. Impact of racial discrimination on inequality. Effects of inequality on community institutions. Formation of attitudes and identities.
Requisite: Admission to SOC Graduate Program
Typically offered in Spring only

SOC 739/WGS 739 Social Psychology Of Inequality (3 credit hours)
The effects of race, class and gender inequality on the formation of group consciousness, self-evaluations, emotions, values, attitudes and beliefs. Attention to interpersonal processes through reproduction of inequality in everyday life.
Requisite: Admission to SOC Graduate Program
Typically offered in Spring only
SOC 746 Sociological Social Psychology (3 credit hours)
Central issues in sociological social psychology, including formation of the self, effects of social structure on individual development, emergence of ritualized interaction and tension between individual agency and societal constraint. Emphasis on symbolic interactionist and dramaturgical perspectives.
Prerequisite: SOC 401

SOC 752 Work and Industry (3 credit hours)
Control of economy and workplace. Special attention to economic restructuring, the labor process and recent workplace innovations. Theories include managerialism, bank hegemony and deskilling. Historical studies complement analyses of contemporary settings and issues.
Prerequisite: SOC 400 or SOC 508 or SOC 701

SOC 753 Inequality in Work and the Economy (3 credit hours)
Sociological study of structural inequality in labor markets and workplaces with implications for class, race, gender, and spatial disparities in employment-related outcomes. Special attention is paid to job quality, spatial disparities in employment opportunity, and processes contributing to race and gender disparities in job attainment and rewards.
Prerequisite: SOC 701
Typically offered in Spring only

SOC 754 Economic Sociology (3 credit hours)
Embeddedness of economic action by individuals, firms, and states within a social context. Topics include globalization, restructuring, the informal economy, social capital, spatial organization, labor markets and role of the state.
Prerequisite: SOC 701
Typically offered in Spring only

SOC 755 Global Institutions and Markets (3 credit hours)
This course introduces students to sociological and related perspectives on the dynamics of global production and consumption processes, focusing in particular on how they shape and are shaped by their organizational, political, cultural, and natural environments.
Prerequisite: Graduate standing
Typically offered in Spring only

SOC 761 Contemporary Debates in Food & Environment (3 credit hours)
This course will be organized around contemporary debates related to the intersections between food and race, class, and gender inequalities. We will focus largely on recent books on these topics, with attention to both their substantive findings as well as the methods and theory employed.
Prerequisite: Graduate standing
Typically offered in Spring only

SOC 762 Sociology of Food Systems (3 credit hours)
This course examines the social relations surrounding the production, distribution, and consumption of food. Sociologists of food display considerable diversity in their theoretical approaches, research methods, and empirical foci. This course will traverse social science research and theorizing to offer an analytic taste on what we eat, how we produce and procure it, who benefits, what we think about it, and how it fits with contemporary social life and institutions.
Prerequisite: Graduate standing
Typically offered in Fall only

SOC 763 Environmental Sociology (3 credit hours)
This is a survey course in environmental sociology. We begin with a discussion of the emergence and development of environmental sociology, followed by an overview of theoretical perspectives in the field. We then conduct a survey of topics that have typically been addressed in the area. These topics include: environmental concern and values, environmental health, environmental inequality, environmental movements, technological disasters, and global environmental issues. Throughout the course we survey theoretical concerns as they relate to various topics within the field.
Prerequisite: Graduate standing
Typically offered in Fall only

SOC 791 Special Topics In Sociology (1-6 credit hours)
An examination of current problems organized on a lecture-discussion basis. Course content varies as changing conditions require new approaches to emerging problems.
Typically offered in Fall, Spring, and Summer

SOC 810 Special Topics In Sociology (1-6 credit hours)
An examination of current problems organized on a lecture-discussion basis. Course content varies as changing conditions require new approaches to emerging problems.
Typically offered in Fall, Spring, and Summer

SOC 855 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

SOC 885 Doctoral Supervised Research (1-6 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

SOC 890 Doctoral Preliminary Exam (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

SOC 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

SOC 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
SSC 112 Principles of Soil Science (4 credit hours)
Fundamental soil physical and chemical properties and principles. Major lecture topics: soil description, formation, soil water and the hydrologic cycle, and soil fertility and fertilizers. Laboratory exercises in identifying soil horizons, determining soil texture, identifying nutrient deficiency symptoms in plants and interpreting soil fertility test reports. BROOME

SSC 151 Fertilizers and Soil Fertility (3 credit hours)
Principles of managing plant nutrients in soils for crop, turfgrass and other plant production; nutrient requirements; deficiency symptoms, nutrient availability in soils; soil acidity and liming; fertilizer materials; organic fertilizers; and environmental effects of fertilizers.

SSC 185 Land and Life (3 credit hours)
Soil is a fundamental natural resource that sustains life on earth. Detailed information is provided about soils at local, community, regional, national, and global scales; and their importance to world food security and human health, agricultural production, environmental quality, and sustainable ecosystems. Students will gain practical knowledge about soils, their use and management, and their critical role in supporting life. Understanding basic soil properties, their interactions, and how they are influenced or impacted by human activity is essential to everyday life and to being a well-informed citizen.

GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

SSC 200 Soil Science (3 credit hours)
Fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships and soil management.

Prerequisite: CH 101 or CH 100
GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

SSC 201 Soil Science Laboratory (1 credit hour)
Hands-on laboratory experience in fundamentals of soils including origin, composition and classification; their physical, chemical, and biological properties; significance of these properties to soil-plant relationships, soil management and the environment.

Corequisite: SSC 200
GEP Natural Sciences
Typically offered in Fall and Spring

SSC 332 Environmental Soil Microbiology (3 credit hours)
Analysis of the effects of soil environments on microbial growth. Relationships and significance of microbes to mineral transformations, plant development, and environmental quality. Management of soil microorganisms in different ecosystems.

Prerequisite: BIO 181 and SSC 200
Typically offered in Spring only

SSC 341 Soil Fertility and Nutrient Management (3 credit hours)
The course provides detailed information on plant nutrition, soil fertility, and management of essential plant nutrients and other amendments affecting plant growth and nutrition. The influence of numerous biological, physical, and chemical soil properties on plant nutrient availability will be emphasized. Students will be familiar with contemporary diagnostic tools to assess nutrient availability, and the soil and nutrient management technologies essential for enhancing soil and plant productivity while minimizing the impact of nutrient use on the environment.

Prerequisite: SSC 200
Typically offered in Fall, Spring, and Summer

SSC 342 Soil and Plant Nutrient Analysis (1 credit hours)
The course provides detailed information on (1) the chemical methods utilized in routine soil testing and plant analysis, (2) field soil sampling techniques, (3) nutrient recommendations, (4) nutrient response functions, and (5) nutrient management planning. Students gain essential experience in interpreting soil, plant, waste, and water analysis reports, and how these data are used in soil and crop management decisions. Course material will be presented in lecture and laboratory format.

Prerequisite: SSC 341
Typically offered in Fall and Spring

SSC 410 Soil Judging for Land Evaluation (1 credit hours)
Lecture and field-based course on describing, classifying, and interpreting soils in their natural setting. Topics will focus on a particular land region that will change each term. The course is in preparation for the regional soil judging contest in the Fall and the national soil judging contest in the Spring. Lectures explain land evaluation techniques and include soil morphology, genesis, and classification. Urban and agricultural applications will be considered. The course meets once per week for 8 weeks. Three field trips will be required and count as field work. The weekly meeting time is TBA. Students who complete the class have the option of participating in a regional, intercollegiate, Soil Judging Contest during each fall semester. Participation in the national contest during the spring semester depends on qualifying at the regional level the previous fall.

Prerequisite: SSC 200
Typically offered in Fall and Spring
SSC 421 Role of Soils in Environmental Management  (3 credit hours)
Importance of soils in land application of municipal, industrial and agricultural wastes; onsite disposal of domestic wastewater; bioremediation of contaminated sites; erosion and sedimentation control; farm nutrient management; and nonpoint source water pollution.
Prerequisite: SSC 200
Typically offered in Spring only

SSC 427 Biological Approaches to Sustainable Soil Systems  (3 credit hours)
Ecological and biochemical concepts will be applied to managing soils in agro-ecological settings such as organic and conventionally managed farms and gardens, emphasizing microbial transformations of nutrients and matter. Topics covered include soil organic matter formation and fractionation, decomposition, microbial assimilation of nutrients, fertilizer management, tillage, crop rotations, cover crop management. Companion course SSC 428 and SSC 341 recommended.
Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101
Typically offered in Fall only

SSC 428/HS 428 Service-Learning in Urban Agriculture Systems  (1 credit hours)
Course provides students a hands-on experience in urban agriculture with under-served youth in the Raleigh area. Students partner with a community gardening organization to provide knowledge and experience in soil science and agriculture to youth with the goals of increasing urban food security and developing student leadership skills. Particular emphasis is places on reflecting on course activities and deepening of skills related to extension, outreach, and working with diverse populations. Course designed to be taken as a companion course to SSC 427, however can be taken as a stand-alone course.
Prerequisite: SSC 200 or equivalent, BIO 181 or 183, and CH 101
Typically offered in Fall only

SSC 440/SSC 540 Geographic Information Systems (GIS) in Soil Science and Agriculture  (3 credit hours)
Geographic information systems (GIS), global positioning system (GPS), and remote sensing to manage spatially variable soils, vegetation, other natural resources. Develop: function understanding of GIS principles, working knowledge of ArcGIS, problem-solving/critical-thinking necessary to use GIS to characterize and manage soils, agriculture, natural resources. Introduction to GIS; Maps/Cartography; Vector/Raster Data Models; Georeferencing/Coordinate Systems; Spatial Data Sources; GPS/GPS skills/ Remote Sensing; Statistics/Interpolation; Precision Agriculture; Computer Aided Design and GIS; Creating Analyzing 3-D Surfaces. Credit not given for both SSC 440 and SSC 540.
Prerequisite: SSC 200
Typically offered in Fall and Spring

SSC 442 Soil and Environmental Biogeochemistry  (3 credit hours)
Quantitative approaches to the cycling of elements and chemical species in soils and the environment, including carbon and organic contaminants, non-metallic macronutrients, metals and metalloids.
Prerequisite: SSC 200 and (CH 101, or CH 201, or CH 220, or CH 221)
Typically offered in Spring only

SSC 452 Soil Classification  (4 credit hours)
Genesis, morphology, and classification of soils; characterization of soils according to their diagnostic properties; interpreting soil use potential; emphasis on North Carolina soils and their taxonomy; field exercise in soil mapping and site evaluation; several field trips, one overnight.
Prerequisite: SSC 200
Typically offered in Spring only

SSC 455 Soils, Environmental Quality and Global Challenges  (3 credit hours)
As the world population grows to 9 billion people by 2050, we will be pressed to increase food security, respond to the consequences of a changing climate, and improve human health -- all while protecting the environment and maintaining natural resources. Soils play a critical role in many of these challenges. The goal of this course is to teach students how soils regulate environmental quality through a host of chemical, physical and biological processes. We will examine a series of global challenges, assess their related environmental issues and policies, and analyse the roles of soils in each issue.
P: SSC 200 or ES 100 or Instructor permission
Typically offered in Fall only

SSC 461 Soil Physical Properties and Plant Growth  (3 credit hours)
Soil physical properties and their influence on plant growth and environmentally sound land use; soil solid-porosity-density relationships, soil water, heat and air relations and transport. Principles and applications of these topics using current literature in agronomy, turf, horticulture, water quality, waste management and urban land use.
Prerequisite: SSC 200
Typically offered in Fall only

SSC 462 Soil-Crop Management Systems  (3 credit hours)
Unites principles of soil science and crop science with those of allied areas into realistic agronomic applications; practical studies in planning and evaluation of soil and crop management systems.
Prerequisite: CS 213 and CS 414 and SSC 342 and Senior standing
Typically offered in Spring only

SSC 470/SSC 570 Wetland Soils  (3 credit hours)
Wetland definitions, concepts, functions and regulations; chemical, physical and morphological characteristics of wetland soils. Wetland soil identification using field indicators and monitoring equipment; principles of wetland creation, restoration and mitigation. Special project required for SSC 570. Two mandatory field trips. Field trips for distance education students are not required but optional. Credit will not be given for both SSC 470 and SSC 570.
Prerequisite: SSC 200, SSC 452 recommended
Typically offered in Fall, Spring, and Summer

SSC 473/BAE 473/BAE 573/SSC 573 Introduction to Hydrologic and Water Quality Modeling  (3 credit hours)
Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic and water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.
Prerequisite: BAE 371
Typically offered in Fall only
**SSC 511 Soil Physics** (4 credit hours)
Soil physical properties and theory of selected instrumentation to measure them. Topics including soil solids, soil water, air and heat. Emphasis on transport processes and the energy concept of soil and water.

Prerequisite: SSC 200, PY 212
Typically offered in Fall only

**SSC 521 Soil Chemistry** (3 credit hours)
A consideration of the chemical and colloidal properties of clay and soil systems, including ion exchange and retention, soil solution reactions, solvation of clays and electrokinetic properties of clay-water systems.

Prerequisite: SSC 200, one yr. of general inorganic chemistry
Typically offered in Spring only

**SSC 532/MB 532 Soil Microbiology** (4 credit hours)
Soil as a medium for microbial growth, the relation of microbes to important mineral transformations in soil, the importance of biological equilibrium and significance of soil microbes to environmental quality.

Prerequisite: MB 351, CH 220

**SSC 540/SSC 440 Geographic Information Systems (GIS) in Soil Science and Agriculture** (3 credit hours)
Geographic information systems (GIS), global positioning system (GPS), and remote sensing to manage spatially variable soils, vegetation, other natural resources. Develop: function understanding of GIS principles, working knowledge of ArcGIS, problem-solving/critical-thinking necessary to use GIS to characterize and manage soils, agriculture, natural resources. Introduction to GIS; Maps/Cartography; Vector/Raster Data Models; Georeferencing/Coordinate Systems; Spatial Data Sources; GPS/GPS skills/ Remote Sensing; Statistics/Interpolation; Precision Agriculture; Computer Aided Design and GIS; Creating Analyzing 3-D Surfaces. Credit not given for both SSC 440 and SSC 540.

Prerequisite: SSC 200
Typically offered in Fall and Spring

SSC 541 Soil Fertility (3 credit hours)
Soil conditions affecting plant growth and the chemistry of soil and fertilizer interrelationships. Factors affecting the availability of nutrients. Methods of measuring nutrient availability.

Prerequisite: SSC 341

**SSC 545 Remote Sensing Applications in Soil Science and Agriculture** (3 credit hours)
Overview of remote sensing including history, evolution, vocabulary, and physical principles, i.e., electromagnetic radiation and its interaction with matter. Distant and proximate remote sensing techniques (aerial photography, satellite imaging, radar, lidar, etc.), hardware, and platforms and their application in the characterization and management of soils and crops. Development of strategies for incorporating remote sensing into soil and agronomic research, and of practical skills for processing, analysis, display, and discussion of remote sensing data with applications in soil science and agriculture.

Prerequisite: SSC 200, PY 212

**SSC 551 Soil Morphology, Genesis and Classification** (3 credit hours)

Prerequisite: SSC 200

**SSC 552 Environmental Applications Of Soil Science** (3 credit hours)
Identification and evaluation of basic factors influencing movement of potential pollutants through soil and their underlying strata. Development of understanding of processes of soil and site evaluation for waste disposal and transport of pollutants.

Prerequisite: SSC 200
Typically offered in Fall only

**SSC 570/SSC 470 Wetland Soils** (3 credit hours)
Wetland definitions, concepts, functions and regulations; chemical, physical and morphological characteristics of wetland soils. Wetland soil identification using field indicators and monitoring equipment; principles of wetland creation, restoration and mitigation. Special project required for SSC 570. Two mandatory field trips. Field trips for distance education students are not required but optional. Credit will not be given for both SSC 470 and SSC 570.

Prerequisite: SSC 200, SSC 452 recommended
Typically offered in Fall, Spring, and Summer

**SSC 573/SSC 473/BAE 473/BAE 573 Introduction to Hydrologic and Water Quality Modeling** (3 credit hours)
Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic and water quality models on watershed systems. Project examples using state-of-the-art models. Credit will not be given for both BAE 473 and BAE 573.

Prerequisite: BAE 371
Typically offered in Fall only

**SSC 590 Special Problems** (1-6 credit hours)
Special problems in various phases of soils. Emphasis placed on review of recent and current research. Credits Arranged

Prerequisite: SSC 200
Typically offered in Fall, Spring, and Summer

**SSC 592 Special Topics in Soil Science** (1-6 credit hours)
Special Topics in Soil Science. Topics of contemporary interest in soil science.

Typically offered in Fall, Spring, and Summer

**SSC 601 Seminar** (1 credit hour)
A maximum of two semester hours allowed toward the master's degree, but any number toward the doctorate. Scientific articles, progress reports in research and special problems of interest to soil scientists reviewed and discussed.

Prerequisite: Graduate standing in SSC
Typically offered in Fall and Spring
SSC 609 Colloquium In Soil Science (1-3 credit hours)  
Seminar-type discussions and lectures on specialized and advanced topics in soil science. Credits Arranged  
Prerequisite: Graduate standing in SSC  
Typically offered in Fall and Spring  

SSC 620 Special Problems (1-6 credit hours)  
Special problems in various phases of soils. Emphasis placed on review of current and recent research. Credits Arranged  
Prerequisite: SSC 200  
Typically offered in Fall and Spring  

SSC 655 Master's Supervised Teaching (1-3 credit hours)  
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.  
Prerequisite: Master's student  
Typically offered in Fall and Spring  

SSC 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)  
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)  
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 690 Master's Exam (1-9 credit hours)  
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam. Credits Arranged  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 693 Master's Supervised Research (1-9 credit hours)  
Instruction in research and research under the mentorship of a member of the Graduate Faculty.  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 695 Master's Thesis Research (1-9 credit hours)  
Thesis Research  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 696 Summer Thesis Research (1 credit hours)  
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.  
Prerequisite: Master's student  
Typically offered in Summer only  

SSC 699 Master's Thesis Preparation (1-9 credit hours)  
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits arranged  
Prerequisite: Master's student  
Typically offered in Fall, Spring, and Summer  

SSC 720 Soil and Plant Analysis (3 credit hours)  
Theory and advanced principles of utilization of chemical instruments to aid research on the heterogeneous systems of soils and plants.  
Prerequisite: PY 212; CH 315; at least three soils courses including SSC 341  
Typically offered in Spring only  

SSC 725/TOX 725/CS 725/HS 725 Pesticide Chemistry (1 credit hours)  
Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of the minicourse.  
Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)  
Typically offered in Spring only  

SSC 727/TOX 727/CS 727/HS 725 Pesticide Behavior and Fate In the Environment (2 credit hours)  
Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of the minicourse.  
Prerequisite: CS(HS,SSC,TOX) 725, SSC 200  
Typically offered in Spring only  

SSC 771/BAE 771 Theory Of Drainage--Saturated Flow (3 credit hours)  
Discussion of physical concepts and properties of fluids and porous media in relation to soil-water movement. Derivation and discussion of the fundamental laws and equations governing saturated flow in porous media. Analysis of mathematical solutions of  
Prerequisite: MA 301  
Typically offered in Fall only  

SSC 790 Special Topics (1-6 credit hours)  
The study of special problems and selected topics of current interest in soil science and related fields.  
Typically offered in Fall only  

SSC 801 Seminar (1 credit hours)  
Weekly seminars on topics of current interest given by resident faculty members, graduate students and visiting lecturers.  
Typically offered in Fall and Spring
SSC 809  Colloquium In Soil Science  (1-3 credit hours)
Seminar-type discussions and lectures on specialized and advanced topics in soil science. Credits Arranged
Prerequisite: Graduate standing in SSC
Typically offered in Fall, Spring, and Summer

SSC 820  Special Problems  (1-6 credit hours)
Special problems in various phases of soils. Emphasis placed on review of recent and current research. Credits Arranged
Prerequisite: SSC 200
Typically offered in Fall and Spring

SSC 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

SSC 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

SSC 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Statistics (ST)

ST 101  Statistics by Example  (3 credit hours)
Sampling, experimental design, tables and graphs, relationships among variables, probability, estimation, hypothesis testing. Real life examples from the social, physical and life sciences, the humanities and sports. Credit not allowed if student has prior credit for another ST course
GEP Mathematical Sciences
Typically offered in Fall and Spring

ST 114  Statistical Programming  (3 credit hours)
This is an introductory course in computer programming for statisticians using Python. Emphasis is on designing algorithms, problem solving, and forming good coding practices: methodological development of programs from specifications; documentation and style; appropriate use of control structures such as loops, of data types such as arrays; modular program organization; version control. Students will become acquainted with core statistical computational problems through examples and coding assignments, including computation of histograms, boxplots, quantiles, and least squares regression.
Restriction: Statistics majors only
Typically offered in Fall only

ST 305  Statistical Methods  (4 credit hours)
Prerequisite: MA 141; Corequisite: ST 307
Typically offered in Fall and Spring

ST 307  Introduction to Statistical Programming- SAS  (1 credit hours)
An introduction to using the SAS statistical programming environment. The course will combine lecture and a virtual computing laboratory to teach students how to use the SAS system for: basic data input and manipulation; graphical displays of univariate
Corequisite: ST 305 or ST 312 or ST 372 or Prerequisite: ST 350 or BUS 350
Typically offered in Fall and Spring

ST 308  Introduction to Statistical Programming - R  (1 credit hours)
Introduction to the statistical programming language R. The course will cover: reading and manipulating data; use of common data structures (vectors, matrices, arrays, lists); basic graphical representations.
Typically offered in Spring only
ST 311 Introduction to Statistics (3 credit hours)
Examinining relationships between two variables using graphical techniques, simple linear regression and correlation methods. Producing data using experiment design and sampling. Elementary probability and the basic notions of statistical inference including confidence interval estimation and tests of hypothesis. One and two sample t-tests, one-way analysis of variance, inference for count data and regression. Credit not allowed if student has prior credit for another ST course or BUS 350

GEP Mathematical Sciences
Typically offered in Fall, Spring, and Summer

ST 312 Introduction to Statistics II (3 credit hours)
A further examination of statistics and data analysis. Inference for comparing multiple samples, experimental design, analysis of variance and post-hoc tests. Inference for correlation, simple regression, multiple regression, and curvilinear regression. Analysis of contingency tables and categorical data. No credit for students who have credit for ST 305.

Prerequisite: ST 311
GEP Mathematical Sciences
Typically offered in Fall and Spring

ST 350/BUS 350 Economics and Business Statistics (3 credit hours)
Introduction to statistics applied to management, accounting, and economic problems. Emphasis on statistical estimation, inference, simple and multiple regression, and analysis of variance. Use of computers to apply statistical methods to problems encountered in management and economics.

Prerequisite: MA 114
Typically offered in Fall, Spring, and Summer

ST 370 Probability and Statistics for Engineers (3 credit hours)
Calculus-based introduction to probability and statistics with emphasis on Monte Carlo simulation and graphical display of data on computer workstations. Statistical methods include point and interval estimation of population parameters and curve analysis.

Prerequisite: MA 241
Typically offered in Fall and Spring

ST 371 Introduction to Probability and Distribution Theory (3 credit hours)
Basic concepts of probability and distribution theory for students in the physical sciences, computer science and engineering. Provides the background necessary to begin study of statistical estimation, inference, regression analysis, and analysis of variance.

Prerequisite: MA 241, Corequisite: MA 242
Typically offered in Fall and Spring

ST 372 Introduction to Statistical Inference and Regression (3 credit hours)
Statistical inference and regression analysis including theory and applications. Point and interval estimation of population parameters. Hypothesis testing including use of t, chi-square and F. Simple linear regression and correlation. Introduction to multiple regression and one-way analysis of variance.

Prerequisite: ST 371
Typically offered in Fall and Spring

ST 380 Probability and Statistics for the Physical Sciences (3 credit hours)
Introduction to probability models and statistics with emphasis on Monte Carlo simulation and graphical display of data on computer laboratory workstations. Statistical methods include point and interval estimation of population parameters and curve analysis.

Prerequisite: MA 241
Typically offered in Fall only

ST 401 Experiences in Data Analysis (4 credit hours)
This course will allow students to see many practical aspects of data analysis. Each section of this course will expose students to the process of data analysis in a themed area such as biostatistics or environmental statistics. Students will see problems of data collection and analysis through a combination of classroom demonstrations, hands on computer activities and visits to local industries.

Prerequisite: Permission of Instructor and either ST 311 or ST 305
Typically offered in Summer only

ST 404/GPH 404 Epidemiology and Statistics in Global Public Health (3 credit hours)
This course will provide a general introduction to the quantitative methods used in global health, combining elements of epidemiology and biostatistics. The course will focus on linear and logistic regression, survival analysis, traditional study designs, and modern study designs. Students will learn fundamental principles in epidemiology, including statistical approaches, and apply them to topics in global public health. The course prerequisite is a B- or better in one of these courses: ST 305, ST 311, ST 350, ST 370, or ST 371. In addition, a B- or better in GPH 201 is strongly recommended.

Pre-requisite: B- or better in one of these courses: ST 305, ST 311, ST 350, ST 370, or ST 371
Typically offered in Fall only

ST 405/ST 505 Applied Nonparametric Statistics (3 credit hours)
Statistical methods requiring relatively mild assumptions about the form of the population distribution. Classical nonparametric hypothesis testing methods, Spearman and Kendall correlation coefficients, permutation tests, bootstrap methods, and nonparametric regressions will be covered.

Prerequisite: ST 508 or ST 512 or ST 514 or ST 516
Typically offered in Fall only

ST 412/MA 412 Long-Term Actuarial Models (3 credit hours)
Long-term probability models for risk management systems. Theory and applications of compound interest, probability distributions of failure time random variables, present value models of future contingent cash flows, applications to insurance, health care, credit risk, environmental risk, consumer behavior and warranties.

Prerequisite: MA 241 or MA 231, Corequisite: MA 421, BUS(ST) 350, ST 301, ST 305, ST 311, ST 361, ST 370, ST 371, ST 380 or equivalent
Typically offered in Fall only

ST 413/MA 413 Short-Term Actuarial Models (3 credit hours)
Short-term probability models for risk management systems. Frequency distributions, loss distributions, the individual risk model, the collective risk model, stochastic process models of solvency requirements, applications to insurance and business decisions.

Prerequisite: MA 241 or MA 231, and one of MA 421, ST 301, ST 305, ST 370, ST 371, ST 380, ST 421.
Typically offered in Summer only
ST 421  Introduction to Mathematical Statistics I  (3 credit hours)
First of a two-semester sequence of mathematical statistics, primarily for undergraduate majors in Statistics. Introduction to probability, univariate and multivariate probability distributions and their properties, distributions of functions of random variables, random samples and sampling distributions. Credit is not allowed for both ST 421 and MA 421.
Prerequisite: MA 242
Typically offered in Fall and Spring

ST 422  Introduction to Mathematical Statistics II  (3 credit hours)
Second of a two-semester sequence of mathematical statistics, primarily for undergraduate majors in Statistics. Random samples, point and interval estimators and their properties, methods of moments, maximum likelihood, tests of hypotheses, elements of nonparametric statistics and elements of general linear model theory.
Prerequisite: ST 421 or MA 421
Typically offered in Fall and Spring

ST 430  Introduction to Regression Analysis  (3 credit hours)
Regression analysis as a flexible statistical problem solving methodology. Matrix review; variable selection; prediction; multicolinearity; model diagnostics; dummy variables; logistic and non-linear regression. Emphasizes use of computer.
Prerequisites: (ST 305 or ST 312 or ST 372) and ST 307 and (MA 305 or MA 405)
Typically offered in Fall and Spring

ST 431  Introduction to Experimental Design  (3 credit hours)
Experimental design as a method for organizing analysis procedures. Completely randomized, randomized block, factorial, nested, Latin squares, split-plot and incomplete block designs. Response surface and covariance adjustment procedures. Stress use of computer.
Prerequisites: (ST 305 or ST 312 or ST 372) and ST 307
Typically offered in Fall, Spring, and Summer

ST 432  Introduction to Survey Sampling  (3 credit hours)
Design principles pertaining to planning and execution of a sample survey. Simple random, stratified random, systematic and one- and two-stage cluster sampling designs. Emphasis on statistical considerations in analysis of sample survey data. Class project on design and execution of an actual sample survey.
Prerequisites: (ST 305 or ST 312 or ST 372) and ST 307
Typically offered in Fall and Spring

ST 433/ST 533  Applied Spatial Statistics  (3 credit hours)
Introduction to statistical models and methods for analyzing various types of spatially referenced data. The focus is on applications with real data and their analysis with statistical programs such as R and SAS. Students are required to write, modify, and run computer code in order to complete homework assignments and final projects.
P: ST 422 and ST 430
Typically offered in Spring only

ST 434/ST 534  Applied Time Series  (3 credit hours)
Statistical models and methods for the analysis of time series data using both time domain and frequency domain approaches. A brief review of necessary statistical concepts and R will be given at the beginning. Analyses of real data sets using the stat1
Prerequisite: ST 422 and ST 430
Typically offered in Fall only

ST 435/ST 535  Statistical Methods for Quality and Productivity Improvement  (3 credit hours)
Use of statistics for quality control and productivity improvement. Control chart calculations and graphing, process control and specification; sampling plans; and reliability. Computer use will be stressed for performing calculations and graphing.
Prerequisite: (ST 305 or ST 312 or ST 372) and ST 307
Typically offered in Fall only

ST 437/ST 537  Applied Multivariate and Longitudinal Data Analysis  (3 credit hours)
An introduction to use of statistical methods for analyzing multivariate and longitudinal data collected in experiments and surveys. Topics covered include multivariate analysis of variance, discriminant analysis, principal components analysis, factor analysis, covariance modeling, and mixed effects models such as growth curves and random coefficient models. Emphasis is on use of a computer to perform statistical analysis of multivariate and longitudinal data.
Prerequisite: ST 422 and ST 430
Typically offered in Spring only

ST 440/ST 540  Applied Bayesian Analysis  (3 credit hours)
Introduction to Bayesian concepts of statistical inference; Bayesian learning; Markov chain Monte Carlo methods using existing software (SAS and OpenBUGS); linear and hierarchical models; model selection and diagnostics.
Prerequisite: ST 422 and ST 430
Typically offered in Spring only

ST 442/CSC 442  Introduction to Data Science  (3 credit hours)
Overview of data structures, data lifecycle, statistical inference. Data management, queries, data cleaning, data wrangling. Classification and prediction methods to include linear regression, logistic regression, k-nearest neighbors, classification and regression trees. Association analysis. Clustering methods. Emphasis on analyzing data, use and development of software tools, and comparing methods.
Prerequisite: (MA 305 or MA 405) and (ST 305 or ST 312 or ST 370 or ST 372 or ST 380) and (CSC 111 or CSC 112 or CSC 113 or CSC 114 or CSC 116 or ST 114 or ST 445)
Typically offered in Fall only

ST 445  Introduction to Statistical Computing and Data Management  (3 credit hours)
Detailed discussion of the program data vector and data handling techniques that are required to apply statistical methods. Topics are based on the current content of the Base SAS Certification Exam and typically include: importing, validating, and exporting of data files; manipulating, subsetting, and grouping data; merging and appending data sets; basic detail and summary reporting; and code debugging. Additional topics with practical applications, such as graphics and advanced reporting, may also be introduced. Statistical methods for analyzing data are not covered in this course. Regular access to a computer for homework and class exercises is required. Previous exposure to SAS is expected.
Prerequisite: (ST 305 or ST 312 or ST 372) and ST 307
Typically offered in Fall and Spring
ST 446 Intermediate SAS Programming with Applications (3 credit hours)
This course covers a wide range of SAS skills that build on the topics introduced in ST 445: Introduction to Statistical Computing and Data Management. In particular, many topics related to the Advanced SAS Certification Exam are covered in order to help students prepare for that exam. However, an additional goal of equal importance is to synthesize statistical content such as regression, distributional assumptions for inference, and power from multiple courses through simulation- and graphics-based investigations.
Prerequisite: ST 430 and ST 445
Typically offered in Spring only

ST 491 Statistics in Practice (3 credit hours)
Mentored experience in applied statistical analysis. Students will work in small groups in collaboration with local scientists to answer real questions about real data. The experience involves mentoring by both the project scientist and the instructor.
P: ST 430
Typically offered in Spring only

ST 495 Special Topics in Statistics (1-6 credit hours)
Offered as needed to present material not normally available in regular departmental course offerings, or for offering new courses on a trial basis.
Typically offered in Fall, Spring, and Summer

ST 497 Professional Experience in Statistics (1-3 credit hours)
Mentored professional experience in statistics. A minimum of 45 hours must be completed for each credit hour earned. The experience must be arranged in advance by the student and approved by the Department of Statistics prior to enrollment. Approval requires completion of the Statistics Department’s Experiential Learning Contract, which must be signed by the student, their professional mentor, and their academic advisor. Professional mentors are encouraged to require a research paper or poster presentation as part of the work expectations when appropriate. Students should refer to their curriculum requirements for possible restrictions on the total number of ST 497 credit hours that may be applied to their degree.
Prerequisite: Sophomore Standing. Students are responsible for identifying their own research mentor and experience.
Typically offered in Fall, Spring, and Summer

ST 499 Research Experience in Statistics (1-3 credit hours)
Mentored research experience in statistics. A minimum of 45 hours must be completed for each credit hour earned. The experience must be arranged in advance by the student and approved by the Department of Statistics prior to enrollment. Approval requires completion of the Statistics Department’s Experiential Learning Contract, which must be signed by the student, their research mentor, and their academic advisor. Research mentors are encouraged to require a research paper or poster presentation as part of the work expectations when appropriate. Students should refer to their curriculum requirements for possible restrictions on the total number of ST 499 credit hours that may be applied to their degree.
Prerequisite: Sophomore Standing. Students are responsible for identifying their own research mentor and experience.
Typically offered in Fall, Spring, and Summer

ST 501 Fundamentals of Statistical Inference I (3 credit hours)
First of a two-semester sequence in probability and statistics taught at a calculus-based level. Probability: discrete and continuous distributions, expected values, transformations of random variables, sampling distributions. Credit not given for both ST 701 and ST 501. Note: this course will be offered in person (Fall) and online (Summer).
Prerequisite: MA 242 or equivalent
Typically offered in Fall and Summer

ST 502 Fundamentals of Statistical Inference II (3 credit hours)
Second of a two-semester sequence in probability and statistics taught at a calculus-based level. Statistical inference: methods of construction and evaluation of estimators, hypothesis tests, and interval estimators, including maximum likelihood. Credit not given for both ST 702 and ST 502. Note: this course will be offered in person (Spring) and online (Fall).
Prerequisite: ST 501
Typically offered in Fall and Spring

ST 503 Fundamentals of Linear Models and Regression (3 credit hours)
Estimation and testing in full and non-full rank linear models. Normal theory distributional properties. Least squares principle and the Gauss-Markov theorem. Estimability, analysis of variance and covariance in a unified manner. Practical model-building in linear regression including residual analysis, regression diagnostics, and variable selection. Emphasis on use of the computer to apply methods with data sets. Credit not given for both ST 705 and ST 503. Note: this course will be offered in person (Spring) and online (Summer).
P: ST 501 and MA 405 or equivalent (Linear Algebra); C: ST 502
Typically offered in Spring and Summer

ST 505/ST 405 Applied Nonparametric Statistics (3 credit hours)
Statistical methods requiring relatively mild assumptions about the form of the population distribution. Classical nonparametric hypothesis testing methods, Spearman and Kendall correlation coefficients, permutation tests, bootstrap methods, and nonparametric regressions will be covered.
Prerequisite: ST 508 or ST 512 or ST 514 or ST 516
Typically offered in Fall only
ST 506 Sampling Animal Populations (3 credit hours)
Statistical methods applicable to sampling of wildlife populations, including capture-recapture, removal, change in ratio, quadrant and line transect sampling. Emphasis on model assumptions and study design.

