**ACCOUNTING**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Prerequisites</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC 200</td>
<td>Introduction to Managerial Accounting</td>
<td>ACC 210 with C- or better</td>
<td>Analysis of 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.</td>
</tr>
<tr>
<td>ACC 210</td>
<td>Concepts of Financial Reporting</td>
<td>ACC 210</td>
<td>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.</td>
</tr>
<tr>
<td>ACC 330</td>
<td>An Introduction To Income Taxation</td>
<td>ACC 210 with a grade of C- or better</td>
<td>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.</td>
</tr>
<tr>
<td>ACC 340</td>
<td>Accounting Information Systems</td>
<td>ACC 200 and ACC 210 with a grade of C- or better</td>
<td>Focus on business processes, entity-wide information systems controls and security, database modeling and design focused on accounting, and contemporary issues involved in providing assurance services for systems reliability.</td>
</tr>
<tr>
<td>ACC 410</td>
<td>Governmental and Nonprofit Accounting</td>
<td>ACC 210 and M110</td>
<td>Accounting for state and local governments, including budgeting, audit issues, and financial analysis. Accounting for nonprofit organizations, including colleges and universities and healthcare organizations.</td>
</tr>
<tr>
<td>ACC 411</td>
<td>Business Valuation</td>
<td>ACC 210, BUS 320, M110 and (BUS/ST 350 or BUS/ST 370 or BUS/ST 372)</td>
<td>Conceptual framework of how businesses work, value generation and reporting. Interpretation of financial statements and their use in valuation of the firm.</td>
</tr>
<tr>
<td>ACC 420</td>
<td>Strategic Finance and Planning</td>
<td>ACC 200 with C- or better and (BUS/ST 350, or ST 302 or ST 361 or ST 370 or ST 372)</td>
<td>Strategic finance in planning, control, and evaluating organizational activities and in designing and implementing business strategies. Use of accounting in corporate management and business planning. Integration of performance measurement and cost control with corporate strategy.</td>
</tr>
<tr>
<td>ACC 440</td>
<td>Enterprise Resource Planning Systems</td>
<td>ACC 340 with grade of C- or better and M110</td>
<td>An Enterprise Resource Planning (ERP) system is business software that is cross-functional, process-centered and uses a relational database. As NCSU is a member of the SAP University Alliance, you will obtain hands-on training with SAP, the ERP market leader. This knowledge will give business and IT students a competitive and advantage in the workplace. This course covers the managerial, accounting, and technical issues of ERP systems. Course content includes evolution of ERP systems, reengineering, process mapping, the ERP life cycle, functionality, bolt-ons, and auditing ERP systems. Credit will not be allowed for both ACC 440 and MBA 515.</td>
</tr>
<tr>
<td>ACC 450</td>
<td>Risk and Assurance</td>
<td>ACC 311 with a C- or better and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372) and M110</td>
<td>Focuses on developing skills for interpreting business strategies and identifying related business risks, describing internal control solutions to those risks, identifying evidential sources, providing assurance about those risks and controls, and designing strategies to provide assurance services about the reliability of business information.</td>
</tr>
<tr>
<td>ACC 451</td>
<td>Internal Auditing</td>
<td>ACC 210 with grade of C- or better and M110</td>
<td>The theory, practice and design of internal audit activities. Examination of industry standards as a guide to the internal audit field. Evaluation of internal controls, information technology and fraud risks and controls, audit evidence and assurance, communicating audit results and consulting engagements. Emphasis on the professional practice of the discipline of internal auditing.</td>
</tr>
<tr>
<td>ACC 470</td>
<td>Accounting Theory</td>
<td>ACC 410 or ACC 312</td>
<td>Major concepts, problem areas and trends in accounting thought and practice, including a review of the most prominent controversies in current publications and the most recent relevant pronouncements of professional institutions.</td>
</tr>
<tr>
<td>ACC 480</td>
<td>Accelerated Survey of Financial and Management Accounting</td>
<td>M110</td>
<td>Accelerated survey of basic concepts underlying accounting in profit-oriented firms: data measurement, summarization and reporting practices as a background for use of accounting information; content of published financial statements; and uses of accounting for management decisions in product costing, budgeting, and operations. Credit may not be received for both ACC 480 and ACC 220 or 280. Intended for graduate students and advanced undergraduates not majoring in Accounting or Management.</td>
</tr>
<tr>
<td>ACC 490</td>
<td>Senior Seminar in Accounting</td>
<td>M110</td>
<td>Accounting Majors in final semester of study or PBS status admitted by permission of department head, successful completion of M110. Integration of financial, managerial, tax, and governmental accounting. Application of appropriate accounting methods to problem resolution.</td>
</tr>
<tr>
<td>ACC 495</td>
<td>Special Topics in Accounting</td>
<td>M110</td>
<td>Presentation of material not normally available in regular course offerings, or offering of new courses on a trial basis.</td>
</tr>
<tr>
<td>ACC 498</td>
<td>Independent Study in Accounting</td>
<td>M110</td>
<td>Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction on a tutorial basis. Contents and content determined by faculty member in consultation with the associate department head.</td>
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</tbody>
</table>
ACC 499 Internship in ACC. Prerequisite: Senior standing, GPA greater than or equal to 3.25, and M110. A full-time professional internship in accounting. Eligibility for participation to be by invitation and by the demand for interns among accounting firms participating in the internship program. Participants will communicate with instructor weeklyover the course of the internship to discuss progress and insights. A post-internship interview and paper is also required. Internships vary in duration from 8 to 15 weeks. Restricted to ACF, ACS, & ACM majors.

ART AND DESIGN

ADN 111 Two Dimensional Design. Offered in Fall and Spring. 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 and a language of design. This course is not open to School of Design students.

ADN 112 Three Dimensional Design. Offered in Fall and Spring. 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 principles and a language of design. This course is not open to School of Design students.


ADN 212 Basic Photography. Offered in Fall and Spring. 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.

ADN 219 Digital Imaging. Offered in Fall and Spring. Prerequisite: D104 or D111. 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.

ADN 272 Introduction to Printing and Surface Design. Offered in Fall and Spring. Prerequisite: C- or better in D104, ADN 111, or ADN 112. Design and production of screen printed, painted and pattern-dyed fabrics. Development of design abilities (color use, pattern generation) and technical skills (screen printing, painting, use of fabric dyes). Production of fabric samples, studies, yardage, and/or end products. Awareness of industrial processes.

ADN 273 Fibers Materials and Processes. Offered in Fall and Spring. Prerequisite: ADN 111 or ADN 112. 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.

ADN 274 Basic Woven and Constructed Textiles. Offered in Fall and Spring. 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.

ADN 275 Color, Pattern, and Cloth. Offered in Fall and Spring. Introduction to the essential elements and skills of cloth design including repeat systems; pattern figure/ground relationships; color mixing; color relationships; applied color; color and pattern relationships; fabric analysis and re-design; yarn windings and color bleeding; cloth structures and their functions. Hands-on work with simple cloth structures such as plaiting, tapestry, bead weaving, pattern repeats, and fiber characteristics.

ADN 281 Basic Drawing. Offered in Fall Only. A beginning descriptive drawing experience which teaches students to see, analyze, and transcribe observed subject matters. The transcription incorporates formal drawing issues (line, form, texture) with traditional and contemporary material space exploration.

ADN 292 Special Topics in Design. Offered in Fall and Spring. Topics of current interest in the School of Design. Used to develop new courses.

ADN 302 Design Studio: History, Culture & Diversity. Offered in Spring Only. Prerequisite: Five studios and HA 202. Investigations into the historical, cultural, perceptual and aesthetic values and precedents of modern art/design movement. In a studio mode, emphasis is on research, documentation, synthetic and analytic activities.

ADN 311 Basic Visual Laboratories. Offered in Fall and Spring. Prerequisite: Design Majors: DF 102; Non-Design Majors: ADN 111, 112. Basic activities that relate to the major design areas in the School of Design. Study of visual communication skills in areas of illustration, printmaking, and life drawing. The student elects instructor and area(s) of activity.

ADN 312 Intermediate Photography. Offered in Fall and Spring. Prerequisite: ADN 212. 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.