Prerequisite: ST 512
Typically offered in Fall only

ST 507 Statistics For the Behavioral Sciences I (3 credit hours)
A general introduction to the use of descriptive and inferential statistics in behavioral science research. Methods for describing and summarizing data presented, followed by procedures for estimating population parameters and testing hypotheses concerning summarized data.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ST 508 Statistics For the Behavioral Sciences II (3 credit hours)
Introduction to use of statistical design principles in behavioral science research. Presentation of use of a statistical model to represent structure of data collected from a designed experiment or survey study. Opportunities provided for use of a computer to perform analyses of data, to evaluate proposed statistical model and to assist in post-hoc analysis procedures. Least squares principles used to integrate topics of multiple linear regression analysis, the analysis of variance and analysis of covariance.

Prerequisite: ST 507
Typically offered in Spring only

ST 511 Statistical Methods For Researchers I (3 credit hours)
Basic concepts of statistical models and use of samples; variation, statistical measures, distributions, tests of significance, analysis of variance and elementary experimental design, regression and correlation, chi-square.

Prerequisite: Graduate Standing
Typically offered in Fall, Spring, and Summer

ST 512 Statistical Methods For Researchers II (3 credit hours)
Covariance, multiple regression, curvilinear regression, concepts of experimental design, factorial experiments, confounded factorials, individual degrees of freedom and split-plot experiments. Computing laboratory addressing computational issues and use of statistical software.

Prerequisite: ST 511 or ST 513 or ST 517
Typically offered in Fall, Spring, and Summer

ST 513 Statistics for Management I (3 credit hours)
Analysis of data to represent facts, guide decisions and test opinions in managing systems and processes. Graphical and numerical data analysis for descriptive and predictive decisions. Scatter plot smoothing and regression analysis. Basic statistical inference. Integrated use of computer.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ST 514 Statistics For Management and Social Sciences II (3 credit hours)
Linear regression, multiple regression and concepts of designed experiments in an integrated approach, principles of the design and analysis of sample surveys, use of computer for analysis of data.

Prerequisite: ST 513
Typically offered in Spring and Summer

ST 515 Experimental Statistics for Engineers I (3 credit hours)
General statistical concepts and techniques useful to research workers in engineering, textiles, wood technology, etc. Probability distributions, measurement of precision, simple and multiple regression, tests of significance, analysis of variance, enumeration data and experimental design.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

ST 516 Experimental Statistics for Engineers II (3 credit hours)
General statistical concepts and techniques useful to research workers in engineering, textiles, wood technology, etc. Probability distributions, measurement of precision, simple and multiple regression, tests of significance, analysis of variance, enumeration data and experimental designs.

Prerequisite: ST 515
Typically offered in Fall and Spring

ST 517 Applied Statistical Methods I (3 credit hours)
Course covers basic methods for summarizing and describing data, accounting for variability in data, and techniques for inference. Topics include basic exploratory data analysis, probability distributions, confidence intervals, hypothesis testing, and regression analysis. This is a calculus-based course. Statistical software is used; however, there is no lab associated with the course. Credit not given for this course and ST 511 or ST 513 or ST 515. This course does NOT count as an elective towards a degree or a minor in Statistics. Note: the course will be offered in person (Fall) and online (Fall and Summer).

Prerequisites: MA 241 or equivalent (Calculus II) and MA 405 or equivalent (Linear Algebra)
Typically offered in Fall and Summer

ST 518 Applied Statistical Methods II (3 credit hours)
This second course in statistics for graduate students is intended to further expand students' background in the statistical methods that will assist them in the analysis of data. Course covers many fundamental analysis methods currently used to analyze a wide array of data, mostly arising from designed experiments. Topics include multiple regression models, factorial effects models, general linear models, mixed effect models, logistic regression analysis, and basic repeated measures analysis. This is a calculus-based course. Statistical software is used, however, there is no lab associated with the course. Credit not given for this course and ST 512 or ST 514 or ST 516. Note: this course will be offered in person (Spring) and online (Fall and Spring).

Prerequisite: ST 517
Typically offered in Fall and Spring

ST 519/EMS 519 Teaching and Learning of Statistical Thinking (3 credit hours)
This course is designed to bridge theory and practice on how students develop understandings of key concepts in data analysis, statistics, and probability. Discussion of students' understandings, teaching strategies and the use of manipulatives and technology tools. Topics include distribution, measures of center and spread, sampling, sampling distribution, randomness, and law of large numbers. Must complete a first level graduate statistics course (ST 507, ST 511, or equivalent) before enrolling.

Prerequisite: ST 507 or ST 511
Typically offered in Spring only
ST 520 Statistical Principles of Clinical Trials  (3 credit hours)

Corequisite: ST 501 or ST 521 or ST 701
Typically offered in Fall only

ST 524 Statistics In Plant Science  (3 credit hours)
Principles and techniques of planning, establishing and executing field and greenhouse experiments. Size, shape and orientation of plots; border effects; estimation of size of experiments for specified accuracy; subsampling plots and yields for laboratory analysis; combining data from a series of years and/or locations; rotation experiments; repeated measures data; multiple comparisons in variety trial results; selection of predictors in multiple regression; introduction to interspecies and intraspecies plant competition experiments and models.

Prerequisite: ST 512
Typically offered in Fall only

ST 531 Experimental Design  (3 credit hours)
Overview and comparison of observational studies and designed experiments followed by a thorough discussion of design principles. Review of estimation and inference for regression and ANOVA models from an experimental design perspective. Review of design and analysis for completely randomized, randomized complete block, and Latin square designs. Designs and analysis methods for factorial experiments, general blocking structures, incomplete block designs, confounded factorials, split-plot experiments, and fractional factorial designs. Examples used to illustrate application and analysis of these designs.

Prerequisite: ST 512, or ST 515, or ST 516, or ST 517, or ST 701
Typically offered in Fall only

ST 533/ST 433 Applied Spatial Statistics  (3 credit hours)
Introduction to statistical models and methods for analyzing various types of spatially referenced data. The focus is on applications with real data and their analysis with statistical programs such as R and SAS. Students are required to write, modify, and run computer code in order to complete homework assignments and final projects.

P: ST 422 and ST 430
Typically offered in Spring only

ST 534/ST 434 Applied Time Series  (3 credit hours)
Statistical models and methods for the analysis of time series data using both time domain and frequency domain approaches. A brief review of necessary statistical concepts and R will be given at the beginning. Analyses of real data sets using the stati

Prerequisite: ST 422 and ST 430
Typically offered in Fall only

ST 535/ST 435 Statistical Methods for Quality and Productivity Improvement  (3 credit hours)
Use of statistics for quality control and productivity improvement. Control chart calculations and graphing, process control and specification; sampling plans; and reliability. Computer use will be stressed for performing calculations and graphing.

Prerequisite: (ST 305 or ST 312 or ST 372) and ST 307
Typically offered in Fall only

ST 537/ST 437 Applied Multivariate and Longitudinal Data Analysis  (3 credit hours)
An introduction to use of statistical methods for analyzing multivariate and longitudinal data collected in experiments and surveys. Topics covered include multivariate analysis of variance, discriminant analysis, principal components analysis, factor analysis, covariance modeling, and mixed effects models such as growth curves and random coefficient models. Emphasis is on use of a computer to perform statistical analysis of multivariate and longitudinal data.

Prerequisite: ST 422 and ST 430
Typically offered in Spring only

ST 540/ST 440 Applied Bayesian Analysis  (3 credit hours)
Introduction to Bayesian concepts of statistical inference; Bayesian learning; Markov chain Monte Carlo methods using existing software (SAS and OpenBUGS); linear and hierarchal models; model selection and diagnostics.

Prerequisite: ST 422 and ST 430
Typically offered in Spring only

ST 542 Statistical Practice  (3 credit hours)
This course will provide a discussion-based introduction to statistical practice geared towards students in the final semester of their Master of Statistics degree. Note: the course will be offered in person (Fall) and online (Spring and Summer).

Typically offered in Fall, Spring, and Summer

ST 544 Applied Categorical Data Analysis  (3 credit hours)
This course focuses on the concepts, methods, and models used to analyze categorical data, particularly contingency tables, count data and binary/binomial type of data. The topics covered include Pearson Chi-squared independence test for contingency tables, measures of marginal and conditional associations, small-sample inference, logistic regression models for independent binary/binomial data and many extended models for correlated binary/binomial data including matched data and longitudinal data. The course emphasizes the implementation of methods/models using SAS and the interpretation of the results from the output.

Prerequisite: ST 512 or ST 514 or ST 515 or ST 516
Typically offered in Fall only

ST 546/MA 546 Probability and Stochastic Processes I  (3 credit hours)
Modern introduction to Probability Theory and Stochastic Processes. The choice of material is motivated by applications to problems such as queueing networks, filtering and financial mathematics. Topics include: review of discrete probability and continuous random variables, random walks, markov chains, martingales, stopping times, erodicity, conditional expectations, continuous-time Markov chains, laws of large numbers, central limit theorem and large deviations.

Prerequisite: MA 421 and MA 425 or MA 511
Typically offered in Fall only
ST 555 Statistical Programming I (3 credit hours)
An introduction to programming and data management using SAS, the industry standard for statistical practice. Detailed discussion of the program data vector and data handling techniques that are required to apply statistical methods. Topics are based on the current content of the Base SAS Certification Exam and typically include: importing, validating, and exporting of data files; manipulating, subsetting, and grouping data; merging and appending data sets; basic detail and summary reporting; and code debugging. Additional topics with practical applications are also introduced, such as graphics and advanced reporting. Statistical methods for analyzing data are not covered in this course. Regular access to a computer for homework and class exercises is required. Previous exposure to SAS is not expected.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

ST 556 Statistical Programming II (3 credit hours)
Statistical procedures for importing/managing complex data structures using SQL, automated analysis using macro programming, basic simulation methods and text parsing/analysis procedures. Students learn SAS, the industry standard for statistical practice. Regular access to a computer for homework and class exercises is required.

P: ST 555 or Base SAS Certification
Typically offered in Spring and Summer

ST 557 Using Technology to Teach Statistics (3 credit hours)
This course will provide statistics educators with an in-depth introduction to applying technology for teaching college statistics. In this course, students will explore a variety of available statistical packages, demonstration applets, and other technologies for teaching statistics. Students will learn pedagogy to help them structure learning activities around these technologies. Students will also learn to identify key elements in technologies that support pedagogical goals.

P: ST 508 or ST 512
Typically offered in Fall only

ST 558 Data Science for Statisticians (3 credit hours)
Methods for reading, manipulating, and combining data sources including databases. Custom functions, visualizations, and summaries. Common analyses done by data scientists. Methods for communicating results including dashboards. Regular access to a computer for homework and class exercises is required.

Prerequisites: (ST 511 or ST 517 or equivalent) and (ST 555 or equivalent)
Typically offered in Fall and Summer

ST 561/ECG 561 Applied Econometrics I (3 credit hours)
Introduction and application of econometrics methods for analyzing cross-sectional data in economics, and other social science disciplines, such as OLS, IV regressions, and simultaneous equations models. Students should have had a statistical methods course at the 300 level or above as well as Calculus I and II.

Typically offered in Fall only

ST 562 Data Mining with SAS Enterprise Miner (3 credit hours)
This is a hands-on course using modeling techniques designed mostly for large observational studies. Estimation topics include recursive splitting, ordinary and logistic regression, neural networks, and discriminant analysis. Clustering and association analysis are covered under the topic "unsupervised learning," and the use of training and validation data sets is emphasized. Model evaluation alternatives to statistical significance include lift charts and receiver operating characteristic curves. SAS Enterprise Miner is used in the demonstrations, and some knowledge of basic SAS programming is helpful.

Prerequisite: ST 512 or ST 514 or ST 515 or ST 516 or ST 517
Typically offered in Spring only

ST 563 Introduction to Statistical Learning (3 credit hours)
This course will introduce common statistical learning methods for supervised and unsupervised predictive learning in both the regression and classification settings. Topics covered will include linear and polynomial regression, logistic regression and discriminant analysis, cross-validation and the bootstrap, model selection and regularization methods, splines and generalized additive models, principal components, hierarchical clustering, nearest neighbor, kernel, and tree-based methods, ensemble methods, boosting, and support-vector machines.

Prerequisite: ST 512 or ST 514 or ST 515 or ST 517
Typically offered in Summer only

ST 590 Special Topics (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

ST 601 Seminar (1 credit hours)
Typically offered in Fall, Spring, and Summer

ST 610 Topics in Stat (1-6 credit hours)
Special topics in Statistics.

ST 630 Independent Study (1-3 credit hours)
Typically offered in Fall, Spring, and Summer

ST 635 Readings (1-3 credit hours)
Typically offered in Spring only

ST 641 Statistical Consulting (1 credit hours)
Participation in regularly scheduled supervised statistical consulting sessions with faculty member and client. Consultant's report written for each session. Regularly scheduled meetings with course instructor and other student consultants to present an

Prerequisite: ST 512 and ST 702
Typically offered in Fall, Spring, and Summer

ST 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ST 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer
ST 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ST 695 Master's Thesis Research (1-9 credit hours)
Thesis Research
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ST 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student
Typically offered in Summer only

ST 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits Arranged
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

ST 701 Statistical Theory I (3 credit hours)
Probability tools for statistics: description of discrete and absolutely continuous distributions, expected values, moments, moment generating functions, transformation of random variables, marginal and conditional distributions, independence, orderstatistics, multivariate distributions, concept of random sample, derivation of many sampling distributions.
Typically offered in Fall only

ST 702 Statistical Theory II (3 credit hours)
General framework for statistical inference. Point estimators: biased and unbiased, minimum variance unbiased, least mean square error, maximum likelihood and least squares, asymptotic properties. Interval estimators and tests of hypotheses: confidence intervals, power functions, Neyman-Pearson lemma, likelihood ratio tests, unbiasedness, efficiency and sufficiency.
Prerequisite: ST 701
Typically offered in Spring only

ST 703 Statistical Methods I (3 credit hours)
Introduction of statistical methods. Examples include multiple linear regression, concepts of experimental design, factorial experiments, and random-effects modeling. A computing laboratory addresses computational issues and use of statistical software. This course is a prerequisite for most advanced courses in statistics. This section is restricted to statistics and closely related majors.
R: 17STPHD Students Only
Typically offered in Fall only

ST 704 Statistical Methods II (3 credit hours)
This course will introduce many methods that are commonly used in applications. Examples include: model generation, selection, assessment, and diagnostics in the context of multiple linear regression (including penalized regression); linear mixed models; generalized linear models; generalized linear mixed models; nonparametric regression and smoothing; and finite-population sampling basics. Coverage will include some theory, plus implementation using SAS and/or R.
Prerequisite: ST 703; Corequisites: ST 702 and ST 705
Typically offered in Spring only

ST 705 Linear Models and Variance Components (3 credit hours)
Corequisite: ST 702
Typically offered in Spring only

ST 706/MA 706/OR 706 Nonlinear Programming (3 credit hours)
An advanced mathematical treatment of analytical and algorithmic aspects of finite dimensional nonlinear programming. Including an examination of structure and effectiveness of computational methods for unconstrained and constrained minimization. Special
Prerequisite: OR(IE,MA) 505 and MA 425
Typically offered in Spring only

ST 708 Applied Least Squares (3 credit hours)
Least squares estimation and hypothesis testing procedures for linear models. Consideration of regression, analysis of variance and covariance in a unified manner. Emphasis on use of the computer to apply these techniques to experimental (including unequal cell sizes) and survey situations.
Prerequisite: ST 512
Typically offered in Fall only

ST 711 Design Of Experiments (3 credit hours)
Review of completely randomized, randomized complete block and Latin square designs and basic concepts in the techniques of experimental design. Designs and analysis methods in factorial experiments, confounded factorials, response surface methodology, change-over design, split-plot experiments and incomplete block designs. Examples used to illustrate application and analysis of these designs.
Prerequisite: ST 512 or ST 516
Typically offered in Fall only

ST 715 Theory Of Sampling Applied To Survey Design (3 credit hours)
Prerequisite: ST 422, ST 512
Typically offered in Fall only
ST 721/GN 721  Genetic Data Analysis  (3 credit hours)
Analysis of discrete data, illustrated with genetic data on morphological
characters allozymes, restriction fragment length polymorphisms and
DNA sequences. Maximum likelihood estimation, including iterative
procedures. Numerical resampling. Development of statistical techniques
for characterizing genetic disequilibrium and diversity. Measures of
population structure and genetic distance. Construction of phylogenetic
trees. Finding alignments and similarities between DNA sequences.
Locating genes with markers.
Prerequisite: ST 430 and GN 311
Typically offered in Spring only

ST 730  Applied Time Series Analysis  (3 credit hours)
An introduction to use of statistical methods for analyzing and forecasting
data observed over time. Trigonometric regression, periodogram/
Regression with autocorrelated errors. Linear filters and bivariate spectral
analysis. Stress on methods and applications; software implementations
described and used in assignments.
Prerequisite: ST 512
Typically offered in Fall only

ST 732  Longitudinal Data Analysis  (3 credit hours)
Introduction to modeling longitudinal data; Population-averaged vs.
subject-specific modeling; Classical repeated measures analysis of
variance methods and drawbacks; Review of estimating equations;
Population-averaged linear models; Linear mixed effects models;
Maximum likelihood, restricted maximum likelihood, and large sample
theory; Review of nonlinear and generalized linear regression models;
Population-averaged models and generalized estimating equations;
Nonlinear and generalized linear mixed effects models; Implications
of missing data; Advanced topics (including Bayesian framework,
complex nonlinear models, multi-level hierarchical models, relaxing
assumptions on random effects in mixed effects models, among others).
Implementation in SAS and R.
Prerequisites: ST 702 and ST 705
Typically offered in Spring only

ST 733  Spatial Statistics  (3 credit hours)
Introduction to the theory and methods of spatial data analysis including:
visualization; Gaussian processes; spectral representation; variograms;
kriging; computationally-efficient methods; nonstationary processes;
spatiotemporal and multivariate models.
Prerequisite: ST 705
Typically offered in Spring only

ST 740  Bayesian Inference and Analysis  (3 credit hours)
Introduction to Bayesian inference; specifying prior distributions;
conjugate priors, summarizing posterior information, predictive
distributions, hierarchical models, asymptotic consistency and asymptotic
normality. Markov Chain Monte Carlo (MCMC) methods and the use of
existing software (e.g., WinBUGS).
Prerequisite: ST 702
Typically offered in Fall only

ST 744  Categorical Data Analysis  (3 credit hours)
Statistical models and methods for categorical responses including the
analysis of contingency tables, logistic and Poisson regression, and
generalized linear models. Survey of asymptotic and exact methods and
their implementation using standard statistical software.
Prerequisite: ST 512 and ST 702
Typically offered in Spring only

ST 745  Analysis of Survival Data  (3 credit hours)
Statistical methods for analysis of time-to-event data, with application
to situations with data subject to right-censoring and staggered entry,
including clinical trials. Survival distribution and hazard rate; Kaplan-Meier
estimator for survival distribution and Greenwood's formula; log-rank
and weighted long-rank tests; design issues in clinical trials. Regression
models, including accelerated failure time and proportional hazards;
partial likelihood; diagnostics.
Prerequisite: ST 502 or ST 702
Typically offered in Spring only

ST 746/MA 746  Introduction To Stochastic Processes  (3 credit hours)
Markov chains and Markov processes, Poisson process, birth and
death processes, queuing theory, renewal theory, stationary processes,
Brownian motion.
Prerequisite: MA 405 and MA(ST) 546 or ST 521
Typically offered in Spring only

ST 747/MA 747  Probability and Stochastic Processes II  (3 credit hours)
Fundamental mathematical results of probabilistic measure theory
needed for advanced applications in stochastic processes. Probability
measures, sigma-algebras, random variables, Lebesgue integration,
expectation and conditional expectations w.r.t sigma algebras,
characteristic functions, notions of convergence of sequences of random
variables, weak convergence of measures, Gaussian systems, Poisson
processes, mixing properties, discrete-time martingales, continuous-time
markov chains.
Prerequisite: MA(ST) 546
Typically offered in Spring only

ST 748/MA 748  Stochastic Differential Equations  (3 credit hours)
Theory of stochastic differential equations driven by Brownian motions.
Current techniques in filtering and financial mathematics. Construction
and properties of Brownian motion, wiener measure, Ito's integrals,
martingale representation theorem, stochastic differential equations and
diffusion processes, Girsanov's theorem, relation to partial differential
equations, the Feynman-Kac formula.
Prerequisite: MA(ST) 747
Typically offered in Fall only
ST 750/ECG 750  Introduction to Econometric Methods  (3 credit hours)
Introduction to principles of estimation of linear regression models, such as ordinary least squares and generalized least squares. Extensions to time series and panel data. Consideration of endogeneity and instrumental variable estimation. Limited dependent variable and sample selection models. Attention to implementation of econometric methods using a statistical package and microeconomic and macroeconomic data sets.

Prerequisite: ST 421; Corequisite: ST 422
Typically offered in Fall only

ST 751/ECG 751  Econometric Methods  (3 credit hours)
Introduction to important econometric methods of estimation such as Least Squares, instrumental Variables, Maximum Likelihood, and Generalized Method of Moments and their application to the estimation of linear models for cross-sectional economic data. Discussion of important concepts in the asymptotic statistical analysis of vector process with application to the inference procedures based on the aforementioned estimation methods.

Prerequisite: ST 421, ST 422
Typically offered in Fall only

ST 752/ECG 752  Time Series Econometrics  (3 credit hours)
The characteristics of macroeconomic and financial time series data. Discussion of stationarity and non-stationarity as they relate to economic time series. Linear models for stationary economic time series: autoregressive moving average (ARMA) models;

Prerequisite: ECG(ST) 751
Typically offered in Spring only

ST 753/ECG 753  Microeconometrics  (3 credit hours)
The characteristics of microeconomic data. Limited dependent variable models for cross-sectional microeconomic data: logit/probit models; tobit models; methods for accounting for sample selection; count data models; duration analysis; non-parametric methods

Prerequisite: ECG 751
Typically offered in Spring only

ST 755 Advanced Analysis Of Variance and Variance Components  (3 credit hours)
Expected mean squares, exact and approximate tests of hypotheses for balanced and unbalanced data sets. Fixed, mixed and random models. Randomization theory. Estimation of variance components using regression, MINQUE and general quadratic unbiased estimation theory.

Prerequisite: ST 512, ST 552
Typically offered in Spring only

ST 756/GN 756  Computational Molecular Evolution  (3 credit hours)

Prerequisite: GN 311 and ST 511
Typically offered in Fall only

ST 757/HS 757/GN 757  Quantitative Genetics Theory and Methods  (3 credit hours)
The essence of quantitative genetics is to study multiple genes and their relationship to phenotypes. How to study and interpret the relationship between phenotypes and whole genome genotypes in a cohesive framework is the focus of this course. We discuss how to use genomic tools to map quantitative trait loci, how to study epistasis, how to study genetic correlations and genotype-by-environment interactions. We put special emphasis in using genomic data to study and interpret general biological problems, such as adaptation and heterosis. The course is targeted for advanced graduate students interested in using genomic information to study a variety of problems in quantitative genetics.

Prerequisite: ST 511
Typically offered in Fall only

ST 758  Computation for Statistical Research  (3 credit hours)
Computational tools for research in statistics, including applications of numerical linear algebra, optimization and random number generation, using the statistical language R. A project encompassing a simulation experiment will be required.

Prerequisite: ST 702 and ST 705
Typically offered in Fall only

ST 771/BMA 771/MA 771  Biomathematics I  (3 credit hours)
Role of theory construction and model building in development of experimental science. Historical development of mathematical theories and models for growth of one-species populations (logistic and offshorets), including considerations of age distributions (matrix models, Leslie and Lopez; continuous theory, renewal equation). Some of the more elementary theories on the growth of organisms (von Bertalanffy and others; allometric theories; cultures grown in a chemostat). Mathematical theories oftwo and more species systems (predator-prey, competition, symbiosis; leading up to present-day research) and discussion of some similar models for chemical kinetics. Much emphasis on scrutiny of biological concepts as well as of mathematical structure of models in order to uncover both weak and strong points of models discussed. Mathematical treatment of differential equations in models stressing qualitative and graphical aspects, as well as certain aspects of discretization. Difference equation models.

Prerequisite: Advanced calculus, reasonable background in biology
Typically offered in Fall only

ST 772/BMA 772/MA 772  Biomathematics II  (3 credit hours)
Continuation of topics of BMA 771. Some more advanced mathematical techniques concerning nonlinear differential equations of types encountered in BMA 771: several concepts of stability, asymptotic directions, Liapunov functions; different time-scales. Comparison of deterministic and stochastic models for several biological problems including birth and death processes. Discussion of various other applications of mathematics to biology; some recent research.

Prerequisite: BMA 771, elementary probability theory
Typically offered in Spring only
ST 773/BMA 773/MA 773/OR 773  Stochastic Modeling  (3 credit hours)
Prerequisite: BMA 772 or ST (MA) 746
Typically offered in Spring only

ST 779 Advanced Probability for Statistical Inference  (3 credit hours)
Sets and classes, sigma-fields and related structures, probability measures and extensions, random variables, expectation and integration, uniform integrability, inequalities, L_p-spaces, product spaces, independence, zero-one laws, convergence notions, characteristic functions, simplest limit theorems, absolute continuity, conditional expectation and conditional probabilities, martingales.
Prerequisite: ST 702
Typically offered in Fall only

ST 784 Multivariate Analysis  (3 credit hours)
Prerequisite: ST 522
Typically offered in Spring only

ST 790 Advanced Special Topics  (1-6 credit hours)
Typically offered in Fall, Spring, and Summer

ST 793 Advanced Statistical Inference  (3 credit hours)
Statistical inference with emphasis on the use of statistical models, construction and use of likelihoods, general estimating equations, and large sample methods. Includes introduction to Bayesian statistics and the jackknife and bootstrap.
Prerequisite: ST 702
Typically offered in Spring only

ST 801 Seminar  (1 credit hours)
Typically offered in Fall and Spring

ST 810 Advanced Topics in Statistics  (1-3 credit hours)
Typically offered in Fall and Spring

ST 830 Independent Study  (1-3 credit hours)
Typically offered in Fall and Spring

ST 835 Readings  (1-3 credit hours)
Typically offered in Spring only

ST 841 Statistical Consulting  (1 credit hours)
Participation in regularly scheduled supervised statistical consulting sessions with faculty member and client. Consultant’s report written for each session. Regularly scheduled meetings with course instructor and other student consultants to present an
Prerequisite: ST 512 and ST 702
Typically offered in Fall only

ST 885 Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ST 890 Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ST 893 Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ST 895 Doctoral Dissertation Research  (1-9 credit hours)
Dissertation Research
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

ST 896 Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

ST 899 Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

Sustainable Materials and Technology (SMT)

SMT 200 Introduction to Sustainable Materials and Technology  (3 credit hours)
The overall goal of the class is to introduce the students to the properties and production, and environmental implications, of common materials, including biobased, metals, plastics and mineral based. The class will connect the structure and mechanical properties of these common materials with the technology used for producing the materials from raw ingredients, and also the processing of these materials into useful items. In addition to the material properties, the environmental impacts, e.g., emissions of carbon, water, and pollutants, will be discussed. The concepts of embodied energy, mass and energy balances, water and land use will all be considered. The concept of Life Cycle Analysis will be introduced and used to evaluate the production of different building materials.
Restriction: SMT majors or with the permission of the instructor
Typically offered in Fall only
SMT 201 Sustainable Materials for Green Housing (2 credit hours)
Sustainable Materials for Green Housing

GEP Interdisciplinary Perspectives
Typically offered in Spring only

SMT 202 Anatomy and Properties of Renewable Materials (3 credit hours)
Formation, cell morphology, cell wall, structure of softwoods, hardwoods, and other renewable materials; variability, naturally occurring defects, biological deterioration, and basic physical and mechanical properties of renewable materials in relation to products utilization. Techniques on hand lens and microscopic identification of renewable materials.