ADN 319 Introduction to Animation. Offered in Fall and Spring. Prerequisite: ADN 219. 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.

ADN 372 Surface Embellishment. Offered in Fall and Spring. 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.

ADN 384 Basic Painting. Offered in Fall Only. Prerequisite: D104 or both ADN 111 and ADN 112. 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.
ADN 306 Basic Sculpture 3. Offered in Fall Only. Prerequisite: D 104, ADN 112. 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 projective.

ADN 400 Design Studio 6. Offered in Fall and Spring. Prerequisite: D 104, D 105. Studio offering upper-level undergraduates the opportunity to intensively study general design issues (form, color, structure, proportions, scale, etc.). Course may be used to partially satisfy studio requirement in all undergraduate degree programs in the School of Design.

ADN 402 Senior Studio 6. Offered in Spring Only. Prerequisite: Seven studios and ADN 219. Advanced Design studio emphasizing the exploration of past, current and potential future technologies within Design Department content areas (e.g., painting, sculpture, fibers, jewelry, color and light, etc.). Students are expected to work independently, develop their own problem statements.

ADN 411 Visual Laboratory II 3. Offered in Fall and Spring. Prerequisite: D 104 or both ADN 111 and ADN 112. Visual communication skills in the areas of life drawing, illustration, painting, print making and sculpture. May be taken for a minimum of 12 credit hours by School of Design students.

ADN 413 Synthetic Drawing 3. Prerequisite: ADN 111, ADN 112. Orthographic and axonometric projections, coordinating and perspective systems, and diagramming to facilitate the drawing of shapes and forms conceived by the designer in order to make visually precise simulations of design ideas.

ADN 414 Color and Light 3. Offered in Fall and Spring. Physical and perceptual nature of color, color awareness, sensitivity and skills in visual communication with color as a designer's tool.

ADN 418 Contemporary Issues in Art and Design 3. Offered in Spring Only. 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.

ADN 419 Multimedia and Digital Imaging 3. Offered in Fall and Spring. Prerequisite: D 105, ADN 219. 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.

ADN 428 Art and Design: Theory and Practice 3. Offered in Fall Only. 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.

ADN 454 Geometry for Designers 3. Offered in Spring Only. Geometry and its application to the various fields of design, mathematical and drawing skills required.

ADN 455 Building Workshop 3. Prerequisite: D 105 or both ADN 111 and ADN 112. Process and logic of producing one's own design. Structural behavior, geometry, and materials in the construction of physical form usually at a large scale. Evaluative testing with critical support.

ADN 460 Multimedia and Advanced Digital Imaging Studio 6. Offered in Fall and Summer. Prerequisite: ADN 219. 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 programs and finally transfer images to CD Rom and video with audio and special effects.

ADN 470 Fibers and Surface Design Studio 6. Offered in Fall and Spring. Prerequisite: A grade of C- or better in DF 101 or ADN 111 and ADN 112. 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.

ADN 472 Advanced Surface Design 3. Offered in Fall and Spring. Prerequisite: D 104, ADN 272. 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 textilemedia. Specific focus changes each semester.

ADN 473 Advanced Three-Dimensional Fibers Forms and Structures 3. Offered in Fall and Spring. Prerequisite: ADN 273 or equivalent. 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.

ADN 474 Advanced Digital Hand Weaving 3. Offered in Fall and Spring. Introduction to the 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.

ADN 475 Pre-Industrial World Textiles 3. 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.

ADN 480 Intermediate Studio 6. Prerequisite: D 104, D 105 or ADN 111, ADN 112, and ADN 311. 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.

ADN 481 Intermediate Drawing 3. Offered in Spring Only. Prerequisite: ADN 281. An intermediate-level drawing course that further develops the designer's graphic, analytic, observational, and conceptual skills.

ADN 484 Intermediate Painting 3. Offered in Spring Only. Prerequisite: D 105 or both ADN 111 and ADN 112. 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.

ADN 486 Intermediate Sculpture 3. Offered in Spring Only. Prerequisite: ADN 486. An intermediate-level sculpture course that further develops the designer's analytic, observational, and conceptual skills.

ADN 487 Sculpture: Life Modeling 3. Offered in Fall Only. Prerequisite: D 105 or ADN 486. A studio course with direct observation of nature a primary concern. In-depth study of specific modeling concepts and processes.

ADN 490 Art and Design International Studio 6. Offered in Fall Spring Summer. 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.

ADN 491 Special Seminar in Design 1-3. Offered in Fall and Spring. Seminars on subjects of current interest in design.

ADN 492 Special Topics in Design 1-3. Offered in Fall and Spring. Topics of current interest in Design & Technology. Used to develop new courses.

ADN 493 Art and Design Senior Lecture 3. Offered in Fall Only. Prerequisite: ADN 219, ADN 281, ADN 418, completion of a 400 level studio; Corequisite: ADN 400, ADN 460, ADN 470, or ADN 480. 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 their work from previous Art and Design courses into a comprehensive portfolio and personal website. Students are required to participate in the Art and Design Senior Exhibition and provide their own transportation to the exhibition.

ADN 494 Internship in Design 1-6. Offered in Fall Spring Summer. Supervised field experience in design offices, galleries, museums and other organizations. Maximum of 6 credit hours.

ADN 495 Independent Study in Design 1-6. Offered in Fall Spring. Special projects in art and design developed under the direction of a faculty member on a tutorial basis. Maximum 6 credit hours.

AEE 101 Introduction to Career and Technical Education 1. Offered in Fall Only. 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.

AEE 103 Fundamentals of Agricultural and Extension Education 1. Offered in Fall Only. 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.

AEE 206 Introduction to Teaching Agriculture 3. Offered in Fall Only. 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.

AEE 208 Agricultural Biotechnology: Issues and Implications 3. Offered in Spring and Summer. Prerequisite: (BIO 105 or BIO 115 or BIO 181 or BIO 183). 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.

AEE 226 Computer Applications and Information Technology in Agricultural & Extension Ed 3. Offered in Fall and Spring. 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 technology for processing information and imaging; network access; and electronic communications.

AEE 230 Introduction to Cooperative Extension 3. Offered in Fall Only. This course is designed for all students who are interested in 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.

AEE 303 Administration and Supervision of Student Organizations 3. Offered in Spring Only. Prerequisite: AEE 206. Principles and techniques for organizing, administering and supervising student organization activities.

AEE 311 Communication Methods and Media 3. Offered in Fall Only. Prerequisite: ENG 101. 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.

AEE 322 Experiential Learning in Agriculture 3. Offered in Fall Only. Prerequisite: AEE 206. Planning, organizing, implementing, supervising and evaluating Supervised Agricultural Experience (SAE) programs in agriculture.

AEE 323 Leadership Development in Agriculture and Life Sciences 3. Offered in Fall Only. Leadership development in agricultural and related settings; foundations of leadership theory and practice; techniques for developing leadership skills; development of understanding of group interactions and group leader roles, technical
communication skills, interpersonal influence, commitment, and goals achievement strategies necessary for effective leaders.

AEE 325 Planning and Delivering Non-Formal Education 3. Offered in Fall Only. 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.

AEE 326 Teaching Diverse Learners in AED 3. Offered in Spring Only. Prerequisite: AEE 206; Junior standing; and AED Majors only. Legislation and issues regarding diverse learners in middle and high school agriculture are examined. Discussion and practice in planning and facilitating teaching strategies to help those with special needs in an agricultural setting are emphasized. Techniques to integrate reading and writing into the curriculum are identified and practiced. Field trips are required.

AEE 327 Conducting Summer Programs in Agricultural Education 3. Offered in Fall Only. Prerequisite: AEE 206, AEE 303, AEE 322, and Corequisite of AEE 426. Field experience emphasizing summer agriscience educational programs. Individualized instruction for students during supervised agricultural experience visits and youth organization activities. Professional development and program improvement activities.

AEE 332 Youth Leadership Dev 3. Offered in Fall Only. Prerequisite: AEE 323-Leadership Development in Agriculture. This course is intended to prepare students to be effective facilitators of youth leadership development programs. Theory will be emphasized in the course because it is essential to be grounded in theory in order to apply it. Major course topics include but are not limited to: understanding the unique leadership development needs of young people, learning how to develop programs that meet those needs, and the evaluation of youth leadership programs. Students will be required to be active in and outside of class sessions. In this course you will learn by doing! Students must provide their own transportation for field trips and outside of class activities.

AEE 333 Youth Program Development and Management 3. Offered in Spring Only. This course is intended to prepare students to be effective youth program facilitators. Application of theory related to youth program management will be emphasized. Major course topics include but are not limited to: understanding various educational delivery modes used in youth programming, selecting and using developmentally appropriate curriculum, using the experiential learning model to teach young people. Students will be required to be active in and outside of class sessions, including outside preparation for the lab component of the course. Students must provide their own transportation for field trips and outside of class activities. Students are encouraged to have successfully completed AEE 323 prior to enrolling in this course.

AEE 350 Personal Leadership Development in Agriculture and Life Sciences 3. Offered in Spring Only. 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.

AEE 360 Developing Team Leadership in Agriculture and Life Sciences 3. Offered in Fall Only. Prerequisite: AEE 327-Leadership in Development in Agriculture. 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.

AEE 423 Practicum in Agricultural Extension/Industry 8. Offered in Spring and Summer. Prerequisite: AEE 230, AEE 325, and Corequisite of AEE 490. Participation in professional work experiences in preparation for effective leadership positions in the Cooperative Extension Service or the agribusiness industry.

AEE 424 Planning Agricultural Educational Programs 3. Offered in Fall Only. Prerequisite: AEE(ED) 426, Corequisite: AEE(ED) 427. 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.

AEE 426 Methods of Teaching Agriculture 3. Offered in Fall Only. 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.

AEE 427 Student Teaching in Agriculture 8. Offered in Spring Only. Prerequisite: AEE (ED) 426: Admission to Professional Semester, Corequisite: AEE (ED) 490, AEE (ED) 424; Skills and techniques involved in teaching vocational agriculture through practice in a public school setting with concurrent on-campus seminars.

AEE 433 Leadership and Management of Volunteers in Agricultural and Extension Education 3. Offered in Fall Only. This course is intended to prepare students to be effective managers of volunteer programs, or to challenge those students already engaged in those roles to improve on their existing skills. Students will be required to be active in and outside of class sessions while exploring course topics including but not limited to recruitment, training, reward and evaluation of volunteers. Limited to students with graduate level status only.

AEE 434 Collaborative Leadership: Building Partnerships Across Community Programs 3. Offered in Spring Only. This course is intended to prepare students to become collaborative leaders at home, at school and within their communities. Theory will be emphasized in the course because it is essential to be grounded in theory in order to apply it. Topics covered in the course include but are not limited to: what is community, how do partnerships form, challenges and opportunities for successful collaborations. This is an active course where students will be required to be engaged in and outside of class sessions. Students are encouraged to have successfully completed AEE 323 prior to enrolling in this course. Students must provide their own transportation for field trips and outside of class activities. AEE 323 encouraged but not required.

AEE 435 Professional Presentations in Agricultural Organizations 3. Offered in Spring Only. 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.

AEE 460 Organizational Leadership Development in Agriculture
and Life Sciences 3. Offered in Spring Only. Prerequisite: AEE 323-
Leadership Development in Agriculture. 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.

AEE 470 Agricultural Communications 3. Offered in Spring Only.
Prerequisite: AEE 311, Senior standing. Use of agricultural
communication materials. Emphasis on application of principles,
materials and processes of B&W and color photography to problems of
communication and the development of visual presentation materials
for instruction and training.

AEE 478 Extension as Non-Formal Education 3. Offered in
Spring Only. Extension as a system of non-formal education, how it
functions in USA and other countries (with special attention to
agricultural extension), historical antecedents and philosophical
foundations, mission, organization, methods, problems dealt with;how
technology and behavioral sciences are can be utilized; provides actual
experience with extension and with conceptual/theoretical ideas that
undergird practice.

AEE 490 Seminar in Agricultural and Extension Education 1.
Offered in Spring and Summer. Analysis of opportunities and
challenges facing educational leaders in agriculture.

AEE 492 External Learning Experience in Agricultural and
Extension Education 1-6. Offered in Fall Spring Summer. 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 liensure
for students in AEE.

AEE 493 Special Problems in Agriculture and Extension
Education 1-6. Offered in Fall Spring Summer. 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 teaching coordinator. Not
intended for teacher licensure for students in AEE.

AEE 495 Special Topics in Agricultural and Extension
Education 1-3. Offered in Fall Spring Summer. Offered as needed to
present material not normally available in regular course offerings or
for offerings of new courses on a trial basis. Not intended for teacher
licensure for students in AEE.

AEG 201 Shop Processes and Management 3. Offered in Fall and
Spring. Safety practices, materials, equipment, processes, procedures,
and management techniques related to operation and maintenance of a
mechanized agricultural enterprise or agriculture-related industry.
Theory and practice through basic shop operations and procedures.

AEE 323 Water Management 3. Offered in Fall Only. Water
management principles applied to agriculture; hydrologic cycle, runoff,
surface.runoff and sub-surface drainage, soil conservation measures to reduce
erosion and sedimentation, irrigation, pond construction, open channel
flow, water rights and environmental laws pertaining to water
management. Emphasis on problem solving.

AEE 332 Management of Animal Environments 4. Offered in
Spring Only. Prerequisite: PY 211 or PY 205. Environmental
relationships, design methods, materials and construction procedures
as they relate to agricultural animal production facilities. Problem
situations integrating structural design, environmental control, and
waste handling.

AEE 333 Processing Agricultural Products 4. Offered in Spring
Only. Prerequisite: PY 211 or PY 205. Application of the principles of
fluid flow, heat transfer, refrigeration, psychrometrics, and materials
handling to the processing of agricultural products. Pump sizing, heat
exchanger selection, refrigeration analyses, fan sizing, crop drying,
and selection of materials handling equipment.

AEE 343 Agricultural Electrification 4. Offered in Fall Only.
Practical and efficient use of electrical energy for agricultural and home
application. Energy conservation, electric rates, farm and house wiring,
circuit design, single-phase and three-phase distribution systems,
electric motors, lighting, space and water heating, electric controls,
safety and protective devices.

This course has a required field trip.

AEE 411 Agricultural Machinery and Power Units 4. Offered in
Spring Only. Prerequisite: CH 101, CH 102, and PY 211 or PY 205.
Agricultural machinery principles, energy requirements, operation,
calibration and environmental considerations. Diesel engine principles
and their application to engine power, efficiencies and systems. Power
trains and hydraulic systems. Application of basic machinery and
power principles to mechanical needs in environmental systems.

AEE 432 Agricultural and Environmental Safety and Health 3.
Offered in Fall Only. Safety and health issues for agricultural and
environmental occupations. Hazard recognition, injury and illness
prevention, regulations, and safety and health management strategies
for agricultural production, chemical handling, and waste management.
Environmental factors which affect human health and safety.

AEE 443 Environmental Restoration Implementation 3. Offered
in Fall Only. Prerequisite: AES 323 or BAE 471. Students will learn
how to implement environmental restoration designs for streams,
wetlands, and stormwater best management practices to improve
ecosystem health. Topics include interpretation of construction
drawings and specifications, calculating construction quantities and
developing contractor bid tabs, environmental permitting and
regulations, erosion and sediment control, project management and
scheduling, construction oversight, specialized construction materials
and equipment for environmental projects, survey stakeout, vegetation
installation and management, site inspection and maintenance, and
monitoring of structural and ecological conditions of restoration
projects. In-class field trips are required.
AFRICANA STUDIES

AFS 230 Introduction to African-American Music 3. Offered in Fall Only. 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.


AFS 260 History of Jazz 3. 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.

AFS 275 Introduction to History of South and East Africa 3. Offered in Fall Spring Summer. 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.

AFS 276 Introduction to History of West Africa 3. Offered in Fall and Spring. 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.

AFS 305 Racial and Ethnic Relations 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. 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.

AFS 340 African American Theatre 3. Offered in Spring Only. This course examines African American dramatic 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.

AFS 342 Introduction to the African Diaspora 3. Offered in Spring Only. 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.


AFS 344 Leadership in African American Communities 3. Offered in Fall and Spring. 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.