GEP Natural Sciences
Typically offered in Fall only

SMT 203 Physical Properties of Sustainable Materials (4 credit hours)
Basic concepts involving the interaction of sustainable materials with moisture, heat, and electricity. Concepts needed to perform calculations related to material balance, energy balance, mass transfer by diffusion, and heat transfer by conduction. Principles and application of basic techniques for characterizing the physical properties of materials and for drying of lumber.

Typically offered in Spring only

SMT 206 Wood Manufacturing Site Visits (1 credit hours)
Examples of the practical implementation of the value added processes within the wood products industry. Visits to wood products industries will be representative of the primary breakdown and secondary value added product operations that will expand an

P: SMT 240
Typically offered in Summer only

SMT 210 Sustainable Materials Internship (1 credit hours)
Experience in the forest products or related industries with a departmentally selected employer. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student a

Prerequisite: Completion of summer practicum
Typically offered in Fall, Spring, and Summer

SMT 232 Recycling to Create a Sustainable Environment (2 credit hours)
The goal of this class is to link the impetus for recycling and recycled materials to the building of a sustainable world. Recycling efficiencies for various materials will be examined as well as recycling practices and attitudes in other parts of the world. This course will explore the technology, economics, markets, trade and social impacts due to the recycling of materials. Case studies will provide an in-depth examination of the problems and potentials for the recycling of selected recycled materials. The use of Life Cycle Analysis (LCA) to evaluate recycling alternatives will be introduced. The economic, policy, social and resource availability drivers for recycling will be examined as well as the technological, economic, market and social barriers to recycling.

GEP Interdisciplinary Perspectives
Typically offered in Spring only

SMT 240 Introduction to Wood Products Industries (2 credit hours)
An introduction to wood products including the products and their characteristics produced by the primary and secondary wood products industries, pulp and paper industry, energy and chemical products produced from wood.

P: SMT 202 or permission of the instructor
Typically offered in Spring only

SMT 293 Independent Study in Sustainable Materials & Technology (1-6 credit hours)
Independent Study for Sustainable Materials & Technology students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a “Course Agreement for Students Enr

Typically offered in Fall and Summer

SMT 294 Independent Study in Sustainable Materials & Technology (1-6 credit hours)
Independent Study for Sustainable Materials & Technology students at the freshman and sophomore level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a “Course Agreement for Students Enr

Typically offered in Fall and Summer

SMT 295 Special Topics in Sustainable Materials and Technology (1-3 credit hours)
Special Topics in Wood Products at the 200 level for offering of courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

SMT 301 Chemistry of Sustainable Materials (3 credit hours)
Introduction of polymer science concepts (thermal transitions, molecular weight, viscoelasticity) to sustainable materials such as wood, cork, starch, silk, etc. Detailed instruction on the chemistry of sustainable materials including reactivity, decay, the chemical aspects of thermal treatments, the separation of sustainable materials into their individual components, the reactivity and modification of the individual components, and the conversion of sustainable materials into energy products.

Prerequisite: CH 101 and CH 102 and CH 220
Typically offered in Spring only

SMT 302 Processing of Biomaterials (4 credit hours)
Principles of the manufacturing processes used in the sustainable and renewable materials industries. Content includes primary and secondary manufacturing, theory of machining basics, and biomaterials-based composite fabrication. Field trips might require meeting outside of class time.

Prerequisite: SMT 202 or SMT 203
Typically offered in Spring only

SMT 308 Wood Processing (4 credit hours)
Principles of the manufacturing processes used in the wood products industries. Content includes primary and secondary manufacturing, theory of machining basics, and solid wood and wood-based composite fabrication. Field trips might require meeting outside of class time.

SMT 202 and SMT 240 or permission of the instructor
Typically offered in Fall only
SMT 310 Introduction to Industrial Ecology (3 credit hours)
In this course, students will explore the main concepts of industrial ecology for sustainable materials. Students will learn about environmental supply chain, manufacturing of products from sustainable materials such as wood and agricultural materials, and how we can learn from nature to close the manufacturing loop. To support the activities in these technical areas, students will also learn how to better manage time, how to work efficiently in teams, and how best to interact with their co-workers.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

SMT 320 Industrial Chemical Pollutants (2 credit hours)
Introduction to the sources, fates, and analysis of common chemical pollutants from industrial sources. Content will focus predominantly on chemicals from industries related to the production and use of sustainable materials such as wood, bamboo, cork, silk, renewable plastics, etc.

P: SMT 301
Typically offered in Spring only

SMT 330 Project Management for Sustainability (3 credit hours)
Main concepts and principles of Project Management (PM). Different tools utilized in project management will be covered. Relationship between project management and sustainability will be emphasized. With the concepts and tools learned in class, students will learn how to better manage their time, how to work efficiently in teams, and how best to interact with their superiors.

Restriction: Junior or Senior Standing
Typically offered in Fall only

SMT 340 Sustainable Materials Business Marketing (3 credit hours)
This course will examine the business and marketing approaches in the forest products industry from a theoretical as well as an applied perspective. Students will learn the importance of business processes and how products, price, distribution, and promotion plays a role in the purchase behavior of consumers. Students will analyze situations and cases to solve real and hypothetical business problems in the forest products industry.

Typically offered in Spring only

SMT 441 Mechanical Properties of Sustainable Materials (4 credit hours)

Prerequisite: MA 121 and PY 211 and SMT 203
Typically offered in Spring only

SMT 444 Sustainable Composites and Biopolymers (3 credit hours)
Manufacture, properties, and processing of lignocellulosic composites and polymers such as laminates, strandboard, particleboard, fiberboard, and nanocomposites. Principles and application of basic techniques for manufacture and testing of composites according to product and quality standards.

Prerequisite: SMT 301 and Senior standing in SMT
Typically offered in Fall only

SMT 450 Sustainable Business and Innovation (2 credit hours)
Theories, practice and case studies of sustainability and innovation in corporate settings. Content will include sustainability and environmental management, innovation, new business development and R&D, change management, corporate strategy and strategic alignment.

Prerequisite: Junior or senior standing
Typically offered in Fall only

SMT 483 Capstone in Sustainable Materials and Technology (3 credit hours)
Capstone course in sustainable materials and technology; integration of sustainable material and technology concepts with economic, environmental, and societal considerations; case studies and practicum in sustainable materials and technologies.

Restricted to students with Senior Standing in SMT
Typically offered in Spring only

SMT 493 Independent Study in Sustainable Materials & Technology (1-6 credit hours)
Independent Study for Sustainable Materials & Technology students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-S
Typically offered in Fall, Spring, and Summer

SMT 494 Independent Study in Sustainable Materials & Technology (1-6 credit hours)
Independent Study for Sustainable Materials & Technology students at the advanced level developed under the direction of a faculty member. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-S
Typically offered in Fall, Spring, and Summer

Technology Education (TED)

TED 530 Foundations for Teaching Technology (3 credit hours)
Three topics related to teaching technology at the secondary and post-secondary levels: philosophical and historical foundations; methodology and curriculum development; and current trends and issues. Emphasis is on developing critical thinking skills, research, technology skill development, and writing procedures.

Prerequisite: Graduate standing
Typically offered in Fall only

TED 532 Current Trends in Technical Graphics Education (3 credit hours)
Current trends in the technology, techniques, and theories relating to technical graphics education. Discussion will center on assigned readings and student-researched presentations on topical subjects. Readings will be drawn from journals and texts, on-line databases and articles, and current news media sources.

Prerequisite: Graduate standing
Typically offered in Fall only
TED 534 Instructional Design in Technical and Technology Education (3 credit hours)
Create instructional activities for technical and technology education. Examine learning theories appropriate for technical and technology education. Explore and apply models for instructional design. Examine issues relative to electronic application.
Prerequisite: Graduate standing
Typically offered in Spring only

TED 536 Scientific and Technical Visualization: Theory and Practice (3 credit hours)
Theory and practice of scientific and technical visualization as a means of displaying scientific data and concepts using graphical methods. Both practitioner and theory driven models of communication are considered. How computer and print graphics can

TED 551 Technology Education: A Discipline (3 credit hours)
 Defines essential attributes of technology and examines the relationship between technology education and related disciplines. Analyzes the theory, models, and literature that constitute the foundation of technology education. Synthesizes relevant research and identifies areas of needed research.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TED 552 Curricula for Emerging Technologies (3 credit hours)
Analyze advanced technologies and develop instructional programs for technology education curricula in secondary schools. Topics include technologies in production, transportation and communication.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TED 555 Developing and Implementing Technology Education (3 credit hours)
Technology Education curriculum trends, standards, design, implementation and management. Students will analyze current curricular trends and develop strategies for implementing and managing technology education programs.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TED 556 Laboratory Management and Safety in TED (3 credit hours)
Laboratory management, planning, and safety considerations for technology education. Analysis of recent research, environmental factors, development of a safety system, safety education, and legal implications. Use of student leaders in management of a safe learning environment. Offered by Distance Education Only
Prerequisite: Graduate standing
Typically offered in Spring only

TED 558 Teaching Creative Problem Solving (3 credit hours)
Provides teachers with the opportunity to study the research associated with creativity and apply these theories to implement a creative problem solving program.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TED 601 Practicum in Technology Education (1-6 credit hours)
Faculty supervised experience in educational, industrial or governmental setting where a student analyzes activities associated with planning, implementing and evaluating instructional and/or services in technology education. This plan is developed by students and approved by supervisor.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

TED 602 Practicum in TED (1-3 credit hours)
Typically offered in Summer only

TED 610 Special Topics in Technology Education (1-6 credit hours)
Individual or group of special topics in professional education. The faculty member determines the topic and mode of study after discussion with students.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 621 Special Problems in Technology Education (1-6 credit hours)
Guided independent or group or current problems in technology education.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 641 Internship in Technology Education (3 credit hours)
Classroom teachers will document products of learning to include: content pedagogy, student development, multiple instructional strategies, motivation and management, professional growth and community involvement.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 646 Field-based Research in Technology Education (3 credit hours)
Employ methods of field-based research to examine and improve instructional effectiveness and student achievement.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 651 Internship in Graphic Communications Education (3 credit hours)
Mentoring during a higher education level teaching experience in the field of technical graphics with emphasis on providing help in teaching visualization, graphical sciences, and technical graphics standards. *Course is offered as needed to 2-3 students at a time (independent Study).
Prerequisite: TED 530 or EOE 751 with Consent of Instructor
Typically offered in Fall and Spring

TED 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student
Typically offered in Fall and Spring
TED 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student
Typically offered in Spring and Summer

TED 692 Research Project in Technology Education (1-6 credit hours)
A project or problem in research in education for graduate students, supervised by members of graduate faculty. The research chosen on the basis of individual students' interests and not to be part of thesis or dissertation research.
Prerequisite: ELP 732
Typically offered in Spring only

TED 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student
Typically offered in Fall and Spring

TED 695 Master's Thesis Research (1-9 credit hours)
Thesis research.
Typically offered in Fall, Spring, and Summer

TED 696 Summer Thesis Res (1 credit hours)

TED 709 Seminar in Technology Education (1-3 credit hours)
Seminar type course with topics selected for each class with attention given to broad concepts of and issues facing technology education at each level of delivery and implementation.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

TED 751 Technology Education: A Discipline (3 credit hours)
Defines essential attributes of technology and examines the relationship between technology education and related disciplines. Analyzes the theory, models, and literature that constitute the foundation of technology education. Synthesizes relevant research and identifies areas of needed research.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TED 752 Curricula for Emerging Technologies (3 credit hours)
Analyze advanced technologies and develop instructional programs for technology education curricula in secondary schools. Topics include technologies in production, transportation and communication.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TED 755 Developing and Implementing Technology Education (3 credit hours)
Technology Education curriculum trends, standards, design, implementation and management. Students will analyze current curricular trends and develop strategies for implementing and managing technology education programs.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TED 756 Planning of Change in TED (3 credit hours)
Theories, research, strategies and practices needed to function as a technology education change agent; demonstrate a working knowledge of planned change in technology education; observe, assess, design and competently plan intervention strategies and apply use behavioral tools to achieve success.
Typically offered in Summer only

TED 757 Leadership Development in TED (3 credit hours)
Research, development and practice of individual and organizational leadership in technology education. Content builds leadership knowledge, skills and practice with emphasis on student assessment and development.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TED 758 Teaching Creative Problem Solving (3 credit hours)
Provides teachers with the opportunity to study the research associated with creativity and apply these theories to implement a creative problem solving program.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TED 801 Practicum in Technology Education (1-6 credit hours)
Faculty supervised experience in educational, industrial or governmental setting where a student analyzes activities associated with planning, implementing and evaluating instructional and/or services in technology education. This plan is developed by student and approved by supervisor.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 810 Special Topics in Technology Education (1-6 credit hours)
Individual or group of special topics in professional education. The faculty member determines the topic and mode of study after discussion with students.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TED 821 Special Problems in Technology Education (1-6 credit hours)
Guided independent or group or current problems in technology education.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

TED 859 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.
Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TED 869 Summer Dissert Res (1 credit hours)

TED 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
Technology Engineering and Design Education (TDE)

TDE 101 Introduction to Technology Education (1 credit hours)
Orientation to technology teacher education curricula. Overview of the philosophy, objectives and scope of technology education programs in the public schools, multicultural and individual differences of students. A study of current technology issues will be conducted throughout the course.

Typically offered in Fall only

TDE 110 Materials & Processes Technology (3 credit hours)
Basic knowledge and skills needed to process common materials and produce functional products of woods, metals, plastics, and composite materials. Includes laboratory safety, use of hand tools, operation of materials, and teaching strategies. Laboratory experiences in materials testing and construction of multi-material projects.

Typically offered in Fall and Spring

TDE 131 Technology through Engineering and Design I (3 credit hours)
Study of engineering and design processes used to solve technological problems, innovate and invent. Students will actively design, model and test solutions to technological problems and explore methods to teach middle and high school students about engineering design and the design process.

Prerequisite: TDE 110
Typically offered in Spring only

TDE 202 Introduction to Teaching Technology Engineering and Design Education (2 credit hours)
This course introduces students to teaching technology, engineering, and design in middle and secondary schools. Students will become familiar with state standards and national recommendations for teaching technology, engineering, and design. The co-requisite for this course has a required fieldwork component in local middle and secondary schools, and students are responsible for their own transportation to and from their field experience sites. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.

Prerequisite: Sophomore standing; Corequisite: ED 204
Typically offered in Fall only

TDE 205 Desktop Publishing and Imaging Technology (3 credit hours)
An introduction to digital document production and techniques. Explores software packages used in producing documents for print. Structured for public school teachers and other interested persons, the course introduces basic standards and concepts of page layout, copyright and trademark laws, document usability, readability, and methods of document production.

Typically offered in Fall and Spring

TDE 220 Civil Engineering Graphics (3 credit hours)
Civil engineering graphics is an introductory course in basic graphic principles for constructed facilities. The emphasis is on sketching and CAD (computer-aided design) drawing skills and how specific construction systems and materials selected for a design affect production of civil engineering drawings for buildings, residences, and other constructed facilities through CAD. Topics include orthographic and axonometric engineering drawing of site plans, plat plans, section details, utility structure details, elevations and related topics. Restricted to Civil Engineering Majors.

Typically offered in Fall and Spring

TDE 230 Scientific and Technical Visualization (3 credit hours)
Scientific and technical visualization is an introductory course providing orientation to communication of scientific and technical information with graphics. Using current practice in science, technology, and engineering disciplines as the context, the class will use general and discipline-specific techniques to explore how to effectively communicate with graphics. Both manual and current software and computer technologies will be used to design and create graphics. Students will also learn to critically examine and discuss graphics produced by themselves and others.

Prerequisite: TDE 205
Typically offered in Spring only

TDE 261 Digital Media Education (3 credit hours)
Image creation and control, aesthetics, production processes and environments, and media transfer are explored. This course emphasizes concepts of audio and video design, various digital media technologies, and nonlinear editing concepts through laboratory experiments and projects in radio, television, original audio development, and video production. TDE Majors or instructor permission.

Typically offered in Spring only

TDE 331 Technology Through Engineering and Design II (3 credit hours)
Students will explore the contributions of systems engineering for developing and sustaining our designed world. Appropriate measurement, analysis and simulation tools will be used to make informed decisions and solve problems. Students will explore methods to teach middle and high school students about engineering design and the design process. TDE Majors or instructor approval.

Prerequisite: TDE 131
Typically offered in Fall only

TDE 351 Ceramics: The Art and Craft of Clay (3 credit hours)
Contemporary and historical examples of the art and craft of ceramics will be studied. Experiences in designing ceramic forms and expressing individual ideas through the medium of clay.

GEP Visual and Performing Arts

TDE 359 Electronics Technology (3 credit hours)
Direct current, alternating current, and semiconductors. Measurement and circuit behavior. Experimentation with application circuits.

Prerequisite: Junior Standing
Typically offered in Fall only
TDE 371 Emerging Issues in Technology  (3 credit hours)
Examination of current and projected technology topics which are growing in importance but are not presently reflected in the Technology Education programs of NC public schools. Laboratory experiences include development, revision, and field testing of appropriate learning activities for middle and high school students in the selected topic areas.
Prerequisite: TDE 131
Typically offered in Fall only

TDE 385 Robotics Education  (3 credit hours)
This course is an introduction to design and invention system control mechanisms and robot sensors. Students will classify foundational technical developments in autonomous and computer- and radio-control robot teleoperations. Students will explore the history and evolution of robots and automation and their social, economic, industrial, and educational impacts.
Prerequisite: Junior standing.
Typically offered in Spring only

TDE 386 Robotics Education Lab  (3 credit hours)
Students will apply technological problem solving skills toward 21st century design and innovation. This includes experiences multiple robotics design and invention systems and related programming and designing, prototyping, and programming an autonomous robot to resolve a real world issue.
Corequisite: TDE 385
Typically offered in Spring only

TDE 407 Field Work in Technology Education  (6 credit hours)
A supervised off-campus field experience in Technology, Engineering, and Design Education that relates on-the-job experiences in the field to the technical competencies that are the content of the curriculum. This course has a required fieldwork component in a workplace, and students are responsible for their own transportation to and from their field experience sites.
Co-requisite: TDE 452, Senior Standing
Typically offered in Spring only

TDE 452 Lab Planning in Technology Education  (3 credit hours)
Laboratory planning, management, and safety for technology education. Physical layout, selection, specification, and cost of equipment; the safe operation, repair and maintenance of power and hand tools; specification of expendable supplies, estimating, and ordering.
Restriction: Senior Standing; Corequisite: TDE 407 or TDE 457
Typically offered in Spring only

TDE 456 Curriculum and Methods in Technology Education  (4 credit hours)
Methods of teaching Technology Education. Emphasis on curriculum development, instructional methods, laboratory instruction, meeting needs of special populations, and management of student organizations. Field experiences and course assignments two hours each week. Students are responsible for their own transportation.
Prerequisite: Technology Education Majors, Admittance to teacher education candidacy
Typically offered in Fall only

TDE 457 Student Teaching in Technology Education  (8 credit hours)
Skills and techniques involved in teaching technology education through practice in a public school setting. The co-requisite for this course has a required fieldwork component in local middle and secondary schools, and students are responsible for their own transportation to and from their field experience sites. Students are required to purchase internship liability insurance to participate in this course. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.
Prerequisite: TDE 456 and Corequisite: TDE 452
Typically offered in Spring only

TDE 481 Research & Development in Technology Education  (3 credit hours)
Senior design, research, and development experience in technology education. Students research a problem, ideate potential solutions, select a final solution, construct a prototype, and complete a final report analyzing the chosen solution.
Prerequisite: TDE 331
Typically offered in Fall only

TDE 490 Special Problems in Technology Education  (1-6 credit hours)
Supervised, independent investigation in a defined area of interest in Technology Education.
Prerequisite: Junior standing.
Typically offered in Fall only

TDE 495 Senior Seminar in Technology Education  (3 credit hours)
An in-depth investigation of a topic or a set of problems and/or issues in Technology Education.
Prerequisite: Junior standing.
Typically offered in Fall and Spring

TDE 498 Independent Study in Technology Education  (1-3 credit hours)
Individual or group study of special topics in professional technology education. The topic and mode of study are determined by the faculty member after discussion with the student. May be repeated for a maximum of 6 credits. Individualized/Independent
Typically offered in Spring and Summer

Textile and Apparel Management (TAM)

TAM 589 Special Studies In Textile Management and Technology  (1-4 credit hours)
New or special course on developments in textile management and technology. Specific topics and prerequisites vary.
Prerequisite: Senior standing
Typically offered in Fall and Spring
Textile Chemistry (TC)

TC 530 The Chemistry Of Textile Auxiliaries (3 credit hours)
Industrially important textile chemicals used for enhancing fiber and fabric properties such as durable press, water repellency, anti-soiling, flame retardancy, softness, stiffness, lubricity and other uses. Correlation of effect with structure, end-use influences, interaction with fabric and fibers, sources and synthetic routes, economic and environmental considerations.

Prerequisite: One yr. of organic chemistry
Typically offered in Spring only

TC 561/MSE 561 Organic Chemistry Of Polymers (3 credit hours)
Principles of step reaction and addition polymerizations; copolymerization; emulsion polymerization; ionic polymerization; characterization of polymers; molecular structure and properties.

Prerequisite: TC 461 and CH 231 or CH 431
Typically offered in Fall only

TC 565 Polymer Applications and Technology (3 credit hours)
Poly(olefins), poly(vinyl chloride), poly(vinyl acetate), poly(urethanes), epoxies, silicones, styrene copolymers used as textile finishes, nonwoven binders, fabric coatings, composites, adhesives, foams, carpet backing adhesives. Emphasis upon synthesis, industrial processes, properties and products.

Prerequisite: One yr. of organic chemistry, TC 461
Typically offered in Spring only

TC 589/TE 589/TMS 589 Special Studies In Textile Engineering and Science (1-4 credit hours)
New or special course on developments in textile engineering and science. Specific topics and prerequisites identified vary. Generally used for first offering of a new course.

Prerequisite: Senior standing or Graduate standing
Typically offered in Fall, Spring, and Summer

TC 601 Seminar (1 credit hours)
Discussion of scientific articles and presentations; review and discussion of student papers and research problems.

Typically offered in Fall and Spring

TC 630 Independent Study (1-3 credit hours)
Typically offered in Fall and Spring

TC 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall only

TC 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TC 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TC 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

TC 695 Master's Thesis Research (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Summer only

TC 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

TC 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis. Credits arranged

Prerequisite: Master's student
Typically offered in Fall only

TC 704 Fiber Formation--Theory and Practice (3 credit hours)
Practical and theoretical analysis of the chemical and physical principles underlying conventional methods of converting bulk polymer to fiber; rheology; melt, dry and wet polymer extrusion; fiber drawing; heat setting; general theory applied to unit processes.

Prerequisite: MA 341, PY 208
Typically offered in Spring only

TC 705 Theory Of Dyeing (3 credit hours)

Prerequisite: CH 433
Typically offered in Spring only
Typically offered in Fall only
Prerequisite: CH 220
Polymer chains, which then related to their unique and rich variety of
to establish polymer microstructures and resultant sizes and shapes of
Analysis of NMR spectroscopy and conformational energy estimates
polymers afforded by analysis of their conformational characteristics.
Exploration of connections between microstructures and properties of
polymer, which then related to their unique and rich variety of
Prerequisite: Senior standing or Graduate standing in TC, Corequisite:
Typically offered in Fall only
Exercises with modern methods and equipment to aid in understanding
color perception, color science and color measurement. Computer color
graphics exercises for comprehension of basic concepts. Independent
projects in color science. Limited enrollment.
Prerequisite: Senior standing or Graduate standing in TC, Corequisite:
Typically offered in Fall only
The primary course purpose is to gain a strong fundamental
understanding of the chemistry and technology of preparation, dyes,
dyeing and finishes. Emphasis will be on the chemistry of different
bleach activators, surfactants, photophysics and photochemistry of
FWAs, modulations of dye structures to influence color, tintorial
strength, light fastness, wash fastness and aggregation. Chemistry of
different dye classes will be studied with emphasis on structure-property
relationships and dye-fiber interactions. Dyeing isomers (Nernst and
Langmuir), kinetics of dyeing with emphasis on derivation of Nernst
and Langmuir based on thermodynamics and kinetics principles will
be covered with practical examples of dyeing at different temperature
and how to calculate thermodynamic parameters of dyeing (entropy,
standard affinity and isotherm constants of Nernst and Langmuir).
Chemistry of different finishes, including soil release, chemistry of flame
retardants and mechanisms of flame retardancy, antimicrobial and water
and oil repellency, will be covered with emphasis on structure-property
relationships.
Prerequisite: Graduate Standing and C or better in CH221 or CH225 and
CH223 or CH227
Typically offered in Fall and Spring
Basis of modern techniques for color specification, measurement, control
and communication. Applications of color science to textiles, plastics,
color reproduction, computer-based imaging and display systems. Basic
concepts taught by computer color graphics.
Prerequisite: Senior standing or Graduate standing in TC, Corequisite:
Typically offered in Fall only
Exercises with modern methods and equipment to aid in understanding
color perception, color science and color measurement. Computer color
graphics exercises for comprehension of basic concepts. Independent
projects in color science. Limited enrollment.
Prerequisite: Senior standing or Graduate standing in TC, Corequisite:
Typically offered in Fall only
The primary course purpose is to gain a strong fundamental
understanding of the chemistry and technology of preparation, dyes,
dyeing and finishes. Emphasis will be on the chemistry of different
bleach activators, surfactants, photophysics and photochemistry of
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and Langmuir based on thermodynamics and kinetics principles will
be covered with practical examples of dyeing at different temperature
and how to calculate thermodynamic parameters of dyeing (entropy,
standard affinity and isotherm constants of Nernst and Langmuir).
Chemistry of different finishes, including soil release, chemistry of flame
retardants and mechanisms of flame retardancy, antimicrobial and water
and oil repellency, will be covered with emphasis on structure-property
relationships.
Prerequisite: Graduate Standing and C or better in CH221 or CH225 and
CH223 or CH227
Typically offered in Fall and Spring
Polymer Science and Engineering
(3 credit hours)
Exploration of connections between microstructures and properties of
polymers afforded by analysis of their conformational characteristics.
Analysis of NMR spectroscopy and conformational energy estimates
to establish polymer microstructures and resultant sizes and shapes of
polymer chains, which then related to their unique and rich variety of
physical properties.
Prerequisite: CH 220
Typically offered in Fall only
Typically offered in Fall only
Prerequisite: (CH 221 or CH 225) and (CH 223 or CH 227)
Typically offered in Spring only
Typically offered in Spring only
Typically offered in Fall only
Typically offered in Fall and Spring
Intensive treatments of selected topics in textile, polymer and fiber
science.
Prerequisite: Senior standing or Graduate standing
Typically offered in Fall and Spring
Study of selected topics of particular interest in various advanced phases
of fiber science.
Typically offered in Fall and Spring
(1 credit hours)
Textile Engineering (TE)
Typically offered in Fall and Spring
Prerequisite: Grade of C- or better CH 101
Typically offered in Spring only
(1-6 credit hours)
Typically offered in Fall and Spring
(2 credit hours)
Typically offered in Fall and Spring
Introduction to textile engineering, polymers and fibers with emphasis
on applications. Discussions of what makes macromolecules unique and
pairing of material properties to a given application. Other discussions by
various TE faculty giving students a picture of the breadth of the program.
This course will also help develop leadership/team work skills and oral/
written communications.
Corequisite: CH 101
Typically offered in Spring only
Typically offered in Fall and Spring
Introductory course in computer-based modeling and programming
using Visual Basic for Applications. Emphasis on algorithm development
and engineering problem solving. Methodical development of VBA
within applications like Microsoft Excel and Access from specifications;
documentation, style; control structures; classes and methods; data
types and data abstraction; object-oriented programming and design;
graphical user interface design. Projects: design problems from electrical,
industrial, textile, and financial systems. Functional relationships will
be given and programs will be designed and developed from a list of
specifications.
Prerequisite: E 115, Corequisite: MA 141
Typically offered in Fall and Spring
Introduction to Polymer Science and Engineering
(3 credit hours)
Science and engineering of large molecules. Correlation of molecular
structure and properties of polymers in solution and in bulk. Introductory
polymer synthesis and kinetics. Analysis of physical methods for
characterization of molecular weight, morphology, rheology, and
mechanical behavior. The content will be focused on polymer synthesis,
structure, and properties. The course will focus on a thorough
understanding of polymer concepts and definitions, equations to calculate
properties, and equipment used to measure properties.
Prerequisite: Grade of C- or better CH 101
Typically offered in Fall and Spring
Fiber Science
(4 credit hours)
Structure, physical and mechanical properties of fibers; structure of
fiber assemblies. Structure/property relations. Laboratory exercises in
characterization of fiber properties.
Prerequisite: CH 101 and (Graduate of C- or better in MA 131 or MA 141)
Typically offered in Fall and Spring
(3 credit hours)
Science of Dye Chemistry, Dyeing, Printing and
Finishing
Typically offered in Fall only
(3 credit hours)
Typically offered in Fall only
(3 credit hours)
Typically offered in Fall only
(3 credit hours)
Chemistry Of Dyes and Color
(3 credit hours)
Chemistry Of Dyes and Color
(3 credit hours)
Typically offered in Fall and Spring
**TE 205 Analog and Digital Circuits (4 credit hours)**
Fundamentals of analog and digital circuit analysis and design. The course will present the systematic analysis and design of AC and DC circuits using Ohms and Kirchhoff's laws, the node voltage method, Thevenin and Norton's theorem, Laplace Transforms, resistance, capacitance, inductance, operational amplifiers, and frequency response. Next, the design of combinatorial and synchronous sequential circuit design will be covered using Karnaugh maps, laws of Boolean algebra, flip-flops, state machines, and latches. Laboratory exercises will supplement the topics presented in class.

Prerequisite: (MA 206 or CE 214) and MA 242
Typically offered in Fall only

**TE 301 Engineering Textile Structures I: Linear Assemblies (3 credit hours)**
Engineering analysis of textile structures, especially yarns. Unit processes of production, handling, and packaging. Production sequences, intermachine effects, machine design and their consequences on the textile product.

Prerequisite: (MAE 206 or CE 214) and MA 242
Typically offered in Fall only

**TE 302 Textile Manufacturing Processes and Systems II (4 credit hours)**

Prerequisite: TE 301 and C- or better in TE/ISE 110
Typically offered in Spring only

**TE 303 Thermodynamics for Textile Engineers (3 credit hours)**
Introduction to the concept of energy and the laws governing the transfer and transformation of energy with an emphasis on thermodynamic properties and the First and Second Laws of Thermodynamics. The fundamentals of thermodynamics will be emphasized, although more applied examples and problems will be heavily utilized.

Prerequisite: MA 242, PY 208
Typically offered in Fall only

**TE 401 Textile Engineering Design I (4 credit hours)**
The design process including initial specification, design constraints, sources of information and design strategy. Development of fact-finding ability in areas unfamiliar to the student. Analysis of existing designs and the development of improved or new designs.

Prerequisite: TE 302
Typically offered in Fall only

**TE 402 Textile Engineering Design II (4 credit hours)**
Application of textile engineering principles using team approach to design, construct and analyze novel engineering solutions to textile industry problems. Evaluation of design to assess the impact on worker, industry and society.