AFS 345 Psychology and the African American Experience 3. Offered in Fall Only. Prerequisite: PSY 200 or PSY 201. 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.

AFS 346 Black Popular Culture 3. Offered in Fall Spring Summer. A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse.


AFS 372 African-American History Through the Civil War, 1619-1865 3. Prerequisite: 3 hours of history or Sophomore standing. African background and continuity of the particular role, experience and influence of African Americans in the United States through the Civil War.

AFS 373 African-American History Since 1865 3. Prerequisite: 3 hours of history or Sophomore standing. The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present.


AFS 409 Black Political Participation in America 3. Offered in Fall Only. 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.

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 approaches and critical analyses.

**AFS 442 Issues in the African Diaspora 3. Offered in Fall Only.** 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.

**AFS 448 African-American Literature 3. Offered in Spring Only.** 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, Huston, Baldwin, Hayden, Brooks, Naylor, Harper, and Dove.

**AFS 455 History of the Civil Rights Movement 3. Prerequisite: 3 hrs. of History.** 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 HI (AFS) 455 and HI 555.

**AFS 475 History of the Republic of South Africa 3. Offered in Fall and Spring. Prerequisite: 3 hours of history.** 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.

**AFS 476 Leadership in Modern Africa 3. Prerequisite: 3 hours of history.** 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.

**AFS 479 Africa (sub-Saharan) in the Twentieth Century 3. Offered in Spring Only. Prerequisite: 3 hrs. of History.** 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.

**AFS 490 Africana Studies and Community Involvement 3. Offered in Fall Only.** 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.

**AFS 491 Study Abroad in Africana Studies 3. Offered in Summer.** Specific category of revolving set of field/semester 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.

**AFS 497 Topics in African-American Studies 3. Offered in Fall and Spring. Prerequisite: AFS 240.** Multidisciplinary examination of selected topics in African-American studies.

### AGRICULTURE AND LIFE SCIENCES

**ALS 103 Introductory Topics in Agriculture and Life Sciences 1. Offered in Fall and Spring.** Introduction to scope and objectives of university education. Emphasis on sciences, particularly as related to agriculture and life sciences. Departmental programs, computers, career opportunities and more.

**ALS 110 Career Exploration Seminar 1. Offered in Spring Only.** Students learn about the career decision-making process through integration of self-knowledge and research in the world of work. Emphasis is placed on Agriculture and Life Sciences careers. Course is offered as needed to present material not normally available in regular departmental course offerings; or for offerings of new courses on a trial basis.

**ALS 295 Special Topics in Agriculture and Life Sciences 1-3. Offered in Fall Spring Summer.** Offered as needed to present material not normally available in regular departmental course offerings; or for offerings of new courses on a trial basis.

**ALS 303 Professional Development and Career Opportunities in Agriculture and Life Science 1. Offered in Fall and Spring. Prerequisite: External transfers or NCSU students with 45 hours or more.** CALS Majors. Transfer students receive an overview of academic policies and career services. Students learn strategies to reach their career goals. Students design a resume and a cover letter and participate in mock interview. Students research and identify internships and begin to construct a skills portfolio. Professional skills are enhanced. Students increase their understanding of career and graduate school options after graduation.

Students will not receive credit for USC 301, ALS 103 and ALS 303.

**ALS 398 Agriculture and Life Sciences Honors Seminar 2. Offered in Spring Only.** 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 development in the agricultural and life sciences; required participation in on- and off-campus scholarly retreats.

**ALS 494 International Learning Experience in Agriculture and Life Sciences 1-6.** Course offered as needed for international learning experiences in agriculture and life sciences involving international travel and immersion in an international culture. A written report is required and student must identify a faculty member to work with them. Travel expenses may be incurred by the student. Departmental Approval Required.

**ALS 495 Special Topics in Agriculture and Life Sciences 1-3.** Offered in Fall Spring Summer. Offered as needed to present material not normally available in regular departmental course offerings or for offering of new courses on a trial basis.

**ALS 498 Honors Research or Teaching I 1-3. Offered in Fall Spring Summer.** Prerequisite: ALS 398, GPA 3.25 or higher. Honors research or teaching for students in Agriculture and Life Sciences. First of a two-course sequence. Identification of a project and development of a proposal; literature search, planning, and work
ANIMAL SCIENCE

**ANS 105 Introduction to Companion Animals 3.** Offered in Fall and Spring. Introduction to animals that people keep as companions. Variation, behavior, anatomy, physiology, disease, and training of animals as diverse as fish, snakes, mice, rats, birds, cats, and dogs. Special relationships between humans and companion animals in a societal context.

**ANS 110 Introduction to Equine Science 3.** Offered in Fall Only. History, management, and use of horses and their profound impact on society. Selection, care, and enjoyment of horses with emphasis on genetics, nutrition, reproduction, behavior, and health.

**ANS 150 Introduction to Animal Science 3.** Offered in Fall and Spring. Fundamental principles of animal management; contributions of animals and animal products to humanity; application of science to animal production; issues regarding animal production.

**ANS 151 Introduction to Animal Science Lab 1.** Offered in Fall and Spring. Corequisite: ANS 150. 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: SAS, IAS, AEX, AGS, and AED. Transportation is provided to the off-campus labs, and students will be returned to campus prior to the end of the scheduled lab period.

**ANS 201 Techniques of Animal Care 2.** Offered in Spring Only. Prerequisite: ANS 150 or ANS 230. IAS Majors or SAS Majors. A laboratory course in the applied management of beef cattle, dairy cattle, swine and small ruminants with participatory assignments of common techniques utilized in livestock production.

**ANS 205 Physiology of Domestic Animals 3.** Offered in Fall and Spring. Prerequisite: (BIO 181 or BIO 183) and Sophomore standing. 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.

**ANS 206 Anatomy of Domestic Animals Lab 1.** Corequisite: ANS 205. 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 examination of gross and microscopic anatomy. SAS and IAS majors only.

**ANS 208 Agricultural Biotechnology: Issues and Implications 3.** Offered in Spring and Summer. 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.

**ANS 215 Basic Agricultural Genetics 3.** Offered in Fall Only. Prerequisite: ZO 160 or BIO 183. Basic principles of inheritance in plants and animals of agricultural significance. Transmission genetics and its effects on the usefulness of plants and animals. Basic principles of plant and animal improvement.

**ANS 220 Reproduction and Lactation in Domestic Animals 3.** Offered in Fall and Spring. Prerequisite: ANS 205. Biological processes in reproduction and lactation with emphasis on domestic mammals such as cattle, sheep, goats, swine, dogs, and cats. Environmental and genetic factors that affect these processes. Identification, evaluation and solutions of problems in these physiological areas.

**ANS 221 Reproduction and Lactation in Domestic Animals Lab 1.** Offered in Fall and Spring. Corequisite of ANS 220. 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).

**ANS 225 Principles of Animal Nutrition 3.** Offered in Summer. 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.

**ANS 230 Nutrition of Domestic Animals 3.** Offered in Fall and Spring. Prerequisite: ANS 150 or BIO 183; ANS 205 is also recommended. Introduction to nutrition, digestion, and absorption in domestic animals. Major nutrient classes and their functions in the body, feed classification and chemical analysis, feed processing, and nutrient requirements.

**ANS 231 Nutrition of Domestic Animals Lab 1.** Offered in Fall and Spring. Corequisite: ANS 230. 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).

**ANS 291 Animal Science Study Abroad 1-6.** Offered in Summer. Course sections offered as needed for international learning experiences in Animal Science involving international travel and N.C. State University faculty-supervised learning in the non-U.S. location. A maximum of one credit hour per week of supervised study will be assigned, and the faculty member will provide students with a syllabus outlining the requirements for successful completion (grade of "S") This course counts as a free elective. All expenses including travel, are the responsibility of the student. The student is also responsible for obtaining a valid passport.

**ANS 292 Australian Animal Agriculture 3.** Offered in Summer. This course involves travel to Australia through N.C. State University's Study Abroad Program. Participants will have the opportunity to increase their knowledge and understanding in the principle areas of animal and veterinary sciences and Australian studies. Species studied include cattle (beef and dairy), sheep, goats, pigs, native Australian...
animals, and non-native feral animals (such as rabbits). All expenses, including the Study Abroad fee and airline travel, are the responsibility of the student. The student is also responsible for obtaining a valid passport.

**ANS 301 Introduction to Human Nutrition 3. Offered in Fall Spring Summer.** Functions, dietary sources and deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery. Food science majors may use as a free elective only.


**ANS 304 Dairy Cattle Evaluation 2. Offered in Spring Only. Prerequisite: ANS 150.** 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.

**ANS 309 Livestock Evaluation 3. Offered in Spring Only. Prerequisite: ANS 150.** 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.

**ANS 322 Muscle Foods and Eggs 3. Offered in Fall Only. Prerequisite: ZO 160, BIO 181 or BIO 183.** 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.

**ANS 324 Milk and Dairy Products 3. Offered in Fall and Spring. Prerequisite: BIO 181 or BIO 183, CH 101.** 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.

**ANS 330 Laboratory Animal Science 3. Offered in Spring Only.** 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.

**ANS 350 Introduction to HACCP 3. Offered in Fall and Spring.** Introductory course on the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants. Offered only as a world wide web course through the Office of Instructional Telecommunications.

**ANS 400 Companion Animal Management 3. Offered in Spring Only. Prerequisite: ANS 105 and Junior standing.** 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.

**ANS 402 Beef Cattle Management Lecture 2. Offered in Spring Only. Prerequisite: ANS 150 and Junior standing.** ANS 402 integrates technical information in animal nutrition, breeding, genetics, and reproductive physiology and incorporates this into information on management skills, business practices, and decision-making processes. This integration requires competency in oral and written communication skills; therefore, a major strategy is to practice and improve students' communication skills during the semester.

**ANS 403 Swine Management 3. Offered in Fall Only. Prerequisite: ANS 150 and Junior standing.** 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.

**ANS 404 Dairy Cattle Management Lecture 2. Offered in Fall Only. Prerequisite: ANS 225 or ANS 230 and Junior standing.** ANS 404 covers nutritional requirements of the dairy cow, digestive physiology, practical applications of balancing rations, feeding systems, and management tools for effective feeding strategies. Students will also receive information on labor management and efficient record keeping tools.

**ANS 408 Small Ruminant Management 3. Offered in Fall Only. Prerequisite: ANS 150, Junior standing.** 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.

**ANS 410 Equine Management 3. Offered in Spring Only. Prerequisite: ANS 110 and Junior standing.** Equine anatomy, physiology, nutrition, genetics and health. Laboratory emphasis on reproductive management, breeding, problem solving, and management skills. Field trips required.

**ANS 411 Management of Growing and Performance Horses 3. Offered in Fall Only. Prerequisite: ANS 110.** 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.

**ANS 415 Comparative Nutrition 3. Offered in Fall Only. Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223.** 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.

**ANS 419 Human Nutrition and Chronic Disease 3. Offered in Spring Only. Prerequisite: Junior standing.** ANS 250, or ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415. 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.
ANS 425 Feed Manufacturing Technology 3. Offered in Spring Only. Prerequisite: ANS/NTR/PQ 415 or ANS 230 or ANS 225. 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.

ANS 440 Selection of Domestic Animals 3. Offered in Fall and Summer. Prerequisite: (ANS/HS 215 or GN 311) and (ST 311 or STIBUS 350) and Junior standing. Modern evaluation and selection procedures for domestic animals; selection goals, estimation of breeding values and performance testing; their impact on genetic changes.

ANS 452 Advanced Reproductive Physiology and Biotechnology 3. Offered in Spring Only. Prerequisite: ANS 220. 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 will not be given for both ANS 452 and ANS (PHY) 552.

ANS 453 Growth and Development of Domestic Animals 3. Offered in Fall Only. Prerequisite: ANS 230, Junior standing. 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 for both ANS 453 and 553.

ANS 454 Lactation, Milk and Nutrition 3. Offered in Spring Only. Prerequisite: ANS 230 or FS/NTR 400; BCH 451 or ZO 421. 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.

ANS 462 Beef Cattle Management Lab 1. Offered in Spring Only. Corequisite: ANS 402. ANS 462 is a hands-on lab held at the Beef Educational Unit of N.C. State University. This lab is required for Animal Science majors who have taken or are taking ANS 402, Beef Cattle Management Lecture. AND 462 is restricted to Animal Science majors and minors. In ANS 462, students learn proper cattle handling techniques and management practices that are important for beef cattle management.

ANS 464 Dairy Cattle Management Lab 1. Offered in Fall Only. Corequisite: ANS 404. ANS 464 lab is hands-on guide to principles of modern dairy cattle management. It will provide students an overview of a complete dairy enterprise. All students will receive instruction on the nutritional requirements of the dairy cow, digestive physiology and practical applications to balancing rations, feeding systems and management tools for effective feeding strategies, records keeping and role of diary record management system, post harvest technology including milk supply, milk processing and marketing and milk products. Restricted to Animal Science majors and minors.

ANS 480 Judging Team 1. Offered in Fall Only. Prerequisite: ANS 303 or ANS 304 or ANS 309. 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).

ANS 492 External Learning Experience 1-6. Offered in Fall and Spring. 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, and the departmental teaching coordinator prior to the experience.

ANS 493 Special Problems in Animal Science 1-6. Offered in Fall and Spring. A learning experience in agriculture and life sciences within an academic framework that utilizes departmental campus facilities and resources (Arrangements must be initiated by student and approved by a faculty adviser and the departmental teaching coordinator).

ANS 495 Special Topics in Animal Science 1-3. Offered in Fall Spring Summer. Offered as needed to present material not normally available in regular course offerings or for offering of new courses on a trial basis.


ANT 252 Cultural Anthropology 3. Offered in Fall Spring Summer. 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.


ANT 254 Language and Culture 3. Offered in Fall Spring Summer. 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.

ANT 261 Technology in Society and Culture 3. Offered in Fall and Spring. Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks 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.

ANT 295 Special Topics in Anthropology 1-3. Offered in Fall Spring Summer. Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.
ANT 310  Native Peoples and Cultures of North America 3.  
Prerequisite: ANT 252 or HI 365. 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 and prospects.

ANT 325  Andean South America 3.  Prerequisite: ANT 252 or HI 215 or HI 216. The societies, cultures, politics, economics and ecology of the Andean countries of South America (Peru, Bolivia, Ecuador, Chile, Colombia). Special attention to the development of pre-Columbian Andean Societies.

ANT 330  Peoples and Cultures of Africa 3. Offered in Spring Only. Prerequisite: ANT 252 or HI 275 or HI 276. African peoples and cultures, especially in sub-Saharan Africa; past and present social patterns of indigenous African populations from a cross-cultural perspective.

ANT 346  Peoples and Cultures of Southeast Asia 3. Offered in Fall Only. Prerequisite: ANT 252. 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.

ANT 351  Contemporary Culture in Japan 3. Offered in Spring Only. Prerequisite: FLJ 101. 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.

ANT 354  Peoples and Cultures of the Pacific 3. Offered in Fall Only. Prerequisite: ANT 252. 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.

ANT 370  Introduction to Forensic Anthropology 3. Offered in Fall Only. Prerequisite: ANT 251. Broad overview of forensic anthropology—an applied field of biological anthropology. Application of the science of biological anthropology to the legal process and humanitarian arena. Identification of skeletal remains to determine age, sex, ancestry, stature, and unique features of a decedent. General identification techniques addressed but proficiency not expected.

ANT 371  Human Variation 3. Offered in Fall Only. Prerequisite: ANT 251. Survey of basic principles of population genetics with emphasis on mechanisms that shape human biological variation. Analysis of laws of heredity exhibited in modern human populations via microevolution and adaptation. Historical development of concepts with specific application to physical and forensic anthropology. Discussion of most current research.

ANT 373  The Human Fossil Record 3.  Prerequisite: Shs of physical anthropology or archaeology. Analysis of the human fossil record and consideration of alternate theories of human evolution.

ANT 374  Disease and Society 3.  Prerequisite: ANT 251 or ANT 252. 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.

ANT 385  Island Archaeology 3.  Prerequisite: ANT 253. Exploration of the archaeology of islands. Analysis of the conditions and phenomena surrounding human adaptation to and impact on island environments. Geographic areas include Oceania, Caribbean, Mediterranean, Japan, and the Americas.