Prerequisite: TE 401
Typically offered in Spring only

**TE 404 Textile Engineering Quality Improvement (3 credit hours)**
Defining and quantifying quality of textile products; quality improvement using statistical process control (SPC) and design of experiment (DOE) techniques.

Prerequisite: ST 370 and C- or better in TE/ISE 110
Typically offered in Spring only

**TE 424 Textile Engineering Quality Improvement Laboratory (1 credit hours)**
Application of process improvement methods to textile systems using statistical software. Laboratory supplements lecture material presented in TE 404.

Corequisite: TE 404
Typically offered in Spring only

**TE 435/CHE 435 Process Systems Analysis and Control (3 credit hours)**
Dynamic analysis and continuous control of chemical and material engineering processes. Process modeling; stability analysis, design and selection of control schemes. Solution of differential equations using Laplace transform techniques.

Prerequisite: (MA 341 and TE 205) or CHE 312
Typically offered in Fall and Spring

**TE 440/TE 540 Textile Information Systems Design (4 credit hours)**
Textile information system design, real-world constraints. Principles of hardware, software, security and ethics issues. Emphasis on solving a real world problem. Credit will not be given for both TE 440 and TE 540.

Typically offered in Fall only

**TE 463 Polymer Engineering (3 credit hours)**
Chemical and physical properties of polymers and fibers; thermodynamics of crystallization, time dependent phenomena, fracture mechanics and rheology. Advanced topics in extrusion.

Prerequisite: MSE 201 or BME 203; and Corequisite: TE 303, MAE 301, or MSE 301
Typically offered in Fall only

**TE 466/BME 466/TE 566/BME 566 Polymeric Biomaterials Engineering (3 credit hours)**
In-depth study of the engineering design of biomedical polymers and implants. Polymeric biomaterials, including polymer synthesis and structure, polymer properties as related to designing orthopedic and vascular grafts. Designing textile products as biomaterials including surface modification and characterization techniques. Biodegradable polymers.

Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 or CH 225) and (MAE 206 or CE 214)
Typically offered in Fall only

**TE 467/BME 467 Mechanics of Tissues & Implants Requirements (3 credit hours)**
Application of engineering and biological principles to understand the structure and performance of tendons, ligaments, skin, and bone; bone mechanics; viscoelasticity of soft biological tissues; models of soft biological tissues; mechanics of skeletal muscle; and tissue-derived devices as well as interfaces between native tissues and synthetic devices.

Prerequisite: (ZO 160 or BIO 183) and (MAE 214 or CE 225)
Typically offered in Spring only
TE 492 Special Topics in Textile Engineering (1-3 credit hours)
Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis. Credits and content determined by faculty member in consultation with the Department Head.  
Typically offered in Fall and Spring

TE 505 Textile Systems and Control (3 credit hours)
Theory and application of instruments and control systems used in modern textile plants. Description of basic instruments and computer systems along with their use in process control, production control, research and development.  
Prerequisite: TE 305, CSC 114  
Typically offered in Spring only

TE 533/TT 533/TTM 533 Lean Six Sigma Quality (3 credit hours)
Systematic approach (Lean Six Sigma philosophy) for improving products and processes. Defining the improvement opportunity, measurement system analysis, data collection, statistical analysis, design of experiment (DOE) methods, and statistical process control (SPC) methods. Application of Lean Six sigma methods to improve product or process.  
Prerequisite: ST 361 and ST 371, or equivalent  
Typically offered in Spring only

TE 540/TE 440 Textile Information Systems Design (4 credit hours)
Textile information system design, real-world constraints. Principles of hardware, software, security and ethics issues. Emphasis on solving a real world problem. Credit will not be given for both TE 440 and TE 540.  
Typically offered in Fall only

TE 550 Clothing Comfort and Personal Protection Science (3 credit hours)
The course presents scientific principles for characterization and development of comfortable and/or protective textiles and clothing. Properties associated with human tactile response, thermal comfort and heat stress are emphasized. Inherent issues of balancing comfort versus protection are illustrated by research studies on performance garments or protective clothing systems. Methods and standards for evaluating comfort and protective performance range from bench level instruments to system level tests for ensembles using instrumented manikins, human clothing wear trials, and physiological tests.  
R: Graduate Standing or Permission of Instructor  
Typically offered in Fall only

TE 551 Human Physiology for Clothing and Wearables (3 credit hours)
This course addresses key principles involved in the interaction between textiles and the human being: basic anatomy and physiology, individual differences, heat balance and ergonomics. Effects of climate and clothing systems on physiology and ability to perform work, and thermal strain of active, clothed humans will be the focus. Students will conduct thermal analysis of human heat balance, including the influence of clothing. Measurements techniques related to exercise physiology, and application of sensors and instruments systems will be discussed.  
R: Graduate Standing or Permission of Instructor  
Typically offered in Fall only

TE 562/OR 562/ISE 562 Simulation Modeling (3 credit hours)
This course concentrates on design, construction, and use of discrete/continuous simulation object-based models employing the SIMIO software, with application to manufacturing, service, and healthcare. The focus is on methods for modeling and analyzing complex problems using simulation objects. Analysis includes data-based modeling, process design, input modeling, output analysis, and the use of 3D animation with other graphical displays. Object-oriented modeling is used to extend models and enhance re-usability.  
Typically offered in Spring only

TE 565/TMS 565 Textile Composites (3 credit hours)
Fiber architecture of textiles used for composites. Manufacturing processes and geometric quantification. Basic analysis for predicting elastic properties. Interrelationship of elastic properties and geometric quantities. Failure criteria for these mate  
Prerequisite: MA 341, MAE 206  
Typically offered in Fall only

TE 566/BME 566/TE 466/BME 466 Polymeric Biomaterials Engineering (3 credit hours)
In-depth study of the engineering design of biomedical polymers and implants. Polymeric biomaterials, including polymer synthesis and structure, polymer properties as related to designing orthopedic and vascular grafts. Designing textile products as biomaterials including surface modification and characterization techniques. Biodegradable polymers.  
Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 or CH 225) and (MAE 206 or CE 214)  
Typically offered in Fall only

TE 570/PY 570 Polymer Physics (3 credit hours)
Polymer microstructures, polymer solutions, polymer physical states (including amorphous polymers, crystalline polymers, polymer melts, melting of polymers, glass-transition, and other transitions), polymer blends, polymer mechanical properties, polymer viscoelasticity and flow, multicomponent polymer systems, and modern polymer topics. The physics of polymer fibers. Graduate standing or permission of instructor.  
Typically offered in Fall only

TE 589/TMS 589/TC 589 Special Studies In Textile Engineering and Science (1-4 credit hours)
New or special course on developments in textile engineering and science. Specific topics and prerequisites identified vary. Generally used for first offering of a new course.  
Prerequisite: Senior standing or Graduate standing  
Typically offered in Fall, Spring, and Summer

TE 601 Seminar (1 credit hours)  
Typically offered in Fall and Spring

TE 630 Independent Study (1-3 credit hours)  
Typically offered in Fall, Spring, and Summer

TE 676 Special Projects (1-3 credit hours)  
Typically offered in Spring only
Typically offered in Fall, Spring, and Summer

GEP Natural Sciences

MA 141
Prerequisite: MT 105 or TT 105 or PCC 101; Corequisite: MA 131 or
students are introduced to tools that will help them reflect on how
polymer structure, fiber properties and utilization are explored. Also,
measuring the physical properties of fibers. Relationships between
electrical, and moisture management properties), and methods of
behaviors of fibers (including their mechanical, thermal, optical, frictional,
electrical, and moisture management properties), and methods of
measuring the physical properties of fibers. Relationships between
polymer structure, fiber properties and utilization are explored. Also,
students are introduced to tools that will help them reflect on how
problems related to fiber science are solved.

Prerequisite: MT 105 or TT 105 or PCC 101; Corequisite: MA 131 or

MAE 206

Typically offered in Spring only

Prerequisite: MT 105 or TT 105 or PCC 101; Corequisite: MA 131 or

Master's student

Typically offered in Fall only

Master's Examination

Prerequisite: Master's student

Typically offered in Fall, Spring, and Summer

Master's Supervised Research

Instruction in research and research under the mentorship of a member of
the Graduate Faculty.

Prerequisite: Master's student

Typically offered in Fall and Spring

Master's Thesis Research

Thesis Research

Prerequisite: Master's student

Typically offered in Fall and Spring

Master's Thesis Preparation

For graduate students whose programs of work specify no formal course
work during a summer session and who will be devoting full time to thesis
research.

Prerequisite: Master's student

Typically offered in Summer only

Master's Thesis Preparation

For students who have completed all credit hour requirements and full-
time enrollment for the master's degree and are writing and defending
their thesis. Credits arranged

Prerequisite: Master's student

Typically offered in Fall only

Textile Materials Science (TMS)

TMS 211 Introduction to Fiber Science

Properties of fibers are related to their classification, chemical structure,
type and origin- which helps with their identification and classification.
Covered in this course are principles of fiber formation and the physical
behaviors of fibers (including their mechanical, thermal, optical, frictional,
electrical, and moisture management properties), and methods of
measuring the physical properties of fibers. Relationships between
polymer structure, fiber properties and utilization are explored. Also,
students are introduced to tools that will help them reflect on how
problems related to fiber science are solved.

Prerequisite: MT 105 or TT 105 or PCC 101; Corequisite: MA 131 or

MAE 206

Typically offered in Spring only

TMS 212 Yarn and Fabric Formation and Properties

The development of products from textile and fibrous materials is a critical
component of new product development in many industries, including
textiles, retail, plastics, composites, transporations, and architecture.
This course provides the technical information required for scientists to
understand how textile and fiber-based products are manufactured, with
a practical view to combining the new knowledge with a molecular level
understanding of fibers for unique new product development.

Prerequisite: TMS 211

Typically offered in Fall and Summer

TMS 214 Yarn and Fabric Formation and Properties Lab

The development of products from textile and fibrous materials is a critical
component of new product development in many industry. This
laboratory course provides hands-on exercises and demonstrations of
key textile and fiber-based products are manufa

Prerequisite: TMS 212

Typically offered in Fall only

TMS 492 Special Topics in Textile Materials Science

Presentation of material not normally available in regular course
offerings or offering of new courses on a trial basis. Credits and content
determined by faculty member in consultation with the Department Head.

Typically offered in Fall and Spring

TMS 500 Fiber and Polymer Microscopy

Art and science of light and electron microscopy; theoretical and practical
aspects of visibility, resolution and contrast. Laboratory practice in
assembling, testing and using various microscopes and accessories in
analyzing, describing and identifying unoriented and oriented crystalline
or amorphous materials. Laboratory emphasis on study of fibers and
polymers through transmission microscopy with polarized light.

Prerequisite: MA 242, PY 208, TC 203

Typically offered in Fall only

TMS 521/TT 521 Filament Yarn Production Processing and Properties

Structure, properties and processes for manufacturing and treating
continuous filament yarns. Response of fibers to elevated temperatures,
twist, false twist and various bulking processes. Yarn structures
and properties required for stretch and molded fabrics. Independent
laboratory and critical literature review in general area of filament yarn
processing, properties and test methods. credit not allowed for both
TT 521 and TT 425

Prerequisite: Graduate standing or PBS status

Typically offered in Fall only

TMS 521/TT 521 Filament Yarn Production Processing and Properties

Structure, properties and processes for manufacturing and treating
continuous filament yarns. Response of fibers to elevated temperatures,
twist, false twist and various bulking processes. Yarn structures
and properties required for stretch and molded fabrics. Independent
laboratory and critical literature review in general area of filament yarn
processing, properties and test methods. credit not allowed for both
TT 521 and TT 425

Prerequisite: Graduate standing or PBS status

Typically offered in Fall only

TMS 565/TE 565 Textile Composites

Fiber architecture of textiles used for composites. Manufacturing
processes and geometric quantification. Basic analysis for predicting
elastic properties. Interrelationship of elastic properties and geometric
quantities. Failure criteria for these mate

Prerequisite: MA 341, MAE 206

Typically offered in Spring only
**TMS 589/TC 589/TE 589 Special Studies In Textile Engineering and Science** (1-4 credit hours)
New or special course on developments in textile engineering and science. Specific topics and prerequisites identified vary. Generally used for first offering of a new course.
Prerequisite: Senior standing or Graduate standing

**Typically offered in Fall, Spring, and Summer**

**TMS 676 Special Projects** (1-3 credit hours)

**TMS 685 Master's Supervised Teaching** (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.
Prerequisite: Master's student

**Typically offered in Fall and Spring**

**TMS 690 Master's Exam** (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.
Prerequisite: Master's student

**Typically offered in Fall and Spring**

**TMS 693 Master's Supervised Research** (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.
Prerequisite: Master's student

**Typically offered in Fall and Spring**

**TMS 695 Master's Thesis Research** (1-9 credit hours)
Thesis research
Prerequisite: Master's student

**Typically offered in Fall and Spring**

**TMS 696 Summer Thesis Research** (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Master's student

**Typically offered in Summer only**

**TMS 699 Master's Thesis Preparation** (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.
Prerequisite: Master's student

**Typically offered in Fall and Spring**

**TMS 761 Mechanical and Rheological Properties Of Fibrous Material** (3 credit hours)
In-depth study of the stress-strain, bending, torsional, dynamic and rheological behavior of natural and man-made fibers. Presentation and discussion of theoretical relations and advanced techniques.
Prerequisite: MA 301

**Typically offered in Spring only**

**TMS 762 Physical Properties Of Fiber Forming Polymers, Fibers and Fibrous Structures** (3 credit hours)
Experimental results and theoretical considerations of physical properties of fibers and fiber-forming polymers. Electrical, thermal, optical, frictional and moisture properties of these materials. Influence of chemical and molecular fine structure on these properties.
Prerequisite: PY 208

**Typically offered in Spring only**

**TMS 763/MSE 763 Characterization Of Structure Of Fiber Forming Polymers** (3 credit hours)
Theories, experimental evidence and characterization methods of the molecular fine structure of fiber forming polymers in the solid state. Characterization methods include X-ray diffraction, microscopy, infrared, thermal and magnetic resonance.
Prerequisite: Graduate standing

**Typically offered in Fall only**

**Textile Technology (TT)**

**TT 105 Introduction to Textile Technology** (3 credit hours)
Introduction to Textile and Apparel, Technology and Management. Structures and production methods for fabrics, yarn, and fibers. Introduction to the nature of polymers and the characteristics of polymers which make them useful for producing fibers that are practically and aesthetically desirable. Design of end products as well as fundamental economic and supply chain issues.

**Typically offered in Fall, Spring, and Summer**

**TT 221 Yarn Production and Properties I** (2 credit hours)
The techniques available for manufacturing yarns from staple fibers. A review of yarn numbering and fiber properties. The principles involved in opening, cleaning, blending, drafting, twisting and winding. Short and long staple spinning systems including a review of opening and cleaning lines, carding, draw frames, roving frames and different spinning machines. Filament yarn processing.
Prerequisite: TT 105 or MT 105; Corequisite: MA 131 or MA 141

**Typically offered in Fall, Spring, and Summer**

**TT 252 Formation and Structure of Textile Fabrics** (4 credit hours)
Prerequisite: TT 221 or TTM 106

**Typically offered in Fall, Spring, and Summer**

**TT 305 Introduction to Nonwoven Products and Processes** (3 credit hours)
Fiber web/nonwoven fabrics produced directly from fibers or their precursors. Physical and chemical nature of local bonding and fiber entanglement. Viable processes for producing these fabrics. Economic justification for process and production. Product/
Prerequisite: TMS 211 and (MA 131 or MA 141) and (PY 211 or PY 205 and 206); Corequisite: ST 311 or ST 370

**Typically offered in Fall, Spring, and Summer**
TT 327  Yarn Production and Properties  (4 credit hours)
The processing of natural and synthetic, fibers and filaments into yarns. The impact of fiber selection and processing parameters on the quality of the yarn and subsequent products. Major processing routes for staple fibers and filaments together with recent developments in applicable technologies.
Prerequisite: TMS 211 and (MA 231 or MA 241) and PY 211 or (PY 205 and PY 206)
Typically offered in Fall only

TT 331  Performance Evaluation of Textile Materials  (4 credit hours)
Standards, principles and effects of test conditions in measuring basic physical and mechanical properties of textile materials. Design of test and interpretation of test results in relation to end-use performance, product development, process control, research and development and other requirements.
Prerequisite: ST 311 or ST 370 and (TMS 211 or TT 327) and (PY 211 or PY 205 and PY 206) and MA 231 or MA 241
Typically offered in Fall and Spring

TT 341  Knitted Fabric Technology  (3 credit hours)
Prerequisite: TT 221 or TT 327
Typically offered in Spring only

TT 351  Woven Products and Processes  (3 credit hours)
Design and development of various woven textile products including their component properties, performance, requirements, structures, and methods of production. The primary objective of the course is to introduce students to various woven textile products, including those used in automotives, agriculture, construction, ETC. and stimulate understanding of their structure, performance requirements, and relevant manufacturing principles including braiding.
Prerequisite: (TT 221 or TT 327) and (PY 211 or (PY 205 and PY 206))
Typically offered in Spring only

TT 380/FTM 380  Management and Control of Textile and Apparel Systems  (3 credit hours)
Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.
Prerequisite: FTM 217
Typically offered in Fall only

TT 401  Textile Technology Senior Design I  (4 credit hours)
This is Part 1 of 2 for the Senior Capstone Design Course. Students work in cross-functional teams to research and solve real-world problems in fibers, polymers, and textile science utilizing their foundation skills in Textile Technology. TT 401 and TT 402 must be taken in the same academic year as the class is project and team dependent. Students will be required to meet outside the normal class times as well as expected to participate in various off-campus field trips and activities for successful completion of the project. Project sponsors will cover any transportation costs that are incurred. TT majors only.
Prerequisite: TT 401
Typically offered in Spring only

TT 402  Textile Technology Senior Design II  (4 credit hours)
This is Part 2 of 2 for the Senior Capstone Design Course. Students work in cross-functional teams to research and solve real-world problems in fibers, polymers, and textile science utilizing their foundation skills in Textile Technology. TT 401 and TT 402 must be taken in the same academic year as the class is project and team dependent. Students will be required to meet outside the normal class times as well as expected to participate in various off-campus field trips and activities for successful completion of the project. Project sponsors will cover any transportation costs that are incurred. TT majors only.
Prerequisite: TT 401
Typically offered in Spring only

TT 404/TT 504/NW 504/NW 404  Introduction to Nonwovens Products and Processes  (3 credit hours)
This course introduces the fundamentals of nonwoven structures, process, and products. It provides performance criteria, raw materials, manufacturing methods, and market outlooks of major nonwoven application segments including hygiene, wipes, filters, medical, automotive, and geotextile. Emphasis is placed on building basic understandings of process/structure/property relationship in nonwoven product and the economic justification for process and production.
Prerequisite: (MA 131 or 141), PY 205; Corequisite: TT 503
Typically offered in Fall only

TT 405/TT 505/NW 505/NW 405  Advanced Nonwovens Processing  (3 credit hours)
Mechanisms used in the production of nonwoven materials. Design and operation of these mechanisms. Process flow, optimization of process parameters, influence of process parameters on product properties.
Prerequisite: MA 231 or MA 241, PY 211 or (PY 205 and PY 206), TT 305 or TT 404
Typically offered in Spring only

TT 407  Characterization Methods in Nonwovens  (3 credit hours)
Prerequisite: ST 311 or ST 370; and TT 305 or TT 404
Typically offered in Spring only
TT 408/TT 508/NW 508/NW 408  Nonwoven Product Development  (3 credit hours)
Prerequisites: TT 405 and TT 407
Typically offered in Spring only

TT 431  Quality Management and Control In Textile Manufacturing  (3 credit hours)
Principles of quality and process management and control in textile/apparel manufacturing with emphases in quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.
Prerequisite: TT 331
Typically offered in Spring only

TT 451/TT 551  Advanced Woven Fabric Design  (3 credit hours)
Design and production requirements for highly specialized woven fabric structures. The laboratory activities will include a project on design from concept to final production and finishing.
Prerequisite: (TT 252 or TT 351) and Senior Standing
Typically offered in Fall only

TT 470  Jacquard Woven Fabric Design  (3 credit hours)
This course is dedicated to the study of Jacquard woven fabric design and structural technology through the use of CAD as both an aesthetic and technical tool, and will culminate in each student producing a unique fabric collection based upon his/her developed area of interest. Jacquard design for many different end uses is addressed, from art fabrics to unique specialty products. A field trip in this course will require personal transportation.
Prerequisite: TT 252, TT 371
Typically offered in Fall only

TT 480/FTM 480  Operations Management Decisions for Textiles  (3 credit hours)
Quantitative techniques for decision making and management in the textile complex. Applications include vendor selection, plant location, retail inventory management, forcasting demand, project management, and logistics planning. Techniques covered include simulation, PERT/CPM, mathematical modeling.
Prerequisite: TT/FTM 380 and ACC 210 and ST 311 or ST 370 and ((MA 131 and 132) or MA 141)
Typically offered in Fall only

TT 481  Design and Technology of Technical Textiles  (3 credit hours)
Performance requirements of various technical textiles. Underlying principles of design, application, manufacture, and evaluation of fibrous structures intended to meet specific end-use requirement.
Prerequisite: TT 305, TT 341 and TT 351
Typically offered in Fall only

TT 485/FTM 485  Textile Computer Integrated Enterprise  (3 credit hours)
Survey of information technology in textile and apparel industries. Topics discussed include: computer aided design (CAD); computer aided manufacturing (CAM); computer aided engineering (CAE); material handling systems; automation and robotics; logistics and warehousing systems; retail product tracking, and Internet resources.
Prerequisite: TT/FTM 380
Typically offered in Fall only

TT 486/FTM 486  Supply Chain Management in the Textile Industry  (3 credit hours)
Study of the operations necessary to produce and distribute a product, starting with the procurement of the raw material used in making the goods and ending with the delivery of the finished product. Topics covered include approaches to solving problems in manufacturing, sourcing, transportation logistics, and retail operations within the Integrated Textile Complex. Credit cannot be given for both TAM486 and MT386.
Prerequisite: TT/FTM 380
Typically offered in Fall only

TT 499  Textile Senior Project  (4 credit hours)
This is a project based course to be taken in the last semester of the Senior year. In this capstone course the students work in cross-functional teams to research and solve applied problems in textile related fields. The results of the projects will
Prerequisite: Senior standing
Typically offered in Fall and Spring

TT 500  Understanding the Textile Complex  (3 credit hours)
This course provides an overview of product development, processing, managing, financing, etc., for the textile industry. It is designed to give new graduate students basic preparations for more advanced, required textile courses. Students will also gain insight into the research being conducted within the College of Textiles.
Prerequisite: Graduate standing
Typically offered in Fall only

TT 503/NW 503  Materials, Polymers, and Fibers used in Nonwovens  (3 credit hours)
Fundamentals of raw material used in nonwoven processes. Raw material production, chemical and physical properties of nonwoven raw materials and assessment of material properties. Introduction of structure/property relationships for these materials and how these relationships influence end use applications.
Prerequisite: MA 141, PY 205, PCC 203
Typically offered in Fall and Spring

TT 504/NW 504/NW 404/TT 404  Introduction to Nonwovens Products and Processes  (3 credit hours)
This course introduces the fundamentals of nonwoven structures, process, and products. It provides performance criteria, raw materials, manufacturing methods, and market outlooks of major nonwoven application segments including hygiene, wipes, filters, medical, automotive, and geotextile. Emphasis is placed on building basic understandings of process/structure/property relationship in nonwoven product and the economic justification for process and production.
Prerequisite: (MA 131 or 141), PY 205; Corequisite: TT 503
Typically offered in Fall only
TT 505/NW 505/NW 405/TT 405  Advanced Nonwovens Processing  (3 credit hours)
Mechanisms used in the production of nonwoven materials. Design and operation of these mechanisms. Process flow, optimization of process parameters, influence of process parameters on product properties.
Prerequisite: MA 231 or MA 241, PY 211 or (PY 205 and PY 206), TT 305 or TT 404
Typically offered in Spring only

TT 507/NW 507  Nonwoven Characterization Methods  (3 credit hours)
Prerequisite: ST 361, Corequisite: TT/NW 505
Typically offered in Spring only

TT 508/NW 508/NW 408/TT 408  Nonwoven Product Development  (3 credit hours)
Prerequisites: TT 405 and TT 407
Typically offered in Spring only

TT 520  Yarn Processing Dynamics  (3 credit hours)
Principles and practice involved in modern yarn and manufacture; including machine-fiber interactions occurring during different processing stages. Not normally for credit for undergraduate textile majors.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Spring

TT 521/TMS 521  Filament Yarn Production Processing and Properties  (3 credit hours)
Structure, properties and processes for manufacturing and treating continuous filament yarns. Response of fibers to elevated temperatures, twist, false twist and various bulking processes. Yarn structures and properties required for stretch and molded fabrics. Independent laboratory and critical literature review in general area of filament yarn processing, properties and test methods. credit not allowed for both TT 521 and TT 425
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TT 530/TTM 530  Textile Quality and Process Control  (3 credit hours)
Quality control and improvement methods for textile processes and products including quality systems, statistical control chart procedures, process capabilities, acceptance sampling plans, textiles process and product designs, on-line and off-line control systems and specific quality factors governing textile products and processes and their variabilities.
Prerequisite: TT 420, Corequisite: ST 511 or ST 515
Typically offered in Spring only

TT 532  Evaluation of Biotextiles  (3 credit hours)
Evaluation of the performance of biotextiles and medical polymers in biological and microbiological environments, with an emphasis on “in vitro” and “in vivo” techniques for testing the biocompatibility and biostability of implantable biomedical products. Related issues will deal with quality assurance systems, inspection and sampling plans, ISO certification, GMP’s, reference materials and organisms, and the use of accelerated tests an animal trials so as to meet regulatory requirements.
Prerequisite: ZO 160, TC 203, TMS 211, CH 220
Typically offered in Fall only

TT 533/TTM 533/TE 533  Lean Six Sigma Quality  (3 credit hours)
Systematic approach (Lean Six Sigma philosophy) for improving products and processes. Defining the improvement opportunity, measurement system analysis, data collection, statistical analysis, design of experiment (DOE) methods, and statistical process control (SPC) methods. Application of Lean Six sigma methods to improve product or process.
Prerequisite: ST 361 and ST 371, or equivalent
Typically offered in Spring only

TT 535/TTM 535  Research Methods and Management  (3 credit hours)
Basic principles and methods of academic and industrial research, research ethics, search of knowledge bases, research hypothesis, scientific paradigm, theory development, optimal research design and execution of scientific experiments, regression methods, survey design, use of variance components for sampling scheme, model building and validation, principles of industrial R&D, project design and management, intellectual property rights, and maximization of research output.
Prerequisite: ST 361, Graduate standing
Typically offered in Spring only

TT 549  Warp Knit Engineering and Structural Design  (3 credit hours)
Prerequisite: TT 443
Typically offered in Spring only

TT 550  Production Mechanics and Properties of Woven Fabrics  (3 credit hours)
Interrelation between mechanics of production and mechanical properties of woven fabric; unit operations required to prepare yarns for weaving and the mechanism employed in weaving; fabric structure, geometry and mechanical properties; designing for specific fabrics properties. Not normally for credit for undergraduate textiles majors.
Prerequisite: Graduate standing or PBS status
Typically offered in Spring only

TT 551/TT 451  Advanced Woven Fabric Design  (3 credit hours)
Design and production requirements for highly specialized woven fabric structures. The laboratory activities will include a project on design from concept to final production and finishing.
Prerequisite: (TT 252 or TT 351) and Senior Standing
Typically offered in Fall only
TT 553  Formation and Structure of Woven and Knitted Fabrics  (3 credit hours)
The interrelation between the mechanics of production and mechanical properties of woven and knitted fabrics; unit operations required to prepare yarns for weaving and knitting and mechanisms employed in weaving and knitting; fabric structure, geometry and mechanical properties; designing for specific fabric properties. Students will not be allowed credit for TT 553 and (TT 541, TT 549, and TT 550).

Typically offered in Spring only

TT 570  Textile Digital Design and Technology  (3 credit hours)
This course focuses on design of textile products balancing industry and creative foci. Students will study a range of industry focused technologies and techniques essential to creation of textile products in a technology intensive environment. Basics of textile product design and relevant technologies will be covered along with methods and techniques to improve commercial textile product design process. Students will research in-depth a topic related to textile product design, and present their research in an oral format.

Prerequisite: Graduate standing
Typically offered in Fall only

TT 571  Professional Practices in Textile Design and Technology  (3 credit hours)
This course builds on the concepts introduced in TT 570 with increased focus on professional practice and methods. Focus on advanced textile product design topics incorporating an industry focus and utilizing commercial technologies. Students will investigate in depth a textile product design industry application, technique or method of interest using individual and team based strategies. Topics include advanced study of textile product design concepts, techniques and preparation for professional competitions, displays and conferences.

Prerequisite: TT 570
Typically offered in Spring only

TT 581  Technical Textiles  (3 credit hours)
Performance requirements of various technical textiles. Underlying principles of design and manufacturing of fibrous structures to meet specific needs in mechanical and other behaviors.

Prerequisite: TT 520 or TT 521, and TT 550
Typically offered in Fall only

TT 591  Special Studies in Textile Technology  (1-4 credit hours)
Special Studies in Textile Technology to fulfill needs not covered by current offering. Student and faculty required to submit topics to be covered to director of graduate programs within first week of semester.

Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TT 601  Seminar  (1 credit hours)
Discussion of scientific articles of interest to the textile industry; review and discussion of student papers and research problems.

Typically offered in Fall and Spring

TT 630  Independent Study in Textile Technology  (1-3 credit hours)
Problems of specific interest in textile technology. Preparation of report, in format suitable for publication required. One-page outline signed by advisor must be submitted to director of graduate programs within first week of semester. A maximum of 3 credit hours will be allowed towards Master of Textiles Degree. No credit is allowed towards MS (Textiles).

Typically offered in Fall, Spring, and Summer

TT 676  Special Projects Textile Technology  (1-3 credit hours)
Typically offered in Fall and Spring

TT 685  Master's Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall only

TT 690  Master's Examination  (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall and Spring

TT 693  Master's Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

TT 695  Master's Thesis Research  (1-9 credit hours)
Thesis Research

Prerequisite: Master's student
Typically offered in Spring only

TT 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

TT 699  Master's Thesis Preparation  (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their thesis.