ANT 389  Fundamentals of Archaeological Research 3.  
Prerequisite: ANT 253. Overview of the objectives, field strategies, bases of laboratory analysis, and interpretative approaches to the archaeological record. Analysis and classification of lithics, shell, bone, ceramics, metal, soils, and perishable materials.

ANT 395  Special Topics in Anthropology 1-3. Offered in Fall Spring Summer. Prerequisite: 3 credits of 200-level Anthropology. Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

ANT 411  Overview of Anthropological Theory 3. Offered in Fall Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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.

ANT 412  Applied Anthropology 3. Offered in Spring Only.  
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.

ANT 416  Research Methods in Cultural Anthropology 3. Offered in Fall Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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.

ANT 419  Ethnographic Field Methods 3. Offered in Summer. 
Prerequisite: Six hours of cultural anthropology. 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.

ANT 421  Human Osteology 3.  Prerequisite: ANT 251 and any ANT 300 Level. 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.

ANT 424  Bioarchaeology 3.  Prerequisite: ANT 421. Survey of approaches used by bioarchaeologists to understand past lifeways through the study of excavated human remains. Analysis of the ways in which bioarchaeologists reconstruct health and disease patterns, mortality rates, diet, degree of interpersonal violence, and social structure in the human past.

ANT 429  Advanced Methods in Forensic Anthropology 4. 
Offered in Spring Only. Prerequisite: ANT 370, ANT 421. 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 anidunique 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.

ANT 431 Tourism, Culture and Anthropology 3. Offered in Fall and Summer. Prerequisite: Three hours of cultural anthropology. 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 tourists and tourism on local communities. Principal theories of leisure in relation to tourism. Theories of culture change in relation to travel and tourism. Credit not given for both ANT 431 and ANT 531.

ANT 433 Anthropology of Ecotourism and Heritage Conservation 3. Offered in Spring Only. Prerequisite: ANT 252. 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.

ANT 444 Cross-Cultural Perspectives on Women 3. Offered in Spring Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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.

ANT 450 Environmental Anthropology 3. Prerequisite: One of the following: ANT 310, 325, 330 or 346. 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, ethnicity and cognitive ecology, subsistence and social organization, historical and political ecology, environmentalism, and environmental policy issues.

ANT 460 Urban Anthropology 3. Offered in Fall Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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 urbanization.

ANT 464 Anthropology of Religion 3. Offered in Spring Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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.

ANT 475 Human Impacts on Ancient Environments 3. Prerequisite: ANT 253. Archaeological investigation of human-environmental interactions. Focuses on various techniques archaeologists and paleoecologists use to reconstruct prehistoric environments. Topics include the analysis of animal remains (e.g., shellfish, fish, marine mammals, birds), soils, and plants, dating techniques, and stable isotopes.

ANT 495 Special Topics in Anthropology 3. Detailed investigation of a topic in anthropology. Topic and mode of study determined by faculty member(s).

ANT 496 Anthropology Internship 6. Offered in Spring Only. Prerequisite: ANT 412, ANT 416; Senior standing in Anthropology (B.A.). 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.

ANT 498 Independent Study in Anthropology 1-6. Offered in Fall Spring Summer. Prerequisite: Six hours of ANT. Independent study of a topic in anthropology. Topic and mode of study determined by faculty member(s) and student(s).

ARCHITECTURE

ARC 140 Experiencing Architecture 3. Contemporary and historic houses, public buildings and cities illustrate the practical and aesthetic aspects of architecture. The basic elements of architectural form, design process, and architectural criticism.

ARC 162 An Introduction to Architecture 3. Offered in Spring Only. 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.

ARC 201 Architectural Design: Environment 6. Offered in Spring Only. Prerequisite: DF 102, ARC 141 and ARC 142. Corequisite: ARC 211. 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.


ARC 211 Natural Systems and Architecture 3. Offered in Fall Only. Prerequisite: D 105 or by permission of instructor. 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.

ARC 232 Structures and Materials 3. Offered in Spring Only. Construction materials related to structural applications. Theory of structures and introduction to quantitative analysis. Implications for design. Historical examples and current practices. Laboratory and field trips required.

ARC 241 Introduction to World Architecture 3. Offered in Fall Only. 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.
ARC 242 History of Western Architecture 3. Offered in Spring Only. Prerequisite: ARC 241. 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.

ARC 251 Digital Representation 3. Offered in Spring Only. Project based methodological investigation of digital representation in architecture including: two- three- and four-dimensional media. Purchase of laptop and necessary software required.

ARC 289 Architectural Travel Study I 3. Offered in Fall Spring Summer. Prerequisite: ARC 141 and ARC 142. 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.

ARC 292 Special Topics in Architecture 1-3. Offered in Fall Spring Summer. Topics of current interest in Architecture. Normally used to develop new courses.

ARC 301 Architectural Design: Intermediate 6. Offered in Fall Only. Prerequisite: ARC 202; Bachelor of Environmental Design (EDA) Majors of Junior studio Standing. Studies in architectural design. Projects of many types and scales are employed to investigate issues in architecture. Emphasis is on independent exploration of design values and their implications.

ARC 302 Architectural Design: Technology 6. Offered in Spring Only. Prerequisite: Bachelor of Environmental Design (EDA) Majors; ARC 301, ARC 331, Corequisite: ARC 332, ARC 414. An investigation of technical systems of building - structure, environmental control/energy, materials, enclosure, and circulation; their fabrication and assembly; and their capacity to affect form and tectonic structure as fundamental elements of the design process. Particular emphasis on physical models.

ARC 331 Architectural Structures I 3. Offered in Fall Only. Prerequisite: ARC 232. 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.


ARC 401 Architectural Design: Urban 6. Offered in Fall Only. Prerequisite: Bachelor of Environmental Design (EDA) Majors, ARC 302. 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.

ARC 402 Architectural Design: Advanced 6. Offered in Spring Only. Prerequisite: Bachelor of Environmental Design (EDA) Majors, ARC 401. 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.

ARC 403 Architectural Design Fundamentals: Environment 6. Offered in Fall Only. Prerequisite: M. Arch Track 3 student, Corequisite: ARC 211. 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.

ARC 404 Architectural Design Fundamentals: Form 6. Offered in Spring Only. Prerequisite: M. Arch Track 3 student, ARC 403, ARC 252, Corequisite: ARC 261. 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.

ARC 405 Architectural Design Fundamentals: Technology 6. Offered in Spring Only. Prerequisite: M. Arch Track 3 student, ARC 404, Corequisite: ARC 331. 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.

ARC 414 Environmental Control Systems 3. Offered in Spring Only. Prerequisite: ARC 211. 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.

ARC 432 Architectural Construction Systems 3. Offered in Fall Only. Prerequisite: ARC 232. Building construction systems related to architectural design. Historical and current building practices. Implications for design and systems selection. Case studies. Field trips are required.

ARC 441 History of Contemporary Architecture 3. Offered in Fall Only. 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.


ARC 450 Architectural Drawing 3. Offered in Fall Only. Introduction to freehand and constructed drawing including planimetric drawing and three-dimensional techniques of axonometric, isometric, and perspective. Freehand on-site drawing in various media and the art of the design sketch. Basics of visual composition and diagramming.

ARC 490 Architecture International Studio 6. Offered in Fall Spring Summer. Prerequisite: ARC 302, Participation in off-campus program. 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.

ARC 492 Special Topics in Architecture 1-3. Offered in Fall Spring Summer. Topics of current interest in Architecture. Normally used to develop new courses.

ARC 495 Independent Study in Architecture 1-3. Offered in Fall Spring Summer. Special projects in architecture developed under the direction of a faculty member on a tutorial basis.

AGRICULTURAL ECONOMICS

ARE 201 Introduction to Agricultural & Resource Economics 3. Offered in Fall and Spring. 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.


ARE 301 Intermediate Microeconomics 3. Prerequisite: MA 121 or 131; ARE 201 or EC 205 or EC 201. 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. Credit not allowed in more than one of EC 301, 310, 401.