Prerequisite: Master's student
Typically offered in Spring only

TT 896  Summer Dissertation Research  (1 credit hours)
Textile Technology Management (TTM)

TTM 106 Yarn Formation, Classification and Numbering Systems (1 credit hours)
The course addresses techniques available for manufacturing staple and filament yarns, classification of yarn types, and processes involved in manufacturing staple and filament yarns. The course covers hands-on calculations and measurements of yarn numbering systems including direct and indirect systems.
Prerequisite: TT 105; Corequisite: MA 131 or MA 141 (Calculus I)
Typically offered in Fall and Spring

TTM 501 Textile Enterprise Integration (3 credit hours)
Discussion of philosophy, strategy and technology of enterprise integration for textile manufacturing. Survey of enabling technologies such as computer-aided design; computer-aided manufacturing; material handling systems; information systems for control, supervision and planning; and internet resources.
Prerequisite: Graduate standing, Background in textile manufacturing.
Typically offered in Fall only

TTM 510 Apparel Technology Management (3 credit hours)
Role of the apparel complex in manufacturing and supplying products on demand to meet the quality and performance of the global customer. The critical juxtaposition of the textile supply together with retail demand studied to understand constraints.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TTM 515 Apparel Production (3 credit hours)
Concepts and practices for the production of apparel items, beginning with development of basic fit blocks and extending through the reaction of stylized garments using pattern engineering techniques, supported by computerized pattern development.
Typically offered in Fall only

TTM 517 Advanced Computer-Aided-Design for Fashion (3 credit hours)
Exploration of industry design software for apparel and other sewn products. U4ia visual design software, 3D to 2D pattern generation software, Gerber Accumark or Lectra pattern design programs, Adobe Illustrator and Photoshop, and other programs used by the industry to create, market and/or visualize products will be taught. Peripheral equipment essential to the design and visualization process will be included.
Typically offered in Fall only

TTM 530/TT 530 Textile Quality and Process Control (3 credit hours)
Quality control and improvement methods for textile processes and products including quality systems, statistical control chart procedures, process capabilities, acceptance sampling plans, textiles process and product designs, on-line and off-line control systems and specific quality factors governing textile products and processes and their variabilities.
Prerequisite: TT 420, Corequisite: ST 511 or ST 515
Typically offered in Spring only

TTM 533/TE 533 TT 533 Lean Six Sigma Quality (3 credit hours)
Systematic approach (Lean Six Sigma philosophy) for improving products and processes. Defining the improvement opportunity, measurement system analysis, data collection, statistical analysis, design of experiment (DOE) methods, and statistical process control (SPC) methods. Application of Lean Six sigma methods to improve product or process.
Prerequisite: ST 361 and ST 371, or equivalent
Typically offered in Spring only

TTM 535/TT 535 Research Methods and Management (3 credit hours)
Basic principles and methods of academic and industrial research, research ethics, search of knowledge bases, research hypothesis, scientific paradigm, theory development, optimal research design and execution of scientific experiments, regression methods, survey design, use of variance components for sampling scheme, model building and validation, principles of industrial R&D, project design and management, intellectual property rights, and maximization of research output.
Prerequisite: ST 361, Graduate standing
Typically offered in Spring only

TTM 545 Weft and Warp Knit Engineering and Structural Design (3 credit hours)
This class is for both designers, engineers, and technicians for garment applications and machine technologies, to design and create a wide range of products using non-traditional materials and techniques, with the options of knitting in both two and three dimensions. Applications can be but are not limited to sports, medicine, Industrial, electronic and entertainment, transportation, interior design, and furniture.
Typically offered in Fall only

TTM 561 Strategic Technology Management in the Textile Complex (3 credit hours)
Management approaches and strategies for forecasting, planning, creating, and implementing technology changes in textile industry complex undergoing rapid market place and global competitive changes.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall only

TTM 573 Management of Textile Product Development (3 credit hours)
The course focuses on an integrated approach to new product design, development and marketing of textile products. This integrated approach includes a) innovation strategy and opportunity identification, b) the design process for textile products, c) market launch, and d) managing innovation. The course include diverse textile end-uses, including apparel, home textiles, transportation textiles, and medical textiles. Trends in textile product development are reviewed. The dynamics of business analysis and strategy, design prototypes, and product analysis and recommendation are analyzed.
Prerequisite: Graduate standing
Typically offered in Spring only
TTM 579  Textile Design Collection Studio  (6 credit hours)
Execution of creative projects addressing textile design problems through
synthesis of background research and investigation, and knowledge
from previous courses; preparation of work for portfolio, juried exhibition and
participation in industry based competitions. Professional textile
design practices including advanced portfolio development concepts and
presentation, development of textile collections for specified end uses
with emphasis on ideation, refinement and design development, and
visual communication. FTD-TD ABM and TATM graduate students only.
Prerequisite: FTD 374, FTD 475, FTD 476
Typically offered in Spring only

TTM 580  Consumer Perspectives in Fashion  (3 credit hours)
Introduction of concepts and theories related to consumer behavior.
Analysis of apparel and textile consumers and their decision making
processes as well as internal and external influencing factors. Application
of consumer behavior models to investigate

Typically offered in Spring only

TTM 581  Global Textile and Apparel Business Dynamics  (3 credit hours)
An overview of the economic, competitive, technological and market
dynamics of the international textile and apparel industries. Trends in
demand, output and trade are reviewed. The dynamic forces shaping and
transforming the industry internationally are analyzed. Patterns of change
at the global, regional, national and company level are explained and the
outlook for the industries is considered.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall and Summer

TTM 582  Global Textile Brand Management and Marketing  (3 credit hours)
The course provides an understanding of the global textile brand
management and marketing environments, global markets, and
marketing programs and organizations. Specific topics include a) the
economic, social, political/legal, and cultural environments; b) global
textile market opportunities and challenges; c) global textile and apparel
marketing strategies, and d) creation and management of global textile
and apparel marketing programs. Credit will not be allowed for both TAM
482 and TMM 582. Graduate standing.

Typically offered in Fall only

TTM 583  Strategic Planning for Textile Firms  (3 credit hours)
Elements of competitive strategy and planning methods within the
textile complex with emphasis on the concepts of strategy in a mature
industry, defining business in a global industry, resource allocation
through strategic planning methods and implementing strategy in a single
business and multi-business firms.
Prerequisite: Graduate standing
Typically offered in Fall only

TTM 585/BUS 585  Market Research In Textiles  (3 credit hours)
A study and analysis of quantitative methods employed in market
research in the textile industry. Function of market research and its
proper orientation to management and decision making.
Prerequisite: TAM (EC) 482
Typically offered in Spring only

TTM 587  Advanced Fashion Collection Studio  (6 credit hours)
Graduate level fashion product design. Design and production of a
“collection” using various methods of generating patterns for garments,
such as flat pattern, draping CAD design techniques. Relationship
of body configuration and fabrication to garment design. Emphasis
on ideation, creativity, communication, fit quality and exhibition of a
fashion collection. Work culminates in a fashion show or static exhibition.
Restricted to TATM majors.
P: FTM 315,317, and 318 or FTD215, 216, and 321
Typically offered in Fall and Spring

TTM 588  Global Perspectives in Textiles Supply Chain
Management  (3 credit hours)
Study and analysis of global textile supply chains. Field trips to textile
related companies and organizations are required. Students will conduct
a research project on global supply chain issues. Course taught off

TTM 591  Special Studies in Textile Technology Management  (1-4
credit hours)
Special Studies in Textile and Apparel, Technology and Management to
fulfill needs not covered by current offerings. Student and faculty required
to submit topics to be covered to director of graduate programs within first
week of semester.
Prerequisite: Graduate standing or PBS status
Typically offered in Fall, Spring, and Summer

TTM 601  Seminar  (1 credit hours)
Discussion of scientific articles of interest to the textile industry; review
and discussion of student papers and research problems.
Typically offered in Fall and Spring

TTM 630  Independent Study in Textile Technology
Management  (1-3 credit hours)
Problems of specific interest in textile and apparel technology.
Preparation of report, in a format suitable for publication required. One-
page outline signed by advisor must be submitted within first week of
semester.

Typically offered in Fall, Spring, and Summer

TTM 632  Special Studies in Textile Product Development  (1-6 credit
hours)
Preq: Graduate standing or PBS student. This course is an Independent
Study in Textile Product Development to fulfill needs not covered by
current course offerings. Student and faculty required to submit the
topic to be covered to the graduate admin

Typically offered in Fall, Spring, and Summer

TTM 693  Master’s Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member
of the Graduate Faculty.

Prerequisite: Master’s student
Typically offered in Fall and Spring

TTM 695  Master’s Thesis Research  (1-9 credit hours)
Thesis research.

Prerequisite: Master’s student
Typically offered in Fall, Spring, and Summer
TTM 696  Summer Thesis Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

TTM 710  Textile Technology Management  (3 credit hours)
The course will discuss economic and technical aspects of managing technology in the textile complex. It will explain how technological change can be planned and thus managed, and it will address the required framework for forecasting, planning, creating, and implementing technological change. Cases of technological change in the textile complex will be discussed.

Requirement: 18TTMPHD
Typically offered in Fall only

TTM 731  Decision Models and Applications in Textile and Apparel Management  (3 credit hours)
This course provides students with an overview of data decision models used in the textile and apparel industry, along with skills to apply them in real-world decision processes. Published academic papers and case studies will augment the teaching and learning in international trade, supply chains, manufacturing processes, quality, marketing, retail and distribution.

Restriction: TTM PhD
Typically offered in Spring only

TTM 750/FPS 750  Advances in Fabric Formation, Structure, and Properties  (3 credit hours)
The course covers different aspects of the processing of yarns to products (braided, knitted, woven, and their composites) and the interrelation between the production mechanics and structure, geometry and properties of fiber assembly. Topics in the field are assigned and each student is expected to thoroughly study the topics and write critical papers based on structured assignments and specific questions. Conduct projects from concept to fabric formation, analyses, and evaluation.

Prerequisite: TT 550 or TT 551 (or TT 451) or equivalent
Typically offered in Spring only

TTM 761  Supply Chain Management and Information Technology  (3 credit hours)
Working knowledge of management concepts and information technologies to design and manage supply chain operations in textile complex. Deals with markets and operations distributed geographically and institutionally.

R: Graduate Students Only
Typically offered in Spring only

TTM 785  Doctoral Research Methods  (3 credit hours)
The course in research methods examines contributions to knowledge among the interdisciplinary streams of inquiry that inform global management in textiles and apparel. The course requires active discourse among students regarding: philosophy of science, dominant research paradigms, assumptions of quantitative and qualitative research methods, application of qualitative and quantitative research methods to areas including but not limited to: product development, technology management, supply chain management, textile economics & trade, marketing strategy and consumer behavior. Students are expected to develop particular understanding of the methods commonly applied in their area of interest.

Requirement: 18TTMPHD
Typically offered in Fall only

TTM 791  Advanced Special Studies in Textile Technology Management  (1-4 credit hours)
Advanced Special Studies in Textile Technology Management to fulfill needs not covered by current offerings. Students and faculty are required to submit topics to be covered to the graduate administrator before the start of semester.

Prerequisite: Doctoral Student
Typically offered in Fall, Spring, and Summer

TTM 801  Seminar  (1 credit hours)
Typically offered in Fall and Spring

TTM 830  Independent Study  (1-3 credit hours)
Typically offered in Fall and Spring

TTM 876  Special Project TTM  (1-3 credit hours)
Typically offered in Fall only

TTM 885  Doctoral Supervised Teaching  (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall only

TTM 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

TTM 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

TTM 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer
TTM 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.
Prerequisite: Doctoral student
Typically offered in Summer only

TTM 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree and are writing and defending their dissertations.
Prerequisite: Doctoral student
Typically offered in Fall and Spring

Textiles (T)

T 101 Introduction to the College of Textiles (1 credit hours)
Introduction topics related to the College of Textiles, the textile industry, all textile curricula, advising, academic skills, team work, research and personnel involved in the college. Students will not receive credit for both USC 301 and T 101.
Typically offered in Fall and Spring

T 102 Introduction to Product Evolution (2 credit hours)
Students explore the new product development (NPD) process through analysis of case studies of how textile products are designed and developed for a variety of sectors of our economy, including automotive, medical, industrial, furniture, and clothing. Students develop critical thinking skills as they read a variety of texts and respond using several forms of writing techniques.
Typically offered in Fall and Spring

T 104 Fabric of Success and Career Readiness (1 credit hours)
This course will provide students with the knowledge and resources needed to effectively identify, plan, and achieve their career interests and goals. Participants will develop the career-readiness skills that employers seek in new hires, thus allowing them to be better prepared for and successful in their future internship and job searches.
Restriction: Wilson College of Textiles Students with 15+ hours completed at NC State
Typically offered in Fall and Spring

T 200 Introduction to Textiles (3 credit hours)
Survey of textiles including technical and economic history of the industry; physical and chemical processes involved in producing textile products from raw materials; unique aesthetic, physical and chemical properties of textiles and how these properties are determined by raw materials and production processes; and influence of properties of textile materials on their utilization and performance. Not open to students required to take TT 105; open to transfer students
Typically offered in Fall, Spring, and Summer

T 491 Honors Seminar in Textiles (1 credit hours)
A seminar on current university and industrial research in the field of textiles.
Prerequisite: By invitation into Honors Program in Textiles
Typically offered in Spring only

T 493 Industrial Internship in Textiles (3 credit hours)
Paid professional-level work experience in textiles, relating academic training in science and technology to industrial practice under professional guidance. Written and final oral presentation used for grading. Limited to three hours per student. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: Textile core courses
Typically offered in Summer only

T 495 International Collaboration in Textiles Research (1-6 credit hours)
Directed undergraduate research in Textiles and/or Apparel related areas that requires collaboration with students at an institution abroad. The research project is structured as an international team project in an applied field that allows students in
Prerequisite: GPA of 2.75 or better and JR standing
Typically offered in Fall, Spring, and Summer

T 497 Independent Research in Textile Engineering, Chemistry and Materials Science I (1-3 credit hours)
Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: Junior standing in TECS; 2.8 GPA
Typically offered in Fall, Spring, and Summer

T 498 Independent Research in Textile Engineering, Chemistry and Materials Science II (1-3 credit hours)
Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required. Individualized/Independent Study and Research courses require a Course Agreement for Students Enrolled in Non-Standard Courses be completed by the student and faculty member prior to registration by the department.
Prerequisite: T 497
Typically offered in Fall, Spring, and Summer

Theatre (THE)

THE 103 Introduction to the Theater (3 credit hours)
Artistic, technical, historical, and literary areas of theater, including acting, directing, design, stagecraft, lighting, costuming, makeup, and criticism.

GEP Visual and Performing Arts
Typically offered in Fall and Spring

THE 203 Theory and Practice of Acting (3 credit hours)
Basic contemporary theories on acting, with practical application through classroom exercises. Role analysis, adaptation of voice and body to performance demands, and role development through various rehearsal activities.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer
Typically offered in Fall only

THE 293 Theater Practicum (1-6 credit hours)
Practical experience in one or more of the various areas of artistic and technical theater through active participation in Thompson Theater's play production program.

Typically offered in Fall, Spring, and Summer

THE 303 Stage Directing (3 credit hours)
Basic theory of directing and its application to theatrical production. Play reading, evaluation, casting procedure, staff organization, and rehearsal planning and practices. Laboratory productions of short plays.

Typically offered in Spring only

THE 334 Advanced Acting (3 credit hours)
Advanced methods in role preparation through exercises in concentration, imagination, sensory and emotional recall, and other Stanislavskian techniques. Analyses and critiques of plays and in-class performances.
Prerequisite: THE 203 or demonstrated competence in acting

Typically offered in Spring only

THE 340 African American Theatre (3 credit hours)
This course examines African American dramaturgy and its impact on American theatre. We will study plays from the early period, 1847-1938, and from the recent period, 1935-present. This course will investigate the thematic structure of each section of plays including family life, social protest, and religion. The course will also help students to better understand the social milieu that shaped the content of each play.

THE 360 Theatre Practicum (1-6 credit hours)
Practical experience in one or more of the various areas of artistic and technical theater through active participation in Thompson Theater's play production program.

Typically offered in Fall and Spring

THE 398 Special Topics in University Theatre (1-3 credit hours)
Presentation of material normally not available in regular course offerings, or offerings of a new course on a trial basis.

Typically offered in Fall, Spring, and Summer

THE 433 Period Styles in Acting (3 credit hours)
Interpreting daily lives in earlier eras through reading, discussion, research, and performance. Plays of complex heightened language, in verse and prose, studied from perspective of character's daily lives and their relevance to contemporary performance skills. Scenes, monologues, and soliloquies rehearsed and performed.
Prerequisite: THE 203

Typically offered in Fall and Spring

Toxicology (TOX)

TOX 201 Poisons, People and the Environment (3 credit hours)
TOX 201 serves as an introduction to the fascinating world of chemical poisons and covers their numerous and varied effects on human health and the environment. We will learn how and why poisons have played an important history, how to critically evaluate the chemical risk information reported in the media, in addition to the underlying principles of the basic science of poisons.

GEP Natural Sciences
Typically offered in Fall, Spring, and Summer

TOX 401/TOX 501 Principles of Toxicology (4 credit hours)
Introduce students to the basic principles of toxicology. Will cover the history and scope of the field; absorption, distribution, metabolism and elimination of toxicants; types and mechanisms of toxic action; carcinogenesis; environmental toxicology as well as human and ecological risk assessment.
Prerequisite: CH 220 or CH 221 or CH 225; BIO 181 or ZO 160
Typically offered in Spring only

TOX 415 Environmental Toxicology and Chemistry (4 credit hours)
Environmental toxicology and chemistry including the sources, fate, and effects of chemicals in the environment. Emphasis on contemporary problems in human health and the environment.
Prerequisite: CH 220 or CH 221 or CH 225; BIO 181 or ZO 160
Recommended

Typically offered in Fall and Spring

TOX 501/TOX 401 Principles of Toxicology (4 credit hours)
Introduce students to the basic principles of toxicology. Will cover the history and scope of the field; absorption, distribution, metabolism and elimination of toxicants; types and mechanisms of toxic action; carcinogenesis; environmental toxicology as well as human and ecological risk assessment.
Prerequisite: CH 220 or CH 221 or CH 225; BIO 181 or ZO 160
Typically offered in Spring only

TOX 515 Environmental Toxicology (4 credit hours)
Evaluation of the nature, distribution and significance of microchemical contamination. Emphasis on current, relevant problems.
Prerequisite: Two years of biology

TOX 595 Special Topics (1-6 credit hours)

TOX 601 Toxicology Seminar (1 credit hours)
Prerequisite: Graduate standing
Typically offered in Fall and Spring
Typically offered in Summer only
Prerequisite: Master's student
Research work during a summer session and who will be devoting full time to thesis research.

TOX 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

TOX 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TOX 695 Master's Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TOX 690 Master's Exam (1-9 credit hours)
For students in non-thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

TOX 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Spring only

TOX 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Spring only

TOX 660 Free Radicals In Toxicology (1 credit hours)
Introduction to the field of free radicals and their role in toxicology and health; chemical and physical properties of partially reduced oxygen intermediates and the natural biological defense mechanisms.

Prerequisite: BCH 451 and TOX 710
Typically offered in Fall only

TOX 620 Special Problems (1-6 credit hours)
Topics include responsibility in science, environmental fate of chemicals, developmental toxicology, lab rotations, journal club and wildlife toxicology.

Prerequisite: Graduate standing
Typically offered in Fall, Spring, and Summer

TOX 600 Fundamentals of Toxicology (3 credit hours)
The basis of toxic action at cellular and molecular levels covering the absorption, distribution, elimination and metabolism of toxicants; toxic action (acute toxicity, carcinogenesis, mutagenesis, organ toxicity, etc.); chemical classes of toxicants; and toxicity testing.

Prerequisite: BCH 451, Senior standing or Graduate standing
Typically offered in Fall only

TOX 725/CS 725/HS 725/SSC 725 Pesticide Chemistry (3 credit hours)
Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)
Typically offered in Spring only

TOX 727/CS 727/HS 727/SSC 727 Pesticide Behavior and Fate In the Environment (2 credit hours)
Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: CS(HS,SSC,TOX) 725,SSC 200
Typically offered in Spring only

TOX 710 Molecular and Biochemical Toxicology (3 credit hours)
Fundamental understanding of biochemical, molecular and cellular mechanisms through which xenobiotics alter cellular homeostasis, produce toxicity and alter organ function. Current biochemical, molecular and cellular experimental approaches for study of biochemical mechanisms of toxicity.

Prerequisite: BCH 451; TOX 701
Typically offered in Spring only

TOX 715 Environmental Toxicology (3 credit hours)
Evaluation of fundamental processes relating fate and effects of chemicals in the environment. Emphasis on effects of pollutants on non-human species, environmental risk assessment and historically relevant incidents of environmental contaminants.

Prerequisite: Two years of biology
Typically offered in Fall only

TOX 725/CS 725/HS 725/SSC 725 Pesticide Chemistry (1 credit hours)
Chemical properties of pesticides including hydration and solvation, ionization, volatilization, lipophilicity, molecular structure and size, and reactivity and classification according to chemical description, mode of action or ionizability. Taught during the first 5 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: (CH 201 or CH 203) and (CH 221 or CH 225)
Typically offered in Spring only

TOX 727/CS 727/HS 727/SSC 727 Pesticide Behavior and Fate In the Environment (2 credit hours)
Sorption/desorption, soil reactivity, movement, volatilization, bioavailability, degradation and stability of pesticides in the environment. Taught during the last 10 weeks of semester. Drop date is last day of 3rd week of the minicourse.

Prerequisite: CS(HS,SSC,TOX) 725,SSC 200
Typically offered in Spring only
TOX 771/CBS 771  Cancer Biology  (4 credit hours)
A comprehensive graduate course focusing on the molecular and cellular bases of cancer. Targets of oncogenic mutations will be discussed as well as their impact on cell proliferation, cell survival, and the invasion of normal tissues by tumorigenic cells. State-of-the-art technologies to detect oncogenic mutations and characterize transformed cells will be discussed as well as therapeutic strategies for the rational treatment of cancer.

Prerequisite: CBS 770
Typically offered in Fall only

TOX 795  Special Topics in Toxicology  (1-6 credit hours)
Typically offered in Fall and Spring

TOX 801  Toxicology Seminar  (1 credit hours)
Prerequisite: Graduate standing
Typically offered in Fall and Spring

TOX 820  Special Problems in Toxicology  (1-6 credit hours)
Topics include responsibility in science, environmental fate of chemicals, developmental toxicity, lab rotations, Journal Club, and wildlife toxicology.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

TOX 860  Free Radicals in Toxicology  (1 credit hours)
Introduction to the field of free radicals and their role in toxicology and health; chemical and physical properties of partially reduced oxygen intermediates and the natural biological defense mechanisms.

Prerequisite: BCH 451 and TOX 710
Typically offered in Fall only

TOX 890  Doctoral Preliminary Examination  (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

TOX 893  Doctoral Supervised Research  (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

TOX 895  Doctoral Dissertation Research  (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

TOX 896  Summer Dissertation Research  (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

TOX 899  Doctoral Dissertation Preparation  (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

U.S. Diversity (USD)

USD 295  U.S. Diversity Special Topics  (1-3 credit hours)
Special topics course offering for the general education U.S. Diversity category.

GEP U.S. Diversity
Typically offered in Fall and Spring

University Scholars Program (USP)

USP 110  Humanities and Social Sciences Scholars Forum  (0 credit hours)
Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

Prerequisite: Enrollment limited to participants in the University Scholars Program
Typically offered in Fall only

USP 111  Humanities and Social Sciences Scholars Forum  (0 credit hours)
Interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities. Discussions of major public issues and topics of contemporary concern.

Prerequisite: Enrollment limited to participants in the University Scholars Program
Typically offered in Spring only

USP 201  Great Decisions  (1 credit hours)
Discussion and investigation of major issues in contemporary American foreign policy selected annually by the Foreign Policy Association through its Great Decisions Program. Must be participants in the University Scholars Program. Must have completed th
Prerequisite: 3 semesters of USP 110/111; R: RS/CS students
Typically offered in Fall and Spring

USP 204  Readings Inspired By the Scholars Forum  (1 credit hours)
Seminar course for upper class University Scholars who have completed three semesters of the Scholars Forum, with readings drawn from upcoming Scholars Forum themes.
Prerequisite: 3 semesters of USP 110/111; R: RS/CS students
Typically offered in Fall and Spring
University Studies Course (USC)

**USC 100 Transition into a Diverse Community** (1 credit hours)
Typically offered in Fall and Spring
USC 100 is required for all Summer Start students. It is designed to assist freshmen in making an effective transition to the rigors of a large diverse research-focused university. The course is designed to provide students with the support and knowledge needed to address the academic and personal challenges as well as other transitional issues. This course will also help students understand how culture shapes identity. Classroom discussions, small group work, completion of StrengthsQuest, and an introduction to technological and other resources are all vital components of this course. Topics include: diversity, cultural awareness, StrengthsQuest, academic adjustment, college success, social adjustment, campus resources, and health.

**GEP U.S. Diversity**
Typically offered in Summer only

**USC 101 Introduction to University Education I** (1 credit hours)
Typically offered in Fall only
Developmental and academic topics to assist students as they make well-informed decisions about majors. Topics include: transition issues between high school and college; community and diversity; major and career decision making; assessment of interests, skills, and values; university resources; overview of university majors and minors as well as policies and procedures. Exploratory Studies students only. Student cannot get credit for both USC 101 and USC 103.

**USC 102 Introduction to University Education II** (1 credit hours)
Typically offered in Spring only
Continuation of USC 101. Developmental and academic topics to assist students as they make well-informed decisions about majors and careers. Topics include: career readiness, preparation, and exploration; community and diversity; major and career decision making; assessment of interests, skills, and values; university resources; exploration of university majors and minors. Exploratory Studies students only. Credit cannot be received for both USC 102 and USC 104.

Prerequisite: USC 101

**USC 103 Introduction to University Education for Varsity Student Athletes I** (1 credit hours)
Introduction to University Education for Varsity Student Athletes I provides success strategies for first year student athletes at North Carolina State University. The course is designed to assist student-athletes with the skills and knowledge needed to meet the academic and personal challenges of university life and the increased responsibilities of adulthood, with special attention to the unique challenges and opportunities of student-athletes. Topics include: goal setting, time management, study skills, critical thinking, interaction with the faculty, NCAA and NCSU continuing eligibility, academic integrity, nutrition, and diversity.

Typically offered in Fall and Spring

**USC 104 Introduction to University Education for Varsity Student-Athletes II** (1 credit hours)
Typically offered in Spring only
Introduction to University Education for Varsity Student-Athletes II will provide student-athletes with the skills necessary to promote informed decision making in choosing an appropriate major and exploring possible careers. Additional areas of career development, academic success, and personal development will also be addressed as they relate to the day-to-day responsibilities and challenges that student-athletes face, as well as a review of NCAA and NCSU continuing eligibility.

Prerequisite: USC 103

**USC 107 College Success for the Pre-College Student** (1 credit hours)
Typically offered in Summer only
USC 107 is designed to assist first-generation pre-college students in making an effective transition to post-secondary education. The course is designed to provide pre-college students with the skills and knowledge needed to address the academic and personal challenges that may impact their progress to degree. Classroom discussions, small group work, guided tours, near-peer mentoring, and access to resources are all vital components of this course. Topics will include campus resources, policies, procedures; study skills; and life management concerns such as health, self-esteem, motivation, goal setting, diversity, and communication. Upon completion, students should be able to function effectively within the college environment to meet their educational goals.

**USC 110 Freshman Advancement Seminar** (1 credit hours)
Typically offered in Fall only
USC 110 provides an opportunity for a diverse student population to explore the question of race and cultural differences in a global society. This course requires that participants actively explore their biases and cultural prejudices for greater enlightenment. This course challenges sources of conventional information such as media outlets, empirical data and prevailing folklore. The course represents an opportunity to have a positive impact on the matriculation and graduation rate of diverse student populations through positive reinforcement, affirmation of cultural heritage and background. Freshman First Year Entering Students Only.

**GEP U.S. Diversity**
Typically offered in Fall only

**USC 111 Strategies for College Success** (1 credit hours)
Typically offered in Fall, Spring, and Summer
This course is intended for students who need to improve their academic standing, with enrollment priority given to students readmitted on academic probation. Students will acquire policy and resource knowledge, practical skills, and strategies to improve their academic standing at NC State University. Students will address the academic and personal challenges that may have impacted progress towards their chosen degree. Department Consent Required
USC 116 Introduction to Sustainability for EcoVillage (1 credit hours)
This course serves as an orientation for students participating in the EcoVillage Living-Learning Village and provides an introduction to the topic of "sustainability." Students have the opportunity to network with their fellow Village residents, campus partners, and guest faculty while performing service learning and during class group activities and discussions. Students will assess their personal definitions, connections to, and impacts on sustainability. This course is required for all first-year EcoVillage residents. This course meets the requirements for the Interdisciplinary Perspectives GEP Category.

Restricted to students participating in the EcoVillage Living-Learning Village
GEP Interdisciplinary Perspectives
Typically offered in Fall and Spring

USC 120 SERV- Seminar Education for Military Veterans/Service Members (1 credit hours)
The USC 120 class will help military veteran/service members transition into the academic environment and campus community. Topics include academic success skills, academic culture, campus resources and student services. Military Veterans (Active and Veteran)

Typically offered in Fall and Spring

USC 202 Career Exploration and Development (2 credit hours)
This course is intended for students who are considering changing their college major and/or are interested in exploring academic major opportunities. Career exploration and development provides students across campus a focused classroom setting to receive career exploration and academic major decision-making assistance. Students will learn about their personal strengths, values, skills, and personality and understand how these self-assessments will affect their major/career decisions. Students will explore the concept of career resiliency while developing professional skills that will be transferable into any college major.

Typically offered in Fall and Spring

USC 203 Professional Development For Career Ambassadors (2 credit hours)
The course is for Career Ambassadors only. This course will offer learning opportunities that will provide class members with the knowledge, skills and attitude necessary to become effective Career Ambassadors. The top seven career readiness competencies will be explained. Guest speakers, class discussions, group activities, reflections and out of class team building experiences will be utilized to facilitate learning. Restricted to students who are chosen to be Career Ambassadors after the interview process. (Department Approval Required).

Typically offered in Fall and Spring

USC 210 Introduction to College Tutoring (1 credit hours)
GPA 3.25 or higher. All enrolled students must be employed as UTC tutors. The purpose of the course is threefold: to introduce tutors to effective tutoring techniques based on educational research, to help tutors implement a variety of tutoring methods depending on the students’ specific needs, and to guide tutors in self-evaluating their individual tutoring progress and goals. Departmental Approval Required.

Prerequisite: Cumulative GPA greater than or equal to 3.25
Typically offered in Fall, Spring, and Summer

USC 220 Leadership and the Resident Mentor (3 credit hours)
Course will provide the student basic concepts of involvement theory, group development theory and community development relevant to residence hall living as a paraprofessional leader on the campus; the basic principles related to leadership with emphasis on how one develops and leads with their values, beliefs and attitudes and develop skills involving active listening, communication, conflict management and mediation techniques; basic program development and presentation skills; teaching pedagogy; and diversity issues. Some out of classroom activities are required. Departmental approval required.

Typically offered in Fall only

USC 223 NSP Student Leader Development (2 credit hours)
For New Student Programs Student Leaders only. Relevant research, student development theory, and shared professional experiences are presented. This course will offer learning opportunities that will provide class members with knowledge, attitude, and skills necessary to become effective NSP Student Leaders. Class discussion, small groups activities, simulations, and writing employed. Individual projects and out-of-class team building experiences are required, including Saturday activities. Departmental Approval Required.

Typically offered in Spring only

USC 225 Leadership Development for University Ambassadors (2 credit hours)
Course provides University Ambassadors with the knowledge, mindset, and skills necessary to effectively represent the University in a variety of settings to a variety of constituents. Course prepares students to emerge as leaders within the Ambassador program and throughout their University experience. Restricted to University Ambassadors only.

Requisite: University Ambassadors Only
Typically offered in Fall and Spring

USC 240 Leadership and Coalition Building in Diverse Communities (3 credit hours)
Exploration of US diversity and effective leadership practices using the National Coalition Building Institute (NCBI) model. NCBI is an international non-profit leadership development network dedicated to elimination of racism and other forms of oppression. Students will be introduced to the NCBI model which involves significant self-discovery, active listening and dialogue, and participate in activities that establish leadership strategies applied in various contexts. Each practical learning tool is grounded in principles that will be explored through group discussions and reflective journaling. Specific skill training will focus on conflict resolution, creating inclusive environments, strategies for effective listening/communication, personal growth and development. This course is intended for undergraduates, sophomores and above.

Prerequisite: Class Level = Sophomore, Junior, or Senior
GEP U.S. Diversity
Typically offered in Fall and Spring
USC 260  Research as a Profession  (2 credit hours)
Broadly defined, research is an interconnected and global process that adds new knowledge, creativity, and innovation to any discipline, from the sciences to the arts to the humanities and in between. During the first half of this course, students will build a foundation of knowledge in the research enterprise including inquiry, research methods, and research governance in a cross-cultural, multi-disciplinary context. Through the use of site-specific case studies, students will analyze past discoveries and innovations that have shaped our current world. This analysis will then become the basis for a research project during the study abroad component of the course. Upon their return, students will learn to synthesize their findings, draw conclusions, and present their research in a cross-disciplinary manner, developing strong oral and written communication skills. To enroll, students must be accepted to the associated study abroad program. All majors are encouraged.

GEP  Interdisciplinary Perspectives
Typically offered in Spring and Summer

USC 291  Service Learning Program Leader Development I  (1 credit hours)
The purpose of the course is to prepare students for their role as Alternative Service Break Team Leaders. The course will incorporate the larger issues of citizenship, social justice, and positive change and will include the logistics, risk-management, and leadership skills needed when leading a service trip. This course will require students to think critically about their role as a leader. Students will participate in a weekend overnight retreat. Transportation for the retreat will be provided by University Van rental. Expenses for the weekend retreat are covered in the ASB administrative charge paid by participants.

Typically offered in Fall only

USC 292  Service Learning Program Leader Development II  (2 credit hours)
The purpose of the course is to prepare students for their role as Alternative Service Break Team Leaders. Part II of the Service Learning Program Leader Development will build upon what students learned in Part I and they will be able to put into prac

Prerequisite: AEE 291
Typically offered in Spring only

USC 293  Independent Study  (1-3 credit hours)
A course in which students participate in individualized, independent, directed, or guided studies under the supervision of the instructor of the field or discipline. Topic, mode of study, evaluation criteria, and credit hours to be determined in consultation with the supervising faculty and documented. Course may be taken a maximum of three times provided the topic is sufficiently different. Individualized/Independent Study and Research courses require a "Course Agreement for Students Enrolled in Non-Standard Courses" be completed by the student and faculty member prior to registration by the department.

Typically offered in Fall, Spring, and Summer

USC 298  Special Topics in University Studies  (1-6 credit hours)
Special Topics in University Studies at the Undergraduate level for offering of courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

USC 301  Transfer Student Success  (1 credit hours)
USC 301 is designed to assist new transfer students in making an effective transition to the rigors of a large research university. The course is designed to provide students with the skills and knowledge needed to address the academic and personal challenges as well as other transitional issues that may impact their progress toward their degree. Classroom discussions, small group work, guided tours, faculty mentors and introduction to resources, services and opportunities are all vital components of this course. Topics include: academic adjustment, social adjustment, campus resources, major and career exploration, policies and procedures, financial aid, and technology. COURSE IS RESTRICTED TO FIRST OR SECOND SEMESTER TRANSFER STUDENTS. Students will not received credit for both USC 301 and ALS 303 or T 101.

Typically offered in Fall and Spring

USC 401  Transitions for the College Graduate  (3 credit hours)
Focus on the unique transitions the student will face upon leaving college. Through a variety of formats, students will have the opportunity to explore several aspects of their post-baccalaureate lives and ways in coping with emerging careers, money management, extracurricular retirement, transitional issues, civic engagement, and continuing education opportunities. Explorations of these areas include specific emphasis on developing and refining interviewing skills, professional and personal networks, financial endeavors, and job application and selection.

Typically offered in Fall and Spring

Veterinary Medicine-Companion Animal & Sp Species (VMC)

VMC 900  Advanced Equine Medicine  (1 credit hours)
This course will build upon topics covered in VMC 951 Equine Medicine and Surgery. Lectures will cover equine medical problems in more depth than in the previous course. Additional topics will also be included. This course is designed for students who p

Prerequisite: 3rd year DVM student
Typically offered in Fall only

VMC 901  Advanced Small Animal Medicine  (2 credit hours)
This course provides more advanced instruction on medical and surgical diseases of dogs and cats. Pathophysiology, diagnostic evaluation and medical and surgical management of diseases in nephrology, urology, oncology, respiratory medicine, infectious diseases, gastroenterology, cardiology and endocrinology are contained within this course. This advanced content of this course is designed to run alongside the content in VMC 951.

Prerequisite: 3rd year DVM student
Typically offered in Fall only

VMC 902  Small Animal Rounds  (1 credit hours)
Course incorporates weekly rounds on actual cases in the NCSU-CVM. Students will practice clinical reasoning, test interpretation and oral and written case presentations in a low stakes, safe environment. Real cases will provide a comprehensive application of the pre-clinical courses. Weekly repetition of these skills will prepare students for clinical practice.

Typically offered in Fall and Spring
VMC 903 Advanced Equine Surgery and Lameness (1 credit hours)
Course will augment areas noted by the syllabus of core equine surgery and lameness presented in VMC952. In the course surgical alternatives, techniques and outcomes will be presented at a level that a student graduating with an equine or mixed focus could describe and discuss treatments with clients or comfortably function in an internship environment.

Prerequisite: 3rd year DVM student
Typically offered in Fall only

VMC 904 Advanced Equine Theriogenology (1 credit hours)
This course provides more advanced instruction in equine Theriogenology (mare and stallion). Diagnostic evaluation and techniques, with expansion on basic core concepts introduced in previous course content are contained within this course.

Prerequisite: 3rd year DVM student
Typically offered in Fall only

VMC 905 Advanced Topics in Small Animal Dermatology (1 credit hours)
This course will provide broad understanding of small animal dermatology by building upon the basic foundation principles covered in VMC 951. Students will learn to recognize, diagnose and treat both common and uncommon skin diseases of small animals.

"Corequisite: Enrollment in a 3rd year DVM program"
Typically offered in Spring only

VMC 906 Equine Field Skills Elective (2 credit hours)
This course will provide practical instruction in commonly used skills and techniques necessary for equine primary care practice. It is an intensive, team taught series of individual laboratories that provide students with experience in the varied skill set required of an equine general practitioner. This course is designed for students that are in the third year of the DVM curriculum, have good horse handling skills and a desire to practice equine veterinary medicine upon graduation. Registration for this course is by instructor permission only.

Prerequisite: 3rd year DVM student
Typically offered in Spring only

VMC 908 Advanced Small Animal Neurology, Ophthalmology, and Orthopedics (2 credit hours)
This course will provide a more advanced approach to the medical and surgical management of selected metabolic, neoplastic, nutritional, immune mediated, developmental and degenerative diseases and traumatic injury of the ophthalmologic, neurologic, and musculoskeletal systems of small animals. It is a companion course to material given in VMC961. Concurrent enrollment in third year of DVM curriculum.

Typically offered in Spring only

VMC 909 Feline Medicine (1 credit hours)
This course will equip students for success in feline practice or in small animal or mixed practice with a feline component. The course will address the basic behavioral and nutritional needs of cats, and students will learn how the unique physiology of this species affects feline health and feline disease management.

Prerequisite: 3rd year DVM student
Typically offered in Spring only

VMC 910 Careers in Veterinary Medicine (1 credit hours)
Specialists and invited speakers from multiple areas of veterinary medicine will present information about career opportunities.

Typically offered in Fall only

VMC 911 Advanced Topics in Equine Medicine and Surgery (1 credit hours)
The major objectives are to expose students to additional in-depth information related to equine medicine and surgery. This course will build on information covered in equine portions of the veterinary curriculum. Students must have a degree in veterinay medicine, enrollment in the veterinary curriculum, or approval of the course coordinator.

Prerequisite: VMB 921
Typically offered in Spring only

VMC 914 Group Communication in Veterinary Medicine (1 credit hours)
This course explores how to effectively communicate in small groups in a professional veterinary context. Students will develop verbal and nonverbal communication skills, an understanding of task/process balance, meeting management and facilitation techniques, and communication styles and strategies for dealing with challenging group situations and conflict management. Examples and cases from veterinary medicine will guide application of group communication in context. Course limited to students enrolled in the DVM curriculum.

Typically offered in Fall only

VMC 915 Ethic Jurispru (2 credit hours)

VMC 917 Pre Hlth & Mgmt I (1 credit hours)

VMC 919 Clinical Behavior and Welfare for Dogs and Cats Elective (1 credit hours)
This is a one-credit course in clinical veterinary behavioral medicine and welfare, with an emphasis on diagnosis and treatment of behavior problems of dogs and cats. The course will build upon the foundation of normal versus abnormal behavior and learning theory of VMC 927. This course will focus on the recognition of common problem behaviors in dogs and cats and how to approach a behavior problem with a systematic Problem Oriented Approach (POVRM). The presentation, proposed etiology and pathogenesis, differential diagnosis, and plan formulation-including diagnostic, treatment, and education plans, will be discussed for common problems. Behavioral medication and complementary products will be included when discussing treatment plans. Additionally, the impact on animal welfare and the human-animal bond will be discussed. Problems to be reviewed include noise aversion, separation anxiety, compulsive disorders, housesoiling, fear and anxiety related problems, problems presenting with aggression, cognitive dysfunction, and some nuisance behaviors.

Typically offered in Fall only

VMC 920 Subtropical Zoology and Medicine in Bermuda (1 credit hours)
This unique opportunity will allow DVM students to experience a subtropical island and much of its natural history offerings. The internationally renowned Bermuda Institute of Ocean Science (BIOS) will serve as the base of operations where students will be housed, fed, and taught. Lectures, laboratory sessions, and field trips will cover a wide variety of zoological and medical topics.

Requisite: Currently enrolled DVM student
Typically offered in Spring only
VMC 921 Special Topics in Zoological Medicine (1-3 credit hours)
This elective course allows students to participate in customized laboratory and field experiences in zoological medicine (avian, aquatic, reptile, amphibian, invertebrate, and mammalian species). This course is designed to be adapted to the needs of students in the DVM program who desire practical experiences in the discipline. Specific details of individual projects are developed by the course coordinator and participating faculty. This elective course can provide partial fulfillment for elective credit for Zoo Focus Area.

Prerequisite: 1st, 2nd, or 3rd year DVM student
Typically offered in Fall and Spring

VMC 922 Veterinary Acupuncture in China (2 credit hours)
This elective course is a two-week international experience in China that will introduce DVM students to Traditional Chinese Veterinary Medicine (TCVM), including acupuncture, moxibustion, and related therapies. The course will include an overview of TCVM history, terminology, theory, and practical applications using equine (horse or donkey) and canine species. In addition, the course will include elective opportunities to meet and interact with Chinese veterinary students, and opportunities to explore the many cultural options available in China.

Prerequisite: VMB 911 and VMB 921; Corequisite: Current enrollment in the DVM program
Typically offered in Spring only

VMC 923 Research in Zoological Health (1-4 credit hours)
This course provides an opportunity to pursue mentored research projects relevant to zoological health while in the DVM curriculum. Projects may be but are not limited to those related to the zoological focus thesis option.

Restriction: DVM student status. By Instructor Permission only.
Typically offered in Fall and Spring

VMC 924 Equatorial Zoology and Medicine In Gal pagos (1 credit hour)
This unique opportunity will allow DVM students to experience a unique equatorial archipelago and much of its natural history offerings. The Gal pagos Science Center (GSC) will serve as the base of operations. Dr. Gregory Lewbart, who has worked at the facility four separate times, will be the local program leader and guide. He will be assisted by local and visiting scientists. Lectures, laboratory sessions, and field trips will cover a wide variety of zoological and medical topics dealing with native invertebrates, fishes, reptiles, birds, and mammals. There will be an emphasis on aquatic species and a paper is required.

Requisite: Currently enrolled DVM student
Typically offered in Spring only

VMC 927 Introduction to Companion Animal Behavior (2 credit hours)
This course explores the behavior of companion animals from a veterinary perspective. An emphasis is placed on behavior as an indicator of welfare and health, humane handling of animals, prevention of behavior problems, and treatment of common behavior problems. In addition the nature of human-animal bond and ethical issues relating to human-animal interactions will be discussed. Students will learn how to diagnose and treat common behavior problems on the basis of video-rich case presentations, lecture material, and class discussion. This course is restricted to students enrolled in the DVM Curriculum.

Doctor of Veterinary Medicine Majors Only
Typically offered in Spring only

VMC 928 Topics in Wild Reptile Medicine (1 credit hour)
The NCSU-CVM Turtle Rescue Team treats sick and injured wild reptiles (mostly turtles) belonging to over a dozen different species. First, second, and third year veterinary students taking this course will be responsible for case management, coordinating consultations, diagnostic testing within the hospital, and placing recuperating animals with local wildlife rehabilitators. Students are also required to attend periodic rounds and attend eight lectures about amphibians and/or reptiles, separate from the core and Selective curriculum.

Typically offered in Spring only

VMC 930 Rehabilitation and Mobility Clinical Rotation (2 credit hours)
In this course, students will gain a general understanding of veterinary rehabilitation therapy, including principles and protocols of assessment and treatment, tissue healing, the theory and application of treatment modalities and the common conditions treated.

Requisite: Currently enrolled DVM student
Typically offered in Fall and Spring

VMC 932 Principles of Surgery (3 credit hours)
This course covers the science, art and craft of surgery, as a foundation for clinical applications. The principles you learn will give you a foundation for performing surgery on all species, even though the examples in this course are centered on the dog and cat.

Prerequisite: 2nd year DVM student
Typically offered in Fall only

VMC 933 Theriogenology (2 credit hours)
The physiology, endocrinology, and pathology of the reproductive system are presented. Emphasis includes genital anatomy and function, endocrine interrelationships, and methods for examination of mammary gland and reproductive tract function, including diagnosis and treatment of clinical disorders.

Prerequisite: Successful completion of the second year of the DVM program
Typically offered in Fall only

VMC 937 Introduction to Physical Examination Skills- Small Animal (1 credit hour)
Introduction to physical examination, laboratory sample collection, and medication administration skills in dogs and cats. Students will also be taught how to understand and use the problem oriented approach for patient management. Students must be enrolled in the Doctor of Veterinary Medicine program. Enrollment in year 2 of Doctor of Veterinary Medicine Program.

Typically offered in Spring only

VMC 939 General Limited Small Animal Practice (2 credit hours)
Will expose clinical year veterinary students to a general small animal veterinary practice. There will be several areas of focus: learning clinical skills relevant to a general veterinary practitioner; developing strong problem solving abilities; developing the strong communication skills necessary to interact effectively with client, colleagues and staff, incorporating and conducting behavioral evaluations of pets during wellness examinations. Enrollment in this course is limited to students in the DVM professional program.

Typically offered in Fall and Spring
VMC 940 Clinical Theriogenology (2 credit hours)
This course is designed to instruct veterinary students to make clinical diagnoses and problems of the reproduction system of domestic animals. Instruction is provided on medical and surgical correction of clinical reproductive system problems, such as infertility, obstetrical procedures, assisted reproductive techniques, and traumatic injuries. Must be enrolled in fourth year clinical rotations.

Typically offered in Fall and Spring

VMC 941 Special Topics in Theriogenology (2 credit hours)
The primary objective of this course is to provide additional information and training to veterinary students that have taken the VMP 980 (VMC 940 new course #) clinical theriogenology senior clinical rotation. Emphasis will be directed to acquaint students with modern and current practices of clinical Theriogenology. It is expected that the majority of the information and activities offered in this course will involve equine species (80%) and, to a lesser extent, canine (10%) and bovine species (10%). Requires satisfactory completion of 3rd year of professional program and clinical theriogenology senior rotations.

Typically offered in Fall and Spring

VMC 942 Principles of Medicine (2 credit hours)
This cross-species course provides an introduction to the principles of disease and injury state common to all species. Content in this course is intended to prepare the students for third year DVM medicine and surgery courses.

Prerequisite: 2nd year DVM student
Typically offered in Spring only

VMC 943 Laboratory Animal and Zoological Species Health and Disease I (1 credit hours)
Principles of applied biology, management, physical examination, and medical techniques, health problems and medical treatment of laboratory and companion fishes, amphibians, and reptiles will be presented. Laboratory sessions will include handling of live animals, examination of necropsy specimens, and case discussions. Students must be enrolled in the Doctor of Veterinary Medicine program.

P: Admission to professional veterinary program
Typically offered in Spring only

VMC 944 Introduction to Clinical and Professional Communication (1 credit hours)
The ability to communicate with clients is important to successful veterinary practice. The focus of this course is to explore how to effectively communicate with clients in a clinical context. Students will develop verbal and nonverbal communication skills, an understanding of relationship-centered care, management of client interactions, getting informed consent, and communicating complex information. Examples and cases from veterinary medicine will guide application of clinical communication in context.

Corequisite: Current enrollment in DVM program
Typically offered in Spring only

VMC 946 Extramural Business Management Experience (2 credit hours)
This course is designed to offer students additional business experience in the veterinary industry. Through partnership with external organizations, students will gain business experience and explore topics such as emerging business, legal, and ethical issues, practice management, human resource management, employment contracts and negotiations, buy and selling veterinary practices, and practice financing. This opportunity will consist of an evolving list of external partners and could include organizations offering practice management consulting, human resource consulting, business consulting, insurance and financing.

Prerequisite: 4th year DVM student
Typically offered in Fall only

VMC 947 Practice Management: Evaluating the workflow, services, and financial performance of a hospital (2 credit hours)
The Practice Management rotation is designed for students interested in obtaining a deeper understanding of how to manage a successful veterinary practice. This experience will give students the opportunity to apply business principles learned in the classroom to real world practices. Students will use assessment tools provided to analyze veterinary practices and provide constructive feedback to practice owners. Students will be expected to interview practice owners and staff, observe practice flow and patient care, and perform an in depth financial analysis. Students will then prepare a written summary and present their findings and appropriate recommendations to the practice owner(s).

Prerequisite: 4th year DVM student
Typically offered in Fall only

VMC 948 Clinical Rotation in Veterinary Radiation Oncology (2 credit hours)
This is an elective rotation during the 4th year of CVM professional studies providing an introduction to veterinary radiation oncology. Basic information about radiation therapy equipment, treatment planning and delivery, and outcome of patients treated for various cancers with radiation therapy will be emphasized. Students will be assigned cases being seen by the radiation oncology service as inpatients, outpatients, and new referral appointments.

Prerequisite: VMB 960
Typically offered in Fall and Spring

VMC 949 Equine Primary Care (4 credit hours)
This 4 week course will provide students with an initial one week of intensive clinical experience in equine primary care and three weeks with a NCSU CVM approved equine primary care practice. Students will be seeing a variety of primary care cases from CVM staff and faculty owned horses, state owned horses, and horses from non-profit organizations during the first week at Southern Pines; including vaccinations, dentistry, lameness, imaging, nasogastric intubation, and field surgery. This course is not an externship and students will have outcome assessments from the instructor as well as the veterinarian at the equine primary care practice. During the final three weeks, students will be exposed to a general equine primary care practice. Students will be expected to examine cases, discuss differentials, provide a treatment plan, perform treatments, and provide client communication. Instructor approval for enrollment required.

Prerequisite: 4th year DVM student
Typically offered in Fall and Spring
VMC 950 Sea Turtle Medicine and Rehabilitation (2 credit hours)
This course provides practical experience in husbandry and disease
diagnosis and treatment in rehabilitating sea turtles at the Karen Beasley
Sea Turtle Rescue and Rehabilitation Center (KBSRRC) in Topsail
Beach, NC. Skills to be acquired in clinical and didactic setting include
sea turtle husbandry and rehabilitation techniques, diagnostic sample
collection and interpretation, physical examination and safe handling,
medication delivery, wound treatment, and necropsy protocols.
Prerequisite: 4th year DVM student
Typically offered in Fall only

VMC 951 Companion Animal Medicine and Surgery I (4 credit
hours)
Overview of medical and surgical management of selective metabolic,
neoplastic, nutritional, immune-mediated, developmental and
degenerative diseases of companion animals.
Prerequisite: Successful completion of the 2nd year of the professional
curriculum
Typically offered in Fall only

VMC 952 Equine Medicine and Surgery (3 credit hours)
Medical conditions in large domesticated animals are presented in
this course. Discussions involve the agents causing diseases and the
therapeutic methods used to correct. 3 semester hours.
Typically offered in Fall only

VMC 953 Laboratory Animal and Zoological Species Health and
Disease II (3 credit hours)
Principles of applied biology, management, physical examination and
medical techniques, health problems and medical treatment of laboratory
animals, small companion mammals and zoological species will be
presented. Laboratory sessions may include handling of live animals,
examination of necropsy specimens, and case discussions. Laboratory
Animal and Zoological Species Health and Disease II will focus on avian
and mammalian species. Students must be enrolled in the Doctor of
Veterinary Medicine program.
Typically offered in Fall only

VMC 954 Companion Animal Medicine for Food Animal Students (2
credit hours)
Small animal medicine clinical rotation emphasizing the disciplined
detection, prioritizing and planning for therapy of medical diseases in
small companion animals. Development of medical judgment and the
use of the problem oriented medical record is stressed. This course is
intended for DVM students in the food animal focus area.
Prerequisite: Senior DVM student
Typically offered in Fall and Spring

VMC 955 Extramural Experiences in Lab An Med (2 credit hours)
DVM students will have the opportunity to undertake a two-week rotation
in an approved laboratory animal facility under the supervision of a
laboratory animal veterinarian. This opportunity will meet the need to
increase "hands-on" experience as part of
Corequisite: Current enrollment in DVM program.
Typically offered in Fall and Spring

VMC 956 Advanced Clinical and Professional Communication (1
credit hours)
The ability to communicate with clients is important to successful veterinary practice. This course explores how to effectively communicate with clients in a clinical context during problem appointments. Students will develop verbal and nonverbal communication skills and an understanding of how to manage difficult client interactions including 1) communicating about money, 2) communicating during adverse events, and 3) communicating during euthanasia. Examples and cases from veterinary medicine and simulated client interactions will guide application of clinical communication in context.
Prerequisite: 3rd year DVM student
Typically offered in Fall only

VMC 957 Introduction to Clinical Practice (1 credit hours)
This course has 4 components: a surgery laboratory, a clinical skills
laboratory, a communication and wellness case-based facilitated session
and community-based experiences. Taken together, these experiences are
designed to give students practice and confidence in skills related to
small animal general practice.
Typically offered in Fall only

VMC 958 Advanced Prosimian Medicine (2 credit hours)
This course is designed to provide senior veterinary students with
clinical experience in prosimian medicine. Students will gain practical
experience in the diagnosis, treatment, and prevention of disease in
captive prosimians maintained in research facilities. Students participate
in formal rounds, autodidactic exercises, and case management at the
Duke Lemur Center. Limited to 4th Year DVM curriculum students.
Prerequisite: VMC 991, restricted to 4th year DVM students
Typically offered in Fall and Spring

VMC 959 Advanced Primate Medicine (2-4 credit hours)
The delivery of health care and management to captive and free-ranging
primates is a component of zoological, wildlife, and laboratory animal
medicine. There is a distinct body of information and techniques for
the practice and an increasing demand and opportunity for veterinary
graduates with this knowledge. Practical application of techniques and
methods for diagnosing disease, delivering health care, and devising
preventative medical programs in a research primate facility environment
will enable students to evaluate their potential role in the field and equip
them to evaluate and responsibly deal with medical issues involving
primates.
Typically offered in Fall only

VMC 960 Small Animal Emergency Service (2 credit hours)
Assessment, triage, and management of canine and feline patients
admitted to the small animal emergency service after hours.
Prerequisite: fourth year clinics student, DVM student
Typically offered in Fall and Spring

VMC 961 Companion Animal Medicine and Surgery II (3 credit
hours)
This course is an overview of medical and surgical management of
selected metabolic, neoplastic, nutritional, immune-mediated,
developmental, and degenerative diseases of companion animals.
Requisite: Currently enrolled DVM student
Typically offered in Spring only
VMC 963  Extramural Experience in Zoological Medicine  (2 credit hours)
This elective senior year rotation allows students to obtain clinical, laboratory, field, and research experiences in zoological medicine that augment the basic rotations in the zoological medicine focus area. Students can customize their training through participation in a variety of opportunities including epidemiology projects, other basic or clinical research projects, and externships involving captive and free-ranging wildlife & zoo species. does not fulfill senior year requirement for elective credit in Zoo Focus Area
Requisite: Currently enrolled DVM student
Typically offered in Fall and Spring

VMC 964  Zoological Husbandry and Nutrition  (2 credit hours)
This course is designed to provide senior veterinary students with husbandry and background experience in a zoo setting as a foundation for health management. Students will gain practical experience in the husbandry and nutrition of zoo animals while learning the importance of prevention of disease in captive wildlife. Students participate in formal rounds, autodidactic exercises, and hands on animal care delivery.
Prerequisite: Successful completion of 3 Zoological Medicine Selectives or course coordinator permission
Typically offered in Fall and Spring

VMC 965  Advanced Principles of Surgery  (1 credit hours)
This laboratory includes induction and maintenance of anesthesia in representative companion animal, food animal, and equine species; the practice of surgery on anesthetized animals and cadaver specimens; and experience with diagnostic and therapeutic techniques. Students examine, assess, and provide preoperative, intraoperative, and postoperative management of their patients.
Prerequisite: DVM student, Completion of fall semester, VM3 students
Typically offered in Spring only

VMC 966  Equine Emergency and Critical Care  (2 credit hours)
An intensive course in the assessment and management of equine emergencies. This would include evaluation of patients, surgical and medical treatment of in house and emergency critical care patients, and post-operative assessment and management. Students will gain valuable practical experience of critically ill patients and rounds will be held daily to ensure a high level of learning.
Prerequisite: 4th year DVM student, Third year veterinary curriculum
Typically offered in Fall and Spring

VMC 967  Clinical Veterinary Dentistry  (2 credit hours)
Will participate in examination, admission, diagnosis treatment, discharge, and follow-up of patients in dentistry service. Take a clinical history, perform a physical examination, develop appropriate diagnostic plan, discuss the plan with the service's clinicians, and participate in formulation of treatment protocol. Service treats patients Monday-Thursday. Friday reserved for overflow, emergencies, research and teaching. Students given prepared lectures on dental procedures and diseases, and will be allowed to perform supervised procedures on cadavers. (No animals euthanized for this purpose.)
Typically offered in Fall and Spring

VMC 968  Equine Orthopedic Surgery and Lameness  (2 credit hours)
Application of problem solving skills and the art, science, and practice of equine orthopedic surgery and lameness in the veterinary teaching hospital setting.
Prerequisite: DVM student, Completion of 3rd year veterinary curriculum
Typically offered in Fall and Spring

VMC 969  Equine Podiatry  (2 credit hours)
Two-week clinical block in equine podiatry clinic Tuesday, Wednesday, and Thursday, with guided independent clinically applied study Monday and Friday.
Prerequisite: 4th yr. standing in the veterinary curriculum at the CVM, Successful completion of 3rd yr. of Veterinary Curriculum
Typically offered in Fall and Spring

VMC 970  Companion Animal and Special Species  (2 credit hours)
Students on this rotation will have the opportunity for more direct animal experience than they have previously had. They will be exposed to the needs of shelter animals and the care of large populations of dogs and cats. The mobile unit will be used for the provision of off-site medical and surgical care, but will be staffed with student volunteers. The Wake County Animal Shelter is serving as the intake facility for all relinquished animals in Wake County.
Prerequisite: Fourth year student in the professional curriculum at The College of Veterinary Medicine
Typically offered in Fall, Spring, and Summer

VMC 971  Comp Animal Med II  (4 credit hours)
1. Obtain a thorough history and perform a complete physical examination. 2. Identifying, defining, and prioritizing problems. 3. Developing and initiating rational diagnostic and therapeutic plans. 4. Performing certain diagnostic and therapeutic procedures. 5. Interpreting results of diagnostic tests, and determining their importance to the patient. 6. Verbal and written communication with clinicians, clients, veterinary techniques, fellow student veterinarians, and referring veterinarians. 7. Determining the point at which it is time to refer a case to a colleague for “another look”, or to a referral center for specialized diagnostic testing or treatment. 8. Understanding how cases management in private practice compares with referral practice. 9. Approaching issues regarding euthanasia; your decision-making, assisting the owner.
Typically offered in Fall and Spring

VMC 972  Clinical Small Animal Veterinary Cardiology  (2 credit hours)
Two-week clinical rotation to provide senior veterinary student training in diagnostic and therapeutic aspects of veterinary small animal cardiology. Clinical experience with patients and clients of Veterinary Teaching Hospital and topic and case review.
Prerequisite: 4th yr. standing in the veterinary curriculum at the CVM, Successful completion of 3rd yr. of Veterinary Curriculum
Typically offered in Fall and Spring
VMC 973 Small Animal Surgery (2 credit hours)
Clinical rotation on the small animal surgery services. Students will be assigned to one of two services, general surgery or orthopedic surgery. Students see cases and assist with care of small animal surgical patients. Students will be on-call to assist with emergency surgery cases.
Prerequisite: Completion of third year veterinary curriculum
Typically offered in Fall, Spring, and Summer

VMC 974 Equine Dentistry and Podiatry (2 credit hours)
This course will provide practical instruction in commonly used skills and techniques necessary for equine dentistry and equine podiatry. It is an intensive, team taught series of didactic lectures, individual laboratories, and clinical case experiences with practitioners that provide students with a high level of experience in equine dentistry and equine podiatry. This course is designed for students in the fourth year of the DVM curriculum, with good horse handling skills and a desire to practice equine veterinary medicine upon graduation. This course is strongly recommended for students with an equine focus or mixed animal focus with an equine concentration. Students must have basic equine handling experience and/or have taken the Equine Behavior Selective. Equine, mixed animal, food animal, and exotics focus students will be given preference.
Typically offered in Fall and Spring

VMC 975 Equine General Surgery (2 credit hours)
Application of problem solving skills and the art, science, and practice of equine general surgery in the veterinary teaching hospital setting.
Prerequisite: DVM student, Completion of 3rd year veterinary curriculum
Typically offered in Fall and Spring

VMC 976 Veterinary Critical Care (2 credit hours)
Assessment and management of companion animal emergency and critical care patients, including several ‘hands on’ laboratories using cadavers to learn and practice emergency and critical care techniques. Principles of emergency and critical patient evaluation, stabilization, and organ system support are the focus of the course. Out-rotations at area emergency clinics are required. Open only to 4th year students in the small animal focus area.
Prerequisite: 4th year DVM student
Typically offered in Spring only

VMC 977 Equine Preventative Health Care (2 credit hours)
Perform routine preventative health care procedures for the horse in a field setting.
Prerequisite: Completion of 3rd year in veterinary curriculum
Typically offered in Fall, Spring, and Summer

VMC 978 Equine Lameness and Imaging (2 credit hours)
Development and use of problem solving skills and techniques for diagnosis, treatment, and management of lameness in horses.
Prerequisite: DVM student, Completion of the third year of the veterinary curriculum
Typically offered in Spring only

VMC 979 Equine Medicine (2 credit hours)
Students are responsible for all aspects of patient care and are expected to be dedicated to their patients. Frequent and careful observation of the patients, attention to detail, diligent record keeping, accuracy in formulating and carrying out a treatment plan, and use of common sense are expected. The earlier you note potential problems, the earlier and easier they can be resolved. Irresponsibility, carelessness, lack of accuracy, untruthfulness, or a poor attitude will not be tolerated.
Typically offered in Fall and Spring

VMC 980 Vet Clini Oncology (2 credit hours)
This is a two-week, two credit elective rotation during the 4th year of CVM professional studies providing experience in the diagnosis and treatment of cancer in animals. Emphasis is on development of comprehensive cancer management strategies including ethical considerations, diagnostic techniques, treatment options, and client communication skills. Students will be assigned cases being seen by the oncology service as inpatients, outpatients, and new referral appointments.
Typically offered in Fall and Spring

VMC 981 Lab Animal Medicine (2 credit hours)
The block will provide practical experience in the diagnosis, treatment and prevention of diseases of laboratory animals. It will include special study of diseases of laboratory animals and the management of laboratory animal facilities. Opportunity to perform surgical procedures on common laboratory animals will be provided in a series of surgical labs. There will be field trips to other laboratory animal resource facilities within the Research Triangle Park and surrounding areas. The student will present a seminar on a selected topic for critical appraisal by students and faculty.
Typically offered in Fall and Spring

VMC 982 Ophthalmology (2 credit hours)
The purpose of the ophthalmology course is to acquaint the student with examinations, diagnostics and therapeutic practices, and principles of clinical veterinary medicine. There will be direct supervision by faculty and house officers. Attendance is required at weekly clinical rounds, general medicine rounds, and the patient rounds and mini-seminars conducted within the service. Irregular and/or long hours may be required. Students will be expected to be neatly dressed, well groomed, and conduct themselves in a professional manner at all times.
VMC 983 Dermatology (2 credit hours)
Dermatological disease will represent a significant proportion of your case load, particularly in companion animal practice. Most of the patients that you will see have chronic relapsing disease that can be frustrating, and often costly for the owner. Therefore, whilst an accurate diagnosis represents the first step in dealing with a case, the challenge in this field of medicine is to successfully manage cases in the long term. This requires good and open communication with the client as well as regular patient evaluation. Most of the diagnostic techniques employed in dermatology are very simple and do not require expensive equipment or excessive amounts of time. The key to successful dermatological practice is to use these tools appropriately to recognize conditions such as parasitic infestations and bacterial or yeast infections for which there is a specific course of treatment. It specializes in the diagnosis and management of chronic ear disease and immunological dermatoses such as autoimmune skin diseases, food reactions and atopic dermatitis. The good practitioner however, recognizes that cutaneous manifestations may be a reflection of internal disease and a thorough systemic evaluation is also required. When studying the skin there is one big advantage, it is on the outside.