ARE 303 Farm Management 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 304 Agribusiness Management 3. Offered in Spring Only. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 306 Agricultural Law 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 309 Environmental Law & Economic Policy 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 311 Agricultural Markets 3. Offered in Fall Only. Prerequisite: ARE 201 or EC 201 or EC 205. 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 over time; futures markets and the management of risk; transportation and international trade; government agricultural programs.

ARE 312 Agribusiness Marketing 3. Offered in Spring Only. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 321 Agricultural Financial Management 3. Offered in Fall Only. Prerequisite: ARE 201 or EC 201 or EC 205. Fundamental concepts for financial management decision in agricultural/farm businesses. Emphasis on financial statement analysis of profitability, efficiency, liquidity, repayment capacity, risk, leverage, growth. Capital budgeting, investment decisions, farmland bid price determination, farm real estate appraisal. Financial markets and credit institutions serving agriculture, lending policies, loan analysis, interest rate determination. Financial structure, performance, condition of farm sector.

ARE 332 Human Resource Management for Agribusiness 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 336 Introduction to Resource and Environmental Economics 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

ARE 345 Global Agribusiness Management 3. Offered in Spring Only. Prerequisite: EC 201 or EC 205 or ARE 201. 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.

ARE 403 Economics of Consumer Decisions 3. Prerequisite: ARE 201 or EC 201 or EC 205. Application of economic theory of the consumer to lifetime personal resource allocation decisions intended for non-major graduate students at the master's level. Emphasis on dynamic considerations in consumption and saving, replacement of consumer durables, and evaluation of consumer protection policies. Not open to undergraduates majoring in the Department of Agricultural and Resource Economics or the College of Management. Credit not allowed for both ARE 210 and ARE 403.

ARE 404 Advanced Agribusiness Management 3. Prerequisite: (ARE 303 or ARE 304), ARE 321, and (ARE 311 or ARE 312). 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.

ARE 412 Advanced Agribusiness Marketing 3. Offered in Fall Only. Prerequisite: ARE(EC) 201 or EC 205; Pre- or Co-requisite: ARE 312 or BUS 360. ARE 412 uses step-by-step marketing plan development for agribusiness, agricultural, and/or life sciences products. Student groups research, develop, and present a written market plan. The course focuses on collection and analysis of information pertaining to a product's environment, customers, and competitors. An integrative course, ARE 412 brings together concepts learned in marketing, finance, management, law and policy areas.

ARE 413 Applied Agribusiness Marketing 3. Offered in Spring Only. 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.

ARE 423 Futures and Options Markets 3. Offered in Spring Only. Prerequisite: ARE(EC) 301 and ARE 311 or BUS 320. Operation and business uses of futures and options markets. Emphasis on market institutions, arbitrage relationships, risk analysis, hedging theory and practice, portfolio evaluation and market regulation. Similarities among commodity, bond and stock index futures emphasized.

ARE 433 U.S. Agricultural Policy 3. Offered in Fall Only. Prerequisite: ARE(EC) 301 or ARE(EC) 401. 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.

ARE 436 Environmental Economics 3. Offered in Spring Only. Prerequisite: ARE(EC) 301. Usefulness of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations, marketable permits and subsidies considered in designing alterations, in the incentive system. Current public policy alternatives in the context of non-market decision-making.


ARE 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

ARE 493 Special Problems/Research Exploration 1-6. Offered in Fall and Spring. 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.

ARE 495 Special Topics in Agricultural and Resource Economics 1-6. Presentation of material not normally available in regular course offerings or offering of new courses on a trial basis.

ARTS STUDIES

ARS 233 Makeup Design for the Stage 3. Offered in Fall Only. The process of design and application of makeup for the stage including techniques for character and age makeup, making and applying facial hair and other specialized techniques. Taught from the play script to production with emphasis on historical research, play analysis, and applications techniques. The course includes hands-on experience with makeup. May not be taken concurrently with ARS 236 or ARS 333. May not be taken concurrently with ARS 236 or ARS 333.

ARS 236 Text to Stage 3. Offered in Fall and Spring. Study of script preparation beginning with the directors' and designers' collaborative efforts through rehearsal process, to the production itself and ending with the final evaluation. Directors' methods and designer processes in theory and practice. Attendance at one rehearsal and two productions is required. May not be taken concurrently with ARS 233 or 333. May not be taken concurrently with ARS 233 or ARS 333.

ARS 251 The Arts of a World Capital: London 3. Offered in Summer. 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.

ARS 252 The Arts of Vienna 1900 3. Offered in Summer. 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.
ARS 253 Arts of NC State 3. Offered in Fall and Spring. Study of the arts in the context of the university community, utilizing university arts programs and resources. Core concepts and methods for aesthetic experience in several disciplines including dance, theater, music, visual art, and craft through performance and exhibition attendance, readings, lectures, and discussion. (Modest fees for performance tickets might be required.).

ARS 257 Technology in the Arts 3. Offered in Fall Only. 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.

ARS 258 Mathematics and Models in Music 3. Offered in Spring Only. 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.

ARS 259 The Arts and Politics 3. Offered in Fall Only. 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.

ARS 306 Music Composition with Computers 3. Offered in Fall Spring Summer. 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 ontology, a real-time piece, or a piece that combines tape and instrument(s).

ARS 333 Costume Design and Technology 3. Offered in Spring Only. Prerequisite: COM 103 or ARS 236. The process of designing costumes taught from the perspective of both the play's script and the anticipated production with emphasis on historical research, play analysis, rendering technique, and basic construction. Hands-on experience required. May not be taken concurrently with ARS 233 or ARS 236. May not be taken concurrently with ARS 233 or ARS 236.

ARS 346 Black Popular Culture 3. Offered in Fall Spring Summer. A multidisciplinary examination of contemporary black cultural expression in film, music, art, and the media. Emphasis on race, class, gender, and political discourse.

ARS 351 Arts, Ideas and Values 3. Offered in Fall Only. 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.

ARS 352 Dress, Style, Change 3. An interdisciplinary course focusing on historical and cultural principles of style as related to dress and fashion. Examination of fashion and stylistic trends in cycles of dress.

ARS 353 Arts and Cross-Cultural Contacts 3. Offered in Spring Only. 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.

ARS 354 The Arts and the Sacred 3. 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.

ARS 433 Period Styles in Acting 3. Offered in Spring Only. Prerequisite: COM 493. 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.

ARS 494 Topics in Arts Studies 3. Offered in Fall and Spring. 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.

ARS 498 Independent Study in Arts Studies 1-3. Offered in Fall Spring Summer. Prerequisite: Nine hours of course work in Arts Studies. Independent study or project directed by a faculty member in the student's area of interest.

AEROSPACE STUDIES

AS 121 The Foundation of the United States Air Force I 1. Offered in Fall Only. Part I 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.

AS 122 The Foundations of the United States Air Force II 1. Offered in Spring Only. Part II 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.

AS 221 The Evolution of USAF Air and Space Power I 1. Offered in Fall Only. Part I of a course featuring topics on Air Force heritage and leaders; introduction to air and space power through examination of competencies and functions; and continued application of communication skills. Its purpose is to instill an appreciation of the development and employment of air power and to motivate students to transition from AFROTC cadet to Air Force ROTC officer candidate.

AS 222 The Evolution of USAF Air and Space Power II 1. Offered in Spring Only. Part II of a course featuring topics on Air Force heritage and leaders; introduction to air and space power through examination of competencies and functions; and continued application of communication skills. Its purpose is to instill an appreciation of the development and employment of air power and to motivate students to transition from AFROTC cadet to Air Force ROTC officer candidate.

AS 321 Air Force Leadership Studies I 1. Offered in Fall Only. Part I of a course that teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is place on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.
AS 322 Air Force Leadership Studies II 3. Offered in Spring Only. . Part II of a course that teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is placed on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.

AS 421 National Security Affairs/Preparation for Active Duty I 3. Offered in Fall Only.. Part I of a course designed for college seniors and that gives them the foundation to understand their role as military officers in American society. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.

AS 422 National Security Affairs/Preparation for Active Duty II 3. Offered in Spring Only. . Part II of a course designed for college seniors and that gives them the foundation to understand their role as military officers in American society. It is an overview of the complex social and political issues facing the military profession and requires a measure of sophistication commensurate with the senior college level.