Typically offered in Fall and Spring

VMC 984 Intro Clin Neuro (2 credit hours)
This service provides diagnosis and management of nervous system disorders in animals, including nuclear imaging, myelography, CT scans, electromyography, neurosurgery, and postoperative patient rehabilitation including hydrotherapy and treadmill training. Attendance is required at weekly clinical rounds, general medicine rounds, and the patient rounds and mini-seminars conducted within the service. Irregular and/or long hours may be required. Students will be expected to be neatly dressed, well groomed, and conduct themselves in a professional manner at all times.

Typically offered in Fall and Spring

VMC 985 Avian and Reptile Medicine (2 credit hours)
The medicine of companion and wild birds and reptiles (turtles, lizards & snakes) will be taught using clinical cases in the Veterinary Teaching Hospital and field service visits to avicultural and herpetological collections. Emphasis will be on proper restraint and handling, physical examination, diagnostic sample collection and routine treatment procedures. A problem orientated approach will be used for all clinical cases.

Prerequisite: 4th year standing in the veterinary curriculum at the CVM, VMC 953, VMF 964
Typically offered in Fall, Spring, and Summer

VMC 986 Adv Com An Int Med (2 credit hours)
This course provides a higher level experience to diagnosis and management of companion animals with complex medical problems. Students may choose to concentrate on particular aspects of internal medicine. Students are not required to participate in e

Typically offered in Fall and Spring

VMC 987 Aquatic Medicine (2 credit hours)
This course is designed as an elective clinical block rotation in field services, in the final year of the professional DVM curriculum. Students electing the course would have successfully completed the two theoretical/laboratory courses in special species medicine providing the foundation for participation in this course. It is the only clinical course offering hands on experience with medical care delivery to aquatic species.

Typically offered in Fall and Spring

VMC 988 Exotic Animal Medicine (2 credit hours)
This clinical rotation provides practical experience in the diagnosis, treatment and prevention of disease in privately owned small mammals, birds, reptiles, fish, and amphibians. In addition to assisting with the management of clinical cases, students will participate in daily teaching rounds, laboratory activities to increase their technical proficiency, and field visits to various exotic animal collections in NC. Presentation of a short seminar on a clinically relevant topic is required. Irregular and/or long hours, including on-call duty for after-hours emergencies, may be required.

Typically offered in Fall and Spring

VMC 989 Zoological Medicine (4 credit hours)
This course is designed to introduce the senior veterinary students to clinical zoological medicine. Students will gain practical experience in the diagnosis, treatment, and prevention of disease in captive zoological specimens maintained in zoos. Students participate in formal rounds, autodidactic exercises, and case management at the N.C. Zoological Park.

Prerequisite: VMC 964 or successful completion of 3 Zoological Medicine Focus Selectives; and Course Coordinator's Permission
Typically offered in Fall and Spring

VMC 990 Musculoskeletal Ultrasound in the Horse (2 credit hours)
Develop and use problem solving skills during management of clinical cases incorporating diagnostic ultrasound in a number of different clinical situations. Physics of ultrasound and the resultant sound beam-tissue interactions, mainly musculoskeletal diagnostic ultrasound.

Prerequisite: VMC 975
Typically offered in Spring only

VMC 991 SP Top in DOCS (1 credit hours)
One week special topic course in the Department of Clinical Sciences
Corequisite: Current enrollment in DVM program

VMC 992 SP Top in DOCS (1-4 credit hours)
Two week special topic course in the Department of Clinical Sciences.

VMC 993 Equine Special Topics (2 credit hours)
This course is offered to students that have already signed up to take any two of the following courses: Preventative Health Care, Equine Medicine, Equine Surgery, or Equine Theriogenology. The course is designed to give additional experience in equine-oriented clinical services at NCSU. Students will not be able to participate in this block off campus, unless working directly with a NCSU faculty member. A faculty mentor must be identified within one month of signing up for this course and an authorized proposal of activities planned submitted to Dr. Gardner.

Typically offered in Fall and Spring
VMC 994  Small Animal 4th Year Extramural Studies  (1-6 credit hours)
This course is a recommended rotation designed to expand opportunities for senior veterinary students to participate in small animal private practice a) enhance and learn clinical and technical skills, b) develop effective client communication skills and time management, and c) observe elements of small business management, including personnel involved and professional financial interactions with private clients. Students will work at a private or corporate veterinary practice under the direct supervision of a licensed veterinarian engaged in small animal practice. Must be senior student in the DVM program.

Typically offered in Fall and Spring

VMC 995  Clinical Conference  (1 credit hours)
This weekly seminar course will incorporate a range of topics relevant to success in the clinical year and beyond, including preparation for the NAVLE exam, integration of themes and topics presented elsewhere in the DVM curriculum, job search strategies, employment contracts, financial literacy and loan repayment, critical reflection, and others. The course calendar is based on relevant topics to members of the senior class as they pass through the academic year. Topics will be addressed in an interactive and discussion-based manner and will be selected with input from the student body.

Restriction: Active DVM student in year 4 of the curriculum (successful completion of years 1-3)
Typically offered in Fall, Spring, and Summer

VMC 996  Advanced Avian Clinical Medicine  (2 credit hours)
Students will work with teaching birds to develop skills in avian handling, diagnostic sample collection, anesthesia and radiology. Cadavers will be used to teach orthopedic and soft tissue surgical procedures. Students and faculty will spend approximately 5 days in the field, working with psittacine birds, waterfowl and raptors at Sylvan Heights Waterfowl park in Scotland Neck, NC and at the Carlina Raptor Center in Charlotte, NC. Restricted to senior DVM students.

P: VMC 988
Typically offered in Fall and Spring

VMC 997  Raptor Medicine and Rehabilitation  (2 credit hours)
This elective senior year rotation allows students to obtain clinical experience in raptor medicine and rehabilitation at Carolina Raptor Center in Charlotte, N.C. Students will develop skills with species identification, capture and handling, physical examination, bandaging, diagnostic sample collection and interpretation, emergency stabilization and treatment techniques, necropsy, anesthesia and surgery assistance, and captive management and husbandry issues. A maximum of 2 students will be permitted in each 2-week clinical rotation. For students enrolled in DVM Curriculum. Will partially fulfill senior year requirement for elective clinical rotation credit in Zoo Focus Area.

Typically offered in Fall and Spring

VMC 998  Basic Wildlife Rehabilitation Medicine  (2 credit hours)
Wildlife rehabilitation medicine, the delivery of health care and management to free-ranging native wildlife with the goal of re-release is an important component of clinical veterinary medicine. Students in this basic course will work with instructors to learn to apply practical medical and surgical techniques and methods for diagnosing disease, delivering health care, and implementing appropriate triage for injured and ill North Carolina native wildlife. Restricted to DVM Curriculum 4th year students.

Prerequisite: VMC 964 or successful completion of 3 Zoological Medicine Focus Selectives, VMC 989, and Course Coordinator’s Permission
Typically offered in Fall and Spring

VMC 999  Advanced Wildlife Rehabilitation Medicine  (2 credit hours)
Wildlife rehabilitation medicine, the delivery of health care and management to free-ranging native wildlife with the goal of re-release is an important component of clinical veterinary medicine. Students in this advanced course will apply practical medical and surgical techniques and methods learned in the basic course for diagnosing disease, delivering health care, and implementing appropriate triage for injured and ill North Carolina native wildlife. They will assist staff and faculty in managing cases native to North Carolina.

Prerequisite: VMC 964 or VMC 998
Typically offered in Fall and Spring

Veterinary Science - VMB (VMB)

VMB 900  Veterinary Pain: Physiology and Clinical Problem Solving  (1 credit hours)
Course will review the neuroanatomy and physiology of pain with emphasis on veterinary species. The course will also cover clinical treatment options and ethical discussions.

Typically offered in Fall only

VMB 901  Molecular Medicine  (1 credit hours)
This elective is designed for all DVM students to augment their training in clinical and basic sciences. Modern medicine is making increasing use of molecular approaches for advancing diagnostic and prognostic modalities, and for developing more effective therapeutic strategies for cancer, metabolic disorders and infectious diseases. This class will outline the concepts underlying current and emerging technologies in molecular medicine, and investigate their utility in a clinical setting. The goal is to equip students with a basic understanding of the appropriate and effective use of molecular strategies, whether directly for patient care, or within academic, industry or government research.

Typically offered in Spring only

VMB 909  Case Based Radiographic Interpretation  (1 credit hours)
Using an entirely case based approach, disorders that are commonly diagnosed radiographically in both small and large animals will be discussed. The emphasis will be on radiographic interpretation. Important concepts in radiographic interpretation and how imaging can affect patient management will be discussed.

*Corequisite: Concurrent enrollment in third year of DVM curriculum*
Typically offered in Spring only
VMB 911 Veterinary Anatomy I  (5 credit hours)
Gross anatomy of the dog and cat. Neuroanatomy of the dog and cat. Dissection of embalmed (dog/cat) cadavers, study of prosections, slides, models, and imaging modalities.

P: Admission to professional veterinary program
Typically offered in Fall only

VMB 912 Introduction to Clinical Problem Solving in Veterinary Practice  (2 credit hours)
A combination of lectures and in-class activities will be used to explore the clinical reasoning process and steps used in "working up" a veterinary clinical case. Specific topics include: patient signalment, chief complaint, history, physical exam, problem list, differential diagnosis. Also covered: introductory clinical skills, medical records (SOAP). Course limited to students enrolled in the DVM curriculum.

Requisite: Currently enrolled DVM student
Typically offered in Fall only

VMB 913 Veterinary Physiology I  (4 credit hours)
A course in comparative physiology with special attention to domestic mammalian and avian species. Emphasis is placed on cellular and metabolic physiology and the physiology of the nervous and cardiovascular systems.

P: Admission to professional veterinary program
Typically offered in Fall only

VMB 914 Histology and Cytology  (2 credit hours)
This course focuses on the study of cells, basic tissues, and selected organs of domestic animals. The primary emphasis is on the molecular and structural basis for cell function, tissue organization, and organ systems.

P: Admission to professional veterinary program
Typically offered in Fall only

VMB 920 Small Group Problem Solving in Veterinary Medicine  (1 credit hours)
Students will work in small groups with a faculty facilitator to examine case scenarios, and apply the problem-solving process discussed in VMB 912 to a variety of clinical and research problems. This course will provide a venue for integration of content presented in other courses, as well as application of small-group communication skills. Course limited to students enrolled in the DVM curriculum.

Typically offered in Spring only

VMB 921 Veterinary Comparative Anatomy  (4 credit hours)
Gross anatomy of domestic ungulates (horse, ox, goat, pig). Involves dissection of embalmed specimens and study of prosections, models, and radiographs.

Typically offered in Spring only

VMB 922 Veterinary Physiology II  (4 credit hours)
A continuation course in comparative physiology with special attention to domestic and avian species. Emphasis is placed upon water and electrolyte metabolism and the physiology of respiratory, renal, gastrointestinal, endocrine, and reproductive systems.

Typically offered in Spring only

VMB 930 Anesthesiology  (2 credit hours)
Anesthetic principles, agents, and techniques of mammalian, avian, and rodent species.

Typically offered in Fall only

VMB 931 Veterinary Ethics and Animal Welfare  (2 credit hours)
This course will explore the major ethical issues confronting the practices of veterinary medicine, biomedical science, and animal welfare. Students will become familiar with legal and institutional positions, consider and debate opposing arguments on the various topics, and examine relevant case studies. Provides the basic leadership and operational training necessary to become a Credentialed responder for the State of North Carolina. Limited to DVM students or by permission of instructor.

Requisite: Currently enrolled DVM student
Typically offered in Fall only

VMB 932 Veterinary Medical Decision Making  (1 credit hours)
A combination of lectures and Moodle activities will be used to explore the medical decision-making process in veterinary medicine and error prevention strategies. Main course themes are errors in: knowledge acquisition, data gathering, data processing and metacognition. Discussion of generation, refinement and testing of diagnostic hypotheses. Course limited to students enrolled in the DVM curriculum.

Typically offered in Fall only

VMB 933 Veterinary Pharmacology I  (3 credit hours)
This course focuses on the action of drugs in animals and basic principles of drug disposition and pharmacokinetics. The course will provide presentations on the principles of pharmacology of medications used in animals. Principles of autonomic pharmacology will form a foundation that is important to other drug groups. Important drug groups discussed during the course will be sympathetic and parasympathetic agonists and antagonists, anesthetic, sedative, and tranquilizer drugs. During the chemotherapy portion of the course, anti-infective agent chemotherapy will be discussed, which includes antibacterial, antiparasitic, antifungal, and antiviral drugs. Anticancer agents also will be considered in the chemotherapy portion of the course.

Restriction: Acceptance and good standing in a veterinary professional curriculum.
Typically offered in Fall only

VMB 934 Introduction to Radiology  (1 credit hours)
This course describes and explains the principles of physics of diagnostic radiology and ultrasound, and the basics of image interpretation. Principles of thoracic radiography and radiographic anatomy will be covered. Radiographic interpretation of the cardiovascular system, lungs and airways and pleural space are discussed and related to physiology of the different organ systems. Principles of abdominal radiography and radiographic anatomy will be covered as well and the concepts of peritoneal detail, abdominal mass effect and intestinal ileus will be introduced.

Typically offered in Fall only
VMB 942 Veterinary Pharmacology II (3 credit hours)
A course in veterinary pharmacology with emphasis on the pharmacology of drugs affecting various body systems including digestive, endocrine, ocular, respiratory, central nervous, cardiovascular, or musculoskeletal. Drugs that produce analgesic and anti-inflammatory properties also are included.
Corequisite: Current enrollment in DVM program
Typically offered in Spring only

VMB 944 Veterinary Toxicology and Poisonous Plants (2 credit hours)
Toxicological basis and pathological features of diseases of animals and birds caused by common toxic chemicals and plants with emphasis on clinical manifestations, diagnosis, prevention, and treatment.
Corequisite: Current enrollment in DVM program
Typically offered in Spring only

VMB 952 Specialized Problem Solving in Veterinary Medicine (1 credit hours)
Specialized Problem-Solving is the fourth in a series of courses focusing on Clinical Reasoning and Problem Solving. In this class, you will build upon the skills developed in earlier courses, and work to diagnose, treat and trouble-shoot more complex cases. These cases may have external constraints that will limit your ability to order diagnostic tests, and/or may require identification and correction of medical errors. You will work in unsupervised teams, and then present the results of your decision-making processes to a facilitator for discussion, review and critique. Course limited to students enrolled in the DVM curriculum.
Typically offered in Spring only

VMB 950 Veterinary Radiology and Radiobiology (2 credit hours)
Fundamentals of radiographic diagnosis. The VMB 960 course is focused on the diagnostic imaging appearance of small and large animal thoracic, abdominal, musculoskeletal and neurologic disease. The main imaging modality that will be covered is diagnostic radiology and some diagnostic ultrasound but Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) will be introduced as well. The principles of image interpretation will be revisited and the imaging appearance of important and common diseases will be presented and discussed. Case examples will be shown and students may be asked to provide case interpretation in class.
Requisite: Currently enrolled DVM student
Typically offered in Spring and Summer

VMB 961 Success in the Clinics and Beyond (1 credit hours)
This course provides an opportunity for students to integrate and synthesize professional skills in preparation for clinical rotations and veterinary practice. An introduction to the current VH electronic medical record system will be provided. Students will apply their knowledge of clinical communication, teamwork, clinical reasoning, and ethics to a variety of case scenarios.
Typically offered in Spring only

VMB 962 Clinician Scientist Research Experience (1-10 credit hours)
This course is designed to give students an opportunity to take part in research in the laboratory of their chosen mentor(s), resulting in a greater understanding of the research process. Students will be specifically required to complete at least three 2-week blocks, and to have at least two of these blocks scheduled consecutively (i.e., a 1-month time period in the laboratory). This course is restricted to students enrolled in the Clinician Scientist Focus Area of the DVM curriculum and requires approval by the student's CSFA mentor.
Prerequisite: All freshman-junior DVM courses allowing the student to enroll in senior DVM courses.
Typically offered in Fall and Spring

VMB 965 Veterinary Nutritional Health (2 credit hours)
The role of nutrition in veterinary medicine. Development, diagnosis and prevention of nutritional problems in a variety of species will be discussed, frequently employing a comparative approach.
Typically offered in Spring only

VMB 975 Radiology (2 credit hours)
VMB 976 Radiology Rotation (2 credit hours)
This rotation will provide practical training in the production of quality radiographic examinations and will help develop interpretation skills in diagnostic radiology. Students are expected to be familiar with material covered in the junior radiology course (VMB 960) as it will be incorporated into this rotation. Review of the auto-tutorial teaching cases, located in the “Star Wars” room. The radiology rotation is oriented toward teaching and service. Learning experiences result from a combination of direct contact with the faculty, residents, technicians, and classmates. You will make diagnostic quality radiographs, participate in morning rounds and review didactic material, VMB 960 teaching files and ask questions.

VMB 977 Clinical Anesthesia Rotation (2 credit hours)
Students engage in the daily clinical service responsibilities of the CVM-VTH Anesthesia Section in the role of anesthetists assigned to the care of client-owned animals. The objective of this clinical course is to enable each student to achieve their maximum potential as neophyte anesthetists having limited experience. Student activities are supervised and conducted by CVM faculty anesthesiologists, and VTH staff anesthetists having limited experience. You will make diagnostic quality radiographs, participate in morning rounds and review didactic material, VMB 960 teaching files and ask questions.
Typically offered in Fall and Spring

VMB 978 Clinical Behavior & Nutrition (2 credit hours)
This 4th year clinical rotation will provide interested students with the opportunity to gain experience in both behavior and nutrition. During the week spent at the Animal Behavior Service, students will participate in the diagnosis and treatment of behavior problems in companion animals. During the week spent at the Nutrition Service, students will develop and initiate Nutrition Support plans for hospitalized and health companion animals. Relevant nutrition support skills will be practiced. This course is restricted to students in the DVM curriculum.
Prerequisite: VMC 927 or equivalent, DVM Curriculum Student Status
Typically offered in Fall and Spring
**Veterinary Science - VMP (VMP)**

**VMP 162/PO 162 Livestock and Poultry Disease Management** (3 credit hours)
Basic principles of disease and disease management in livestock and poultry. Disease prevention through sanitation and vaccination. Diseases of horses, pigs, ruminants, poultry, and disease prevention programs for each species.

Requisite: Agricultural Institute Only

**Typically offered in Spring only**

**VMP 401 Poultry Diseases** (4 credit hours)
Concepts of factors contributing to or causing disease, disease cycle, host responses, and general approaches to prevention and control including management and biosecurity methods, immunization, and medication. Recognition, diagnosis, prevention, control, and treatment of economically significant infectious and noninfectious diseases affecting poultry.

**Typically offered in Spring only**

**VMP 420 Disease of Farm Animals** (3 credit hours)
Pathology of bacterial, viral, parasitic, nutritional, thermal and mechanical disease processes for farm animals. This emphasis practices for prevention and control of each disease.

Prerequisite: Junior standing.

**Typically offered in Spring only**

**VMP 900 Global Health Research Project** (5 credit hours)
This international elective (Global Health Research Project) will allow students to develop an understanding of methodological approaches and techniques used in global health research, including qualitative field work, quantitative surveys, experimental designs, intervention trials, and program evaluation. This elective will highlight the importance of understanding and addressing global health through multidisciplinary frameworks and collaborations. This elective is a required component of the Certificate in Global Health. Course Coordinator Permission required.

**Typically offered in Summer only**

**VMP 901 Small Ruminant Medicine** (1 credit hour)
This course will present the key principles involved with management, reproduction and diseases of sheep, goats, and camels. This will include basic information such as recommended nutrition programs to more advanced material such as diagnostic, therapeutic and prophylactic measures necessary to correct, reduce or prevent common diseases. Course restricted to 3rd year veterinary students, unless special permission is granted by course coordinator.

**Typically offered in Fall only**

**VMP 904 Swine Industry** (1 credit hour)
This course will provide veterinary students with expertise to approach a clinical swine problem and also to understand and analyze different parameters from a swine production. Students will evaluate clinical signs, analyze and understand production records, understand regulations and economic analysis. Students will also learn how to set up clinical trials, to interpret serological and virological results, to perform necropsy and to understand swine reproductive management.

Restriction: Third Year DVM Students

**Typically offered in Spring only**

**VMP 906 Bovine Assisted Reproduction Techniques** (1 credit hours)
Students will gain hands-on experience with bovine rectal palpation, rectal ultrasonography, trans-cervical catheterization, and embryo flushing. Course will provide didactic instruction on assisted reproduction techniques followed by lab time to practice discussed topics. Students will be required to travel to lab locations.

**Typically offered in Spring only**

**VMP 907 Cancer Pathogenesis and Diagnosis** (1 credit hours)
This course will enable the student to describe the steps that lead from a normal cell to a fully malignant neoplasm, understand underlying molecular mechanisms, and correlate these mechanisms to relevant treatment options. Students will be able to classify different tumor types and deduce the impact of the neoplasm on the host and host responses. Students will also learn to assess clinical samples to make a relevant clinical diagnosis of tumor type and predicted behavior.

Prerequisite: 3rd year DVM student

**Typically offered in Spring only**

**VMP 908 Advanced Ruminant Medicine and Surgery** (2 credit hours)
This elective course will be a weekly lecture and lab that covers routine ruminant surgical procedures and advanced medicine techniques to supplement VMP 962 Ruminant Medicine and Surgery.

Prerequisite: 3rd year DVM student

**Typically offered in Spring only**

**VMP 909 Veterinary International Elective Experience** (1-2 credit hours)
This course will provide students with practical experience in a foreign country working on a veterinary medicine related project being conducted in that country. Projects may focus on production medicine, occupational, zoological medicine, or basic research. Travel restricted to sites not included on the State Department alert/warning list. See http://travel.state.gov/content/passports/english/alertswarnings.html for details.

Corequisite: Current enrollment in DVM program

**Typically offered in Fall and Summer**
VMP 910 Infection and Immunity 1 (3 credit hours)
This course is intended to familiarize the student with the pathogenic bacteria and fungi of veterinary importance. The student will learn the properties and cultivation of these microorganisms and receive a general introduction to the diseases they can cause. Primary emphasis will be placed on how the biology of the pathogen influences disease pathogenesis, and microbiological identification of infectious agents. The laboratory exercises will complement the lectures and focus on standard procedures for microbial cultivation and identification.
Prerequisite: Admission to the DVM Curriculum
Typically offered in Fall only

VMP 916 Health Maintenance and Animal Production I (1 credit hour)
This course is part I of a series with VMP 936 and 956 designed to introduce students to procedures for health maintenance and care of horses and food-producing animals. Students learn how to prevent diseases and promote animal health in laboratories.
Typically offered in Fall and Spring

VMP 920 Infection and Immunity 2 (4 credit hours)
This course is intended to continue the topics introduced in Infection and Immunity 1. Specific bacterial, fungal and viral pathogens will be covered including pathogenesis and strategies used to control infection and/or development of disease. The course will also cover more advanced topics in immunology including the types of hypersensitivities, autoimmunity, immunity in the newborn and fetus, immune deficiencies and vaccination.
Prerequisite: Admission to the DVM Curriculum
Typically offered in Spring only

VMP 921 Problem Solving for Cases in Infectious Diseases and Immunity 1 (2 credit hours)
This course is intended to challenge first-year veterinary students to reach a diagnosis of realistic cases involving either infectious diseases or immune pathology. The first part of the course is an introduction to diagnostic laboratory procedures. The second portion of the course requires the students to develop a list of differential causes to assigned clinical cases, choose a presumptive diagnosis based on available data and ordering of diagnostic tests to confirm the presumptive diagnosis. The individual cases are discussed in a small group format with a faculty facilitator.
Prerequisite: Admission to the DVM Curriculum
Typically offered in Fall only

VMP 930 Infection and Immunity 3 (3 credit hours)
Infection and Immunity 3, VMP93X, is designed to serve as a continuation of Infection and Immunity 1 & 2 (first-year curriculum) for the second-year veterinary student. This course is designed to reinforce principles if infectious disease and immunity introduced in the first year of the DVM curriculum and expand upon specific groups of parasites. This course will cover the diagnosis, treatment and control of major endo and ecto parasites of domesticated animals.
Prerequisite: Admission to the DVM Curriculum
Typically offered in Fall only

VMP 931 Veterinary Pathology I (3 credit hours)
Introduction to the basic pathologic changes which occur in animal tissues. Developmental processes and resulting morphology observed at gross, cellular, and subcellular level emphasized.
Typically offered in Fall only

VMP 934 Problem Solving for Cases in Infectious Diseases & Immunity 2 (2 credit hours)
This course is intended to challenge first-year veterinary students to reach a diagnosis of realistic cases involving either infectious diseases or immune pathology. The first part of the course is an introduction to diagnostic laboratory procedures. The second portion of the course requires the students to develop a list of differential causes to assigned clinical cases, choose a presumptive diagnosis based on available data and ordering of diagnostic tests to confirm the presumptive diagnosis. The individual cases are discussed in a small group format with a faculty facilitator.
Prerequisite: Admission to the DVM Curriculum
Typically offered in Fall only

VMP 936 Health Maintenance and Animal Production II (1 credit hour)
This course is part II of a series with VMP 916 and 956 designed to introduce students to procedures for health maintenance and care of horses and food-producing animals. Students learn how to care for animals, prevent diseases, and milk cows in laboratories.
Prerequisite: VMP 916
Typically offered in Fall and Spring

VMP 941 Veterinary Pathology II (4 credit hours)
Systemic Pathology - A study of specific responses of organ systems to pathogenic influences in animals with emphasis on the effects on the body as a whole.
Corequisite: Current enrollment in DVM program
Typically offered in Spring only

VMP 942 Veterinary Clinical Pathology (3 credit hours)
Introduction to the mechanisms which produce abnormal physiologic parameters within the animal during illness, with emphasis on the techniques for determining those abnormalities in the living animal.
Typically offered in Spring only

VMP 945 Epidemiology & Public Health (3 credit hours)
The focus of this course is to construct a foundation for clinical medicine by acquiring a holistic view of disease, exploring optimal preventive medicine strategies while developing a critical thinking skills and quantitative reasoning techniques. The teaching/learning format of the course will include lecture, in-class exercises, discussions and case studies.
Prerequisite: VMP 912, DVM student
Typically offered in Spring only

VMP 956 Health Maintenance and Animal Production III (1 credit hour)
This course is part III of a series designed to instruct students in procedures for maintaining the health and well-being of horses and food-producing animals. Students learn how to prevent diseases and promote animal production, including production of safe meat and milk.
Typically offered in Fall only
VMP 962  Ruminant Medicine  (3 credit hours)
The principles of medical disorders of ruminants are presented. This
includes the cause of the disorders and the diagnostic, therapeutic and
prophylactic measures necessary to correct, reduce or prevent these
problems.

Typically offered in Spring only

VMP 964  Swine and Poultry Medicine  (2 credit hours)
Lecture series supplemented with projected illustration on the most
economically important diseases of poultry and swine. Emphasis is
placed on definition of diseases, etiology, characteristics of the disease,
and diagnosis. The economics related to occurrence, prevention,
treatment, and control are presented.

Typically offered in Spring only

VMP 970  Ruminant Health Management I  (2 credit hours)
This is a two-week block considering health management of ruminant
species. During the two-week period, students accompany faculty on
visits to farms to deliver health management programs, to investigate
health problems, or to consider approaches to enhance productivity. A
portion of the course also involves experience in providing individual
animal health management and addressing medical/surgical disorders.
Available to senior veterinary students.

Prerequisite: VMP 956 or VMP 974 or consent of the instructor
Typically offered in Fall and Spring

VMP 971  Food Animal Diagnostics for Disease Diagnosis, Control,
and Population Surveilla  (2 credit hours)
This course intended to instruct food animal veterinary students in:
1) underlying principles of veterinary diagnostic assays, 2) proper
collection of samples, 3) effective testing approaches for diagnosis and
management of disease, 4) strategies for efficient monitoring of food
animal population for infection by specific agent(s), and 5) analysis of
data from veterinary diagnostic laboratory tests and optimal use of the
results for making production management decisions. Priority given to
students in Food Animal Focus area. Students in Mixed Animal Focus
Area or special-case Epidemiology Focus Area students can enroll (if
space remains) with the approval of Course Coordinator if they meet the
criteria states in the above requisites.

Prerequisite: Prior undergraduate coursework, summer work
experiences, and/or consistent enrollment and good performance in food
animal selective.
Typically offered in Fall only

VMP 972  Ruminant Health Management II  (2 credit hours)
Senior veterinary students will experience advanced training in ruminant
clinical medicine.

Prerequisite: VMP 970
Typically offered in Fall and Spring

VMP 973  Special Topics in Epidemiology  (2 credit hours)
The main goal of this course is to provide senior veterinary students
with the opportunity for pursuing a focused research topic in the area of
veterinary epidemiology and population medicine under the direction of
consenting faculty. The exact direction and scope of the topic is agreed
upon between the instructor, the student and the course coordinator. The
course is offered only by the permission of the participating instructor(s)
and the course coordinator. The instructor and the student will work out
the type of project, what exact objectives are to be met and how the
success of obtaining those objectives will be evaluated. The objectives
and methods of evaluation of performance will be negotiated between the
veterinary student and the instructor and put into writing in the form of a
Plan of Action PRIOR to course permission being granted by the course
coordinator.

Typically offered in Fall and Spring

VMP 974  Food Supply Veterinary Medicine  (2 credit hours)
This 2-week course provides exposure to the clinical principles of food
supply veterinary medicine. It is primarily intended for individuals who
are not in the NCSU-CVM Food Animal Focus Area. Ruminant, swine
and poultry faculty provide an overview of the animal industries and
production practices, as well as exposure to basic veterinary knowledge
and clinical skills. Prerequisites may include consent of instructor.

Prerequisite: Completion of first 3 years of veterinary curriculum; consent
of instructor for any enrollment >8.
Typically offered in Fall only

VMP 975  Advanced Topics in Veterinary Anatomic Pathology  (1-6
credit hours)
This is a two-week senior veterinary clinical rotation that provides
students with additional, focused experience in veterinary anatomic
pathology. Students have the option of rotating through necropsy service
and surgical biopsy service for two weeks to gain additional experience in
pathology similar to VMP 977, the prerequisite for this course. Students
have the option of designing a specialized pathology experience with the
guidance of an approved pathology faculty member. Enrollment requires
pre-approval by faculty assigned to the course.

Prerequisite: VMP 977
Typically offered in Fall and Spring

VMP 976  Food Animal Pharmacology  (2 credit hours)
This course will outline the basic principles of pharmacology and therapy
of the major diseases of ruminants, swine and poultry. Students will be
expected to develop a thorough understanding of how properly to use
drugs in food animal species and should be able to develop a treatment
program for most major livestock diseases. The course will be restricted
to students in the food animal and mixed animal focus areas.

Prerequisite: VMB 943; VMP 962; VMP 964
Typically offered in Fall only

VMP 977  Autopsy/ Clinical Pharmacology  (2 credit hours)
Two clinical disciplines are completed during this clinical block - Autopsy
Pathology and Clinical Pharmacology. The autopsy clinical rotation
provides exposure to pathology techniques, observation skills and
medical reasoning used to obtain and interpret autopsy and laboratory
data in order to develop diagnoses, understand disease processes and
address clinical and/or farm problems. The clinical pharmacology portion
of the rotation will expose the students to current veterinary clinical
pharmacology and therapeutics.

Typically offered in Fall and Spring
VMP 978 Clinical Pathology and Laboratory Medicine (2 credit hours)
This course provides veterinary students with a practical case-based approach to learning all majors aspects of veterinary clinical pathology and laboratory medicine (parasitology, immunology, bacteriology) in a clinical setting. It is restricted to students enrolled in the fourth year of the DVM curriculum.

Typically offered in Fall and Spring

VMP 979 Epidemiology (2 credit hours)
The main goal is to provide senior veterinary students with the opportunity for pursuing a focused research topic in the area of veterinary epidemiology and population medicine under the direction of consenting faculty. The exact direction and scope of the topic is agreed upon between the instructor, the student, and the course coordinator. This course is offered only by the permission of the participating instructor(s) and the course coordinator. The instructor and the student will work out the type of project, what exact objectives are to be met and how the success of obtaining those objectives will be evaluated. The objectives and methods of evaluation of performance will be negotiated between the veterinary student and the instructor and put into writing in the form of a Plan of Action PRIOR to course permission being granted by the course coordinator. No one textbook is required for this course.

Typically offered in Fall and Spring

VMP 980 Theriogenology I (2 credit hours)
This course is designed to instruct students in clinical Theriogenology. It will be primarily oriented toward equine and canine species, however, cases and problems from other species will be seen and included as teaching materials. The students will improve upon the skills learned in VMF 951 and will be expected to use these skills in dealing with clinical cases and laboratory type situations. Transabdominal, vaginal, and rectal examination of the reproductive tract, semen collection, and evaluation will be taught during this course. This course may be repeated as many times as a student wishes during their senior year.

Prerequisite: Enrolled in fourth year clinical rotations.
Typically offered in Fall, Spring, and Summer

VMP 981 Special Topics in Theriogenology (2 credit hours)
The primary objective of this course is to provide additional information and training to veterinary students that had taken the VMP 980 Clinical Theriogenology senior clinical rotation. Specifically, emphasis is directed to acquaint students with modern and current practices of clinical Theriogenology. Various aspects of assisted reproductive technology available to domestic animals will be discussed. It is expected that the majority of the information and activities offered in this course will involve equine species (80%) and, to a lesser extent, canine (10%) and bovine species (10%). Teaching and client-owned animals are available for the rotation. Although emphasis is given on hands-on activities, didactic instruction of selected topics in clinical Theriogenology will be discussed.

VMP 982 Poultry Health Management I (2 credit hours)
Poultry Health Management I is a clinical rotation elective for 4th year veterinary students with an interest in poultry health management or food animal production. This two-week course is offered 4 times each year. Diseases of turkeys and chickens will be discussed. Basic concepts in poultry disease diagnosis, prevention and treatment will be emphasized. The course will consist of lectures, laboratory and field experiences.

Typically offered in Fall and Spring

VMP 983 Poultry Health Management II (2 credit hours)
Poultry Health Management II is a clinical rotation elective for 4th year veterinary students with a commitment to pursue a career in poultry health management or food animal production. This two-week course is offered throughout the year and may be repeated with permission of the instructor. The course will consist of laboratory and/or field experiences designed to meet the student's career goals. A list of available externships in poultry health management, which may be applicable for this course can be found on the Association of Avian Pathologists web site: http://www.aaap.info/index.html, under Educational Opportunities, Senior Veterinary Student Externships approved by the Kenneth Eskelund Preceptorship Committee. Funds to help pay for travel expenses may be available through the Kenneth Eskelund Preceptorship, see information at the web site listed above.

Typically offered in Fall and Spring

VMP 984 Swine Health Management I (2 credit hours)
This course will provide senior veterinary students with techniques and expertise to approach a clinical swine problem. Students will evaluate clinical signs, analyze production records, assess facilities and management, institute a diagnostic plan and establish an economically feasible solution to the clinical problem. The outline for this course may vary slightly from year to year but the following topics will be covered: Necropsy procedures/sample techniques; Interpreting serologic/virologic results; Farm visits - review building/equipment designs; Practical swine reproductive management; Practical bacteriology; Practical swine nutrition/rations; Swine record systems/Pig Champ.

Typically offered in Fall and Spring

VMP 985 Swine Medicine & Production II (2 credit hours)
This course will provide senior veterinary students with the opportunity to utilize the techniques and expertise gained in VMP 984. Students will evaluate clinical and production problems on a variety of swine farms. Practicum/field work and independent study will be conducted on commercial swine farms, usually with a veterinary practitioner or faculty member.

Typically offered in Fall and Spring

VMP 986 One Health: From Philosophy to Practice (2 credit hours)
Graduate/professional seminar (with team project) addressing intersections of veterinary medicine, human medicine, and environmental health. Co-listed at UNC CH Gillings School of Global Public Health and Duke University School of Medicine. Includes participants from these three institutions, plus related private-sector members, non-governmental organizations, and governmental professionals. Its purpose is to facilitate understanding of one health as a system of systems, and promote cross-campus and cross-discipline interactions. Weekly evening course held at NC Biotechnology Center, RTP. Limit: 15 students per university. Requires current graduate standing at NCSU or professional student standing within the College of Veterinary Medicine.

Typically offered in Fall only

VMP 987 Ruminant Topics (2 credit hours)
This two-week elective allows goal-directed educational enrichment in Ruminant Practice under the direction of consenting faculty. Formats include clinical experiences, clinical and applied investigations, etc. Topics and times are arranged by the student and consenting faculty. Available to 3rd and 4th year veterinary students only upon consent of faculty. VMF 970 may be a required prerequisite.

Typically offered in Fall and Spring
VMP 988 Advanced Topics in Clinical Pathology (2 credit hours)
The goal of the Advanced Topics in Clinical Pathology is to gain further experience in clinical pathology beyond the required prerequisite laboratory medicine rotation VMP978. This senior clinical rotation is designed around the interests and career goals.

Prerequisite: VMP 978 (Clinical Pathology, Laboratory Medicine and Nutrition) is a prerequisite course although under special circumstances instructor permission is required.

Typically offered in Fall, Spring, and Summer

VMP 990 Extramural Experiences - Large Animal (2 credit hours)
Senior DVM students will have the opportunity to undertake an elective rotation in an approved practice externship in a large animal practice where they will experience "hands on" experience in a private practice setting. Private practice experiences are available for year 1 - 3 students through the selective offerings. Practitioners will be valuable partners in the education process in the senior year, providing access to individual animal and herd-related clinical diversity that is increasingly difficult to offer in the academic setting.

Typically offered in Fall and Spring

VMP 991 SP Top in PHP (1 credit hours)
One week special topic course in the Department of Population Health & Pathobiology Department.

VMP 992 SP Top in PHP (1-2 credit hours)
One week special topic course in the Department of Population Health & Pathobiology Department.

VMP 993 Extramural in Epidemiology, Public Health, and Public Policy (2-6 credit hours)
This course is designed to expand opportunities for senior veterinary students to participate in a 2 week practicum in epidemiology, public health, or public policy under mentorship of experienced State, Federal, or private organization professionals. Students select an area or topic of interest and consult with the Focus Area Leader and submit a short proposal for review. Students work under supervision of an approved professional. Focus Area students may repeat the 2 week experience 3 times for a total of 6 weeks.

Typically offered in Fall and Spring

VMP 994 Extramural Experience in Pathology (1-4 credit hours)
This is a two-week externship experience in pathology. The student will arrange an extramural experience in an academic, diagnostic, government, industrial, or zoological/wildlife laboratory setting under the supervision of a board certified veterinary anatomical or clinical pathologist. Fourth year DVM students only.

Typically offered in Fall and Spring

VMP 995 Clinical Conference (1 credit hours)

VMP 999 Extramural in Vet International Programs (2 credit hours)
This course will provide students with practical experience in a foreign country working on a veterinary medicine related project being conducted in that country. Projects may focus on production medicine, occupational safety, zoological medicine, or basic research.

Typically offered in Fall and Spring

Visual and Performing Arts (VPGE)

VPGE 295 Visual and Performing Arts Special Topics (3 credit hours)
Special topics course offering for the general education Visual and Performing Arts category.

GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

Visual and Performing Arts and Glob Know (VPGK)

VPGK 295 Visual and Performing Arts and Global Knowledge Special Topics (3 credit hours)
Special topics course offering for the general education Visual and Performing Arts and Global Knowledge categories. This course may be used for the Global Knowledge (GK) co-requisite and/or for the Visual and Performing Arts (VPA) requirement.

GEP Global Knowledge, GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

Visual and Performing Arts and U.S. Div (VPUS)

VPUS 295 Visual and Performing Arts and U.S. Diversity Special Topics (3 credit hours)
Special topics course offering for the general education Visual and Performing Arts and U.S. Diversity categories. This course may be used for the U.S. Diversity (USD) co-requisite and/or for the Visual and Performing Arts (VPA) requirement.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Fall, Spring, and Summer

Women's and Gender Studies (WGS)

WGS 200 Introduction to Women's and Gender Studies (3 credit hours)
Introduction to women's and gender studies as an interdisciplinary field spanning the humanities, social sciences and natural sciences. Study of historical perspectives and contemporary understanding of women and gender. Theory, systematic analysis and experimental accounts used to explore complexities of gender, and other identity determinants, mechanisms of power and privilege, and avenues for social change.

GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer
WGS 204/SOC 204 Sociology of Family (3 credit hours)
Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 210/STS 210 Women and Gender in Science and Technology (3 credit hours)
Interdisciplinary introduction to the reciprocal relationships between scientific/technological research and contemporary understanding of gender. Special emphasis on social factors influencing scientists and engineers in their professions.

GEP Interdisciplinary Perspectives, GEP U.S. Diversity
Typically offered in Fall, Spring, and Summer

WGS 220 Men and Masculinity (3 credit hours)
An introduction to the study of men and masculinity as an interdisciplinary field spanning the humanities and social sciences. This course will draw on both historical perspectives and contemporary understanding of men and masculinity, with attention to key domains of men's lives such as the roles of men in fiction and film, race and masculinity, religion and masculinity, fatherhood, masculinity and sports, and male sexuality.

GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 293 Special Topics in WGS (3 credit hours)
Examination of varying topics on women and/or gender from an interdisciplinary perspective at an introductory level.

Typically offered in Fall and Spring

WGS 300 Introduction to Feminist Theories (3 credit hours)
This course provides an overview of primarily US and western feminist theoretical perspectives by focusing on the variety of viewpoints within feminism and their specific historical roots. More than half of the course is devoted to studying specific themes and issues in women's history. The historical background lays the foundation for examining specific feminist theories, including liberal feminism, difference feminism and black feminism/womanism. The course prepares students for further work in Women's and Gender Studies, including WGS 492.

Prerequisite: WGS 200
Typically offered in Fall only

WGS 304/SOC 304 Gender and Society (3 credit hours)

P: 3 credits in SOC at the 200-level
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 305/ENG 305 Women and Literature (3 credit hours)
Nineteenth through twenty-first century women's literature, as shaped by the intersecting and competing claims of gender, race, sexuality, and culture. Focus on fiction, accompanied by critical readings from American studies, feminist literary criticism, and postmodern theory.

Prerequisite: Sophomore standing and above
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 306/PS 306 Gender and Politics in the United States (3 credit hours)
This course explores the role of gender in contemporary American politics. The course examines the historical course of gender politics to see how we have arrived at the present state. It investigates the activities that women and men play in modern politics—voting, running for office, serving in office, etc., and how women and men perform these activities in different ways. The course also focuses on major areas of public policy that affect women and men in different ways.

Prerequisite: PS 201
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall only

WGS 308/ENG 308 Contemporary Issues in Ecofeminism (3 credit hours)
Contemporary issues in ecofeminism provides a historical introduction to and global perspectives on women's sociopolitical, ethical, and economic contributions to the 20th and 21st century environmental movement. Theory and political action as they interweave issues of gender, race, and class in western and non-western contexts will be emphasized. Students will read works by and about female scientists/activists/writers and examine their own communities, analyzing the ways that individuals, community values, and dominant institutions impact women's relationships with the environment. Students will formulate questions, responses, and interpretations through critical reading practices, class discussion groups, self-reflective writing, and comparative analyses. Special attention will be paid to the role of literature—memoir, novel, short story, essay—in the dissemination of ecofeminist ideas.

GEP Humanities, GEP Interdisciplinary Perspectives
Typically offered in Spring only

WGS 310 Women's and Gender Studies Internship (3 credit hours)
Internship program. Introduction to careers that deal specifically with women's issues. Ten-hours-per-week work at a nonprofit or governmental organization. Contextualization of that experience through additional academic requirements. Individualized

Typically offered in Fall and Spring

WGS 327/ENG 327 Language and Gender (3 credit hours)
Introduction to the use of language by men and women. Research in Linguistics and Women's Studies addressing issues such as the acquisition of gender-differentiated language, gender and conversational interaction, sexism in language, gender issues in society, and the relationship between language, gender, and other social constructs (e.g., class, culture, and ethnicity).

Prerequisite: ENG 101
Typically offered in Fall only
WGS 330 Women and Health (3 credit hours)
Women and Health utilizes an interdisciplinary approach to explore historical perspectives on health, access to health technologies, health policy research, and emerging topics in women’s health. The humanities, social sciences, and biological sciences inform inquiry into “hot topics” in health policy, ethics, and the medical sciences. The health of women is dissected through a lens of gender equity and domestic and international perspectives are employed. Students are encouraged to identify and study topics of their own interest.

GEP Interdisciplinary Perspectives
Typically offered in Fall, Spring, and Summer

WGS 350 Emerging Issues in Women’s and Gender Studies (3 credit hours)
Exploration of advanced specialized topics in Women’s and Gender Studies, to enhance in-depth undergraduate training in specific applied theories and methods. Seminar content will rotate, with attention to contemporary theoretical currents, and their application and effectiveness in addressing important emerging issues affecting individuals’ well-being in society, particularly those faced by underrepresented groups.

Prerequisites: WGS 200 or WGS 210 or STS 210
Typically offered in Fall, Spring, and Summer

WGS 360/MUS 360 Women In Music (3 credit hours)
The role of women in music as patrons, teachers, composers, and performers, placing them within the social, economic, and political framework to which they belong. Emphasis on Western Art Music and the role of women in popular music. No previous formal training in music is required.

GEP U.S. Diversity, GEP Visual and Performing Arts
Typically offered in Spring only

WGS 362/COM 362 Communication and Gender (3 credit hours)
effects of gender on the interpersonal communication process. Construction of gendered identities via communication practices. Examination of theories of gender and the role of gender in organizational, institutional, and media communication practices.

Prerequisite: Junior standing, COM 112
Typically offered in Fall only

WGS 370 Advanced Studies of Gender in Science (3 credit hours)
This course is designed to provide students with an in-depth view of recent research about the influence of contemporary gender relations on science and engineering. Readings address feminist theories about sex/gender, race/class/sexualities, the social construction of science, and technological innovation. Discussions will focus on scholarship that explores how, why, and when a “gender lens” brings value to understanding nature and knowledge.

Prerequisites: WGS 200 or (WGS 210 or STS 210)
GEP Interdisciplinary Perspectives
Typically offered in Spring only

WGS 380/AFS 380 Black Feminist Theory (3 credit hours)
Focused examination of Black feminist theory as a significant and distinct body of work. Interdisciplinary exploration of the impact of Black feminist theory on movements for social justice, the development of academic feminism generally, and the lived experience of Black women both in the United States and internationally.

Prerequisite: Any 200-level course in either WGS or AFS
GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 390 Queer Theory (3 credit hours)
Queer Theory provides an overview of the writings, art, identity/ies, work, politics, debates, histories, bodies, intimacies, kinship, and other lived realities of the people and experiences often organized under the LGBTQIA+ umbrella. As a critical theory, queer theory examines how circulations of power, dominance, and oppression constantly re/ vision what it is to be queer, queering, and queered. The course will focus on how gender, race, class, functional diversity, sexuality, work, documentation status, age, etc. impact and are impacted by queer becoming.

P: Any 3-credit 200-level WGS course.
GEP Humanities
Typically offered in Fall and Summer

WGS 393 Special Topics in Women’s and Gender Studies (3 credit hours)
Special topics in Women’s and Gender Studies at the 300 level for offering courses on an experimental basis.

Typically offered in Fall, Spring, and Summer

WGS 406/PSY 406 Psychology of Gender (3 credit hours)
Current theory and research on perceived and actual biological, social, cognitive, personality and emotional similarities and differences of men and women throughout the lifespan. The construction and consequences of gender in our society and others. Credit will not be given for both PSY/WGS 406 and PSY/WGS 506.

Prerequisite: PSY 200 or WGS 200
GEP Social Sciences, GEP U.S. Diversity
Typically offered in Fall and Spring

WGS 407/SOC 407 Sociology of Sexualities (3 credit hours)

Prerequisite: 3 hours SOC 200 level, 300 level
Typically offered in Fall only

WGS 410/ENG 410 Studies in Gender and Genre (3 credit hours)
This course examines the ways in which women writers from diverse backgrounds have revised the literary genres to include the varied experiences of women. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

Requisite: Sophomore Standing or Above
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only
WGS 418/PS 418 Gender Law and Policies (3 credit hours)
Law and policy pertaining to contemporary gender issues. Examination of agenda setting, policy formation, implementation, judicial interpretation and evaluation of selected issues, such as reproductive policies, equal employment and sexual abuse.

Prerequisite: 3 hours of Political Science
GEP U.S. Diversity
Typically offered in Spring only

WGS 444/ANT 544/WGS 544/ANT 444 Cross-Cultural Perspectives on Women (3 credit hours)
Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women's statuses and roles. Effect of gender on social position

Prerequisite: ANT 252 and one of the following: ANT 310,325,330 or 346
Typically offered in Fall only

WGS 447/HI 547/WGS 547/HI 447 Women in America: From Contact to the Civil War (3 credit hours)
The historical experience of women in America from Native American and European contact through the colonial period to the immediate post-Civil-War years (to 1890). Topics include the history of women's work, education, legal and political status, religious experience, and sex roles, with consideration of age, class, race, sexual preference, and region as significant variables in women's experience in America. Credit will not be given for both HI (WGS) 447 and HI (WGS) 547.

P: 3 Hours of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

WGS 448/HI 548/WGS 548/HI 448 American Women in the Twentieth Century (3 credit hours)
Women's historical experience in America, 1890-1990. Changes in women's work, education, legal and political status, and sex roles, age, class, race, sexual preference and region as significant variables in women's experience. Credit will not be given for both HI (WGS) 448 and HI (WGS) 548.

P: 3 hrs. of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only

WGS 472/REL 472 Women and Religion (3 credit hours)
Historical, literary, and theological sources dealing with portrayals of women and religious experience in several religious traditions of the world through different historical periods, from ancient to modern. Impact of feminist theory on the academic study of religion; methodological issues surrounding the study of women's religious history; role of religion in shaping attitudes toward women and their status in society. Students cannot receive credit for both REL/WGS 472 and REL/WGS 572.

Prerequisite: one course in religious studies or women's and gender studies
GEP Humanities
Typically offered in Spring only

WGS 473/REL 573/WGS 573/REL 473 Religion, Gender, and Reproductive Technologies (3 credit hours)
Examines comparative religious ethics concerning gender marriage, parenthood, children, and the relationship of human beings to the “natural”. Relates these views to new and emerging reproductive and genetic technologies. Compares the internally diverse perspectives of three major religious traditions with regard to their interpretations of these technologies. Analyzes the impact of particular uses of these technologies on the rights of women and girls. Students cannot earn credit for both REL 473 and REL 573.

Prerequisite: One 3 cr course in Philosophy (PHI) or Religious Studies (REL) or Women's and Gender Studies (WGS)
Typically offered in Fall only

WGS 492 Theoretical Issues in Women's and Gender Studies (3 credit hours)
Examination of feminist theory. Study of formative texts in modern feminism, drawn from various disciplines within the humanities, social sciences, and natural sciences. In-depth exploration of feminist perspectives on issues of race, class, gender, sexuality, work and mothering, among others. Analysis of local and global cultural practices using feminist theoretical frameworks.

Prerequisite: WGS 200
GEP Humanities, GEP U.S. Diversity
Typically offered in Spring only

WGS 493 Special Topics in Women's and Gender Studies (3 credit hours)
Examination of varying topics on women and/or gender from a multidisciplinary perspective.

Typically offered in Fall only

WGS 540/ECD 540 Gender Issues in Counseling (3 credit hours)
Exploration of gender as primary identity and social construct. Emphasis on gender dynamics in counseling, client empowerment and preventive approaches.

Prerequisite: Graduate standing or Six hrs. in ED or PSY
Typically offered in Spring and Summer

WGS 544/ANT 444/WGS 444/ANT 544 Cross-Cultural Perspectives on Women (3 credit hours)
Comparison of women in a variety of societies: western and non-western; hunting and gathering to industrialized. Cross-cultural perspective on the similarity and diversity of women's statuses and roles. Effect of gender on social position

Prerequisite: ANT 252 and one of the following: ANT 310,325,330 or 346
Typically offered in Spring only

WGS 547/Hi 447/WGS 447/HI 547 Women in America: From Contact to the Civil War (3 credit hours)
The historical experience of women in America from Native American and European contact through the colonial period to the immediate post-Civil-War years (to 1890). Topics include the history of women's work, education, legal and political status, religious experience, and sex roles, with consideration of age, class, race, sexual preference, and region as significant variables in women's experience in America. Credit will not be given for both HI (WGS) 447 and HI (WGS) 547.

P: 3 Hours of History
GEP Humanities, GEP U.S. Diversity
Typically offered in Fall only
Typically offered in Fall only

Prerequisite: Graduate student, SOC 736 or 731

their daily lives. Contemporary research and substantive readings about development of gender stratification. How individuals “do gender” in their daily lives. Contemporary research and substantive readings about gender in public and intimate relation

Typically offered in Fall and Spring

WGS 737/SOC 737 Sociology Of Gender (3 credit hours)
Theories about the development and maintenance of gender. Historical development of gender stratification. How individuals “‘do gender’” in their daily lives. Contemporary research and substantive readings about gender in public and intimate relation

Prerequisite: Graduate student, SOC 736 or 731

Typically offered in Spring only

WGS 739/SOC 739 Social Psychology Of Inequality (3 credit hours)
The effects of race, class and gender inequality on the formation of group consciousness, self-evaluations, emotions, values, attitudes and beliefs. Attention to interpersonal processes through reproduction of inequality in everyday life.

Requisite: Admission to SOC Graduate Program

Typically offered in Spring only

Wood and Paper Science (WPS)

Typically offered in Spring only

WPS 201 Sustainable Materials for Green Housing (2 credit hours)
The overall goal of the class is to make the students more informed and aware consumers of materials used in housing. The class will connect the economic and energy impacts of producing common materials with the environmental impacts, e.g., carbon, water, and pollutants. The concepts of embodied energy, water use, and land impacts will be used to examine common building materials. The concept of Life Cycle Analysis will be introduced and used to evaluate the use and trade-offs for different building materials. The opportunities and trade-offs for reuse and recycling materials at the ‘end of life’ will also be explored.

GEP Interdisciplinary Perspectives

Typically offered in Spring only

WPS 491 Special Topics in Wood and Paper Science (1-4 credit hours)
Independent study of management or technology problems selected with faculty approval or the offering of experimental courses.

Typically offered in Fall, Spring, and Summer

Zoology (ZO)

Typically offered in Fall and Summer

ZO 250 Animal Anatomy and Physiology (4 credit hours)
Roles of physical laws, environmental challenges, and evolutionary history in shaping animal structure and function. Selected examples from invertebrates and vertebrates. Laboratory in anatomy and physiology, hypothesis generation and testing and data analysis and presentation.

Prerequisite: C- or better in BIO 183

Typically offered in Fall only
ZO 317 Primate Ecology and Evolution  (3 credit hours)
A comprehensive survey of the behavior, evolution, and ecology of nonhuman primates. Special emphasis will be placed in the evolution of cognitive abilities, social systems, and behavioral patterns that are unique to primates, including the evolution of language. Topics include primate taxonomy, evolution of the extant primates, geographic distribution, social behavior, reproductive behavior and strategies, parental behavior, communication, and cognitive. Classes will consist of interactive lectures, films, and class discussions.
Prerequisite: C- or better in BIO 181 & BIO 183, and one of the following courses: ANT 251, BIO 212, BIO 240, BIO 245, BIO 250, BIO/PB 330, BIO 350, BIO/PB 360, BIO 410, BIO 422, BIO 424, or BIO 488
Typically offered in Spring only

ZO 333 Captive Animal Biology  (3 credit hours)
This course serves to introduce interested students to historical and current captive animal conservation efforts. We will discuss in detail a variety of issues essential to the management of wild animals in a captive setting including ethics, nutrition, reproduction, behavior, and population management.
Prerequisite: C- or better in BIO 181 and one of the following (BIO 140 or 250 or 260 or 350 or NTR 301 or ANS 150 or 205 or GN 311)
Typically offered in Spring only

ZO 334 Captive Animal Biology Field Laboratory  (2 credit hours)
This laboratory course serves to introduce interested students to today’s captive animal conservation efforts from the perspective of NC facilities on the front lines. Through the lens of these nearby institutions, we will investigate in detail a variety of factors essential to the management of wild animals in a captive setting. We will take topics (history, population management, genetics, nutrition, education, conservation) from the lecture course and expand them as we focus on challenges unique to these local captive facilities. While some activities will take place on campus, a number of off-campus field trips are required, including one 3-day laboratory at North Carolina Zoo. We will return to campus most days within the scheduled time frame, however students should plan for the possibility that labs may go overtime on some occasions.
Prerequisite: C- or better in BIO 181; Co-requisite: ZO 333; Sophomore standing and above.
Typically offered in Spring only

ZO 350 Animal Phylogeny and Diversity  (4 credit hours)
Phylogenetic history and adaptive radiation of animals; contrast of environmental determinants of biodiversity in tropical and polar regions; modern approaches to phylogeny; role of humans in influencing biodiversity. Students may not receive credit for
Prerequisite: A grade of C- or better in BIO 181 and sophomore standing.
Credit is not allowed for both ZO 350 and ZO 402
Typically offered in Spring only

ZO 402 Invertebrate Biology  (4 credit hours)
Over 90% of all animals are invertebrates, and many invertebrate species have proven extremely useful in medical and research applications. This course will survey invertebrate groups or clades (excluding the Protista), and will emphasize their functional biology, phylogeny, ecology, behavior, and use as models in research. Lab will emphasize an experimental approach and will involve work primarily with live material. Students may not receive credit for both ZO 402 and ZO 350.
Prerequisite: A grade of C- or better in BIO 181 and BIO 183. Credit is not allowed for both ZO 402 and ZO 350.
Typically offered in Fall only

ZO 410 Introduction to Animal Behavior  (3 credit hours)
Studies in animal behavior in vertebrates and invertebrates, focusing on the mechanisms and evolution of animal behavior. Topics include neural, hormonal, and genetic bases of behavior; foraging; anti-predator defenses; mating systems and sexual selection; social behavior; communication; parental care; territoriality and habitat selection.
Prerequisite: C- or better in BIO 181 and BIO 183
Typically offered in Fall and Summer

ZO 486 Capstone Course in Zoology  (3 credit hours)
Topical problems in zoology. BIO 486 provides a challenging opportunity for students to integrate and apply knowledge and skills gained from their major studies. Emphasis will be placed on collaborative learning and effective, professional communication. Topics and instructors will vary from semester to semester. Priority will initially be given to seniors in the SZO curriculum; other students with the necessary prerequisites will be admitted on a space available basis.
Prerequisite: C- or better in BIO 250, BIO/PB 360, and one of the following: BIO 350 or BIO 402/403 or GN 311 or ST 311.
Typically offered in Fall and Spring

ZO 512 Animal Symbiosis  (3 credit hours)
Symbiotic associations of animals including mutualism, commensalism and parasitism. The morphological, physiological, behavioral and ecological adaptations of symbionts and the complex interactions between partner species.
Prerequisite: 12 hrs. of biology and zoology
Typically offered in Spring only

ZO 513 Comparative Physiology  (3 credit hours)
Comparative study of the organ systems of vertebrates and physiological processes involved in maintaining homeostatic state. Various compensatory mechanisms employed during environmental stress included.
Prerequisite: ZO 421
Typically offered in Fall only

ZO 522 Biological Clocks  (3 credit hours)
The anatomy, physiology and development of biological clocks in a variety of organisms, including humans. Required readings in primary literature.
Prerequisite: Graduate standing
Typically offered in Spring only
ZO 524/PHY 524/PO 524  Comparative Endocrinology  (3 credit hours)
Basic concepts of endocrinology, including functions of major endocrine glands involved in processes of growth, metabolism and reproduction.

Prerequisite: BIO 421 or PO 405
Typically offered in Spring only

ZO 542  Herpetology  (3 credit hours)
The biology of the amphibians and reptiles: systematics, life history, anatomy, behavior, physiology and ecology.

Prerequisite: ZO 250 and ZO 421
Typically offered in Spring only

ZO 553/FW 553  Principles Of Wildlife Science  (3 credit hours)
The principles of wildlife management and their application studied in the laboratory and in the field.

Prerequisite: BIO 260 or BIO/PB 360
Typically offered in Spring only

ZO 582/ENT 582  Medical and Veterinary Entomology  (3 credit hours)
The morphology, taxonomy, biology and control of the arthropod parasites and disease vectors of man and animals. The ecology and behavior of vectors in relation to disease transmission and control.

Prerequisite: ENT 425 and ZO 315
Typically offered in Spring only

ZO 790  Special Topics  (1-6 credit hours)

ZO 791  Topics In Animal Behavior  (3 credit hours)
Intensive examination of selected aspects of animal behavior and their relationship to physiology, ecology and other biological fields. May be repeated for credit when topic changes.

Prerequisite: Graduate standing
Typically offered in Fall only

ZO 829  Special Topics  (1-6 credit hours)
A directed individual investigation of a particular problem in zoology, accompanied by a review of the pertinent literature. A maximum of three hours allowed toward master's degree.

Prerequisite: Twelve hours ZO
Typically offered in Fall and Spring
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