AS 495 Special Topics in Aerospace Studies 2. Offered in Fall and Spring. . Offered as needed to treat new or special subject matter relating to the Department of the Air Force..

ARTS VILLAGE

AVS 100 Arts Village Forum 1. Offered in Fall and Spring. . 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.

BIOLOGICAL and AGRICULTURAL ENGINEERING

BAE 100 Introduction to Biological Engineering 1. Offered in Spring Only. . 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.

BAE 200 Computer Methods in Biological Engineering 2. Offered in Fall Only. Prerequisite: MA 141 and E 115. Students develop computer-based problem solving techniques to solve introductory problems in Biological and Biomedical Engineering. Emphasis is on developing solution algorithms and implementing these with spreadsheets, equation solvers, and computer programming.

BAE 202 Introduction to Biological and Agricultural Engineering Methods 4. Offered in Spring Only. Prerequisite: E 115. 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.

BAE 315 Properties of Biological Engineering Materials 3. Offered in Spring Only. Prerequisite: (BIO 181 or BIO 183), and either (BAE 200, CSC 112, CSC 114 or CSC 116) and Corequisites: (MAE 308 or CE 382), and (MAE 314 or CE 313). Physical properties of biological and non-biological engineering materials, their uniqueness and variability within systems. Relationships between plant, animal, and human tissues, property measurement, and evaluation of dimensional, mechanical, rheological, thermal, electrical, and optical properties.

BAE 325 Introductory Geomatics 3. Offered in Fall Only. . 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.

BAE 361 Analytical Methods in Engineering Design 3. Offered in Spring Only. Prerequisite: BAE 202, CE 215 or MAE 208, MA 341. Corequisite: MAE 314. Engineering problem solving through studies of topics in engineering design. Kinematic analysis of linkages, analysis and design/selection of machine structures and power transmission components, including vibration modeling and control in lumped mass mechanical and biomechanical systems.

BAE 401 Instrumentation for Biological Systems 3. Offered in Fall Only. Prerequisite: (BAE 200, ECE 321). Basic concepts of instrumentation for monitoring of 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.

BAE 402 Transport Phenomena 3. Offered in Fall Only. Prerequisite: (BAE 200, ECE 321). Basic concepts of instrumentation for monitoring of 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.

BAE 422 Introduction to Food Process Engineering 3. Offered in Spring Only. Prerequisite: BAE 402; MAE 308 or CE 382; MAE 301 or CHE 315. 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.

BAE 425 Industrial Microbiology and Bioprocessing 3. Offered in Spring Only. Prerequisite: Junior or higher standing in CALS or COE; MB 351. Introduction to the structure and functions of microbial cells and their cultivation and utilization in bioprocess engineering. Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels, industrial chemicals, pharmaceuticals, food additives and food products such as beer, wine, cheese and yogurt Microbial biomass production. Introduction to environmental biotechnology including waste water treatment, bioremediation and biostabilization. Biodeterioration and its control. Product development, regulations and safety. Field trip(s) are an essential educational component of the course and are required. Credit will not be given for both BAE(BBS) 425 and BAE 525.

BAE 435 Precision Agriculture Technology 3. Offered in Spring Only. . Overview of technology available for implementation of a comprehensive precision agriculture program. Topics include
computer, 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/SSC 435 and BAE/SSC 535.

BAE 440 Geographic Information Systems in Production Agriculture 3. Offered in Spring Only. Prerequisite: SSC 341. Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

BAE 442 Systems Approach to Agricultural and Environmental Issues 3. Offered in Spring Only. Prerequisite: ENG 331 or ENG 332 or ENG 333; Senior standing. Systems approach to complex agricultural and environmental issues and problematic situations including people's views. Multiple stages of soft systems approach: open inquiry into and description of issues, conceptual modeling, feasibility and implementation of changes. Individual project using systems approach to a complex issue in agriculture or the environment.

BAE 451 Engineering Design I 2. Offered in Fall Only. Prerequisite: BAE 202 and 3 of the following courses - BAE 315, 361, 401, 402, 422, 425, 471, 472, or 481. Design Concepts of engineering problems, objectives, specifications, manufacturing, prior art and analysis. Oral and written exercises in reverse engineering, national and international standards, quality control, intellectual law and engineering ethics. Team projects from agricultural, bio-processing and environmental engineering. Must be within 36 credit hours of completing the BE degree. Field trips are required. Must be within 36 credit hours of completing the BE degree.

BAE 452 Engineering Design II 2. Offered in Spring Only. Prerequisite: BAE 451. Continuation of BAE 451; Project analysis, design, scheduling, construction, tests and reports. Teamwork and the function of engineering design in society. Field trips are required. Must be within 36 hours of completing the BE degree.

BAE 462 Machinery Design and Applications 3. Offered in Fall Only. Prerequisite: BAE 361. 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.

BAE 471 Land Resources Environmental Engineering 3. Offered in Fall Only. Prerequisite: BAE 200 and one of (CSC 112, CSC 114, or CSC 116). Corequisite: SSC 200 and either (CE 382 or MAE 380). Hydrology and erosion principles. Designing structures and selecting practices to control land runoff, erosion, sediment pollution and flooding.

BAE 472 Irrigation and Drainage 3. Offered in Spring Only. Prerequisite: BAE 471. 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.

BAE 473 Introduction to Surface/Water Quality Modeling 3. Offered in Fall Only. Prerequisite: BAE 471. Concepts in basic hydrologic, erosion and chemical transport used in modeling. Evaluation of typical hydrologic/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.

BAE 474 Principles and Applications of Ecological Engineering 3. Offered in Spring Only. Prerequisite: MB 351 or SSC 332, BAE 471. 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.

BAE 481 Structures & Environment 3. Offered in Spring Only. Prerequisite: BAE 402; CE 313 or MAE 314. 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.

BAE 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

BAE 493 Special Problems in Biological and Agricultural Engineering 1-6. Offered in Fall and Spring. 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.

BAE 495 Special Topics in Biological and Agricultural Engineering 1-3. Offered in Fall Spring Summer. Offered as needed for presenting material not normally available in regular BAE departmental courses or for new BAE courses on a triennial basis.

BIOPROCESSING

BBS 201 Introduction to Biopharmaceutical Science 3. Offered in Spring Only. 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.

BBS 301 Process Validation Science 3. Offered in Fall Only. Prerequisite: (FS 231 and BBS 201) or BBS 426. 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.

BBS 425 Industrial Microbiology and Bioprocessing 3. Offered in Spring Only. Prerequisite: Junior or higher standing in CALS or COE; MB 351. Introduction to the structure and functions of microbial cells and their cultivation and utilization in bioprocess engineering. Fermentation systems and downstream processing methods. Enzyme kinetics, production and application. Biomanufacturing of fuels,
industrial chemicals, pharmaceuticals, food additives and food products such as beer, wine, cheese and yogurt. Microbial biomass production. Introduction to environmental biotechnology including waste water treatment, bioremediation and biomining. Biodeterioration and its control. Product development, regulations and safety. Field trip(s) are an essential educational component of the course and are required. Credit will not be given for both BAE/BBS 425 and BAE 525.

BBS 426 Industrial Microbiology & Biomanufacturing Laboratory 2. Offered in Fall and Spring. Prerequisite: (MB 351 and FS 231) or MB/RE 420 or CHE/EC 463. 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.

BIOCHEMISTRY

BCH 101 Introduction to Microbiology and Biochemistry Laboratory Practices 3. Offered in Spring Only. 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 aspetic 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.

BCH 220 Role of Biotechnology in Society 3. Offered in Summer. Prerequisite: BIO 181, CH 101. Biotechnology and 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, the ability to understand how biotechnology works. Offered only in Poland through Study Abroad (4-week course). Departmental approval required.

BCH 351 General Biochemistry 4. Offered in Fall Spring Summer. Prerequisite: CH 223 and BIO 183. 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 discusses amino acids and proteins, carbohydrates, lipids, and nucleic acids. The pathways discussed will include glycolysis, gluconeogenesis, and the Krebs cycle. 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.

BCH 451 Principles of Biochemistry 4. Offered in Fall Spring Summer. Prerequisite: CH 223. Introduction to the fundamental principles of biochemistry. Emphasis on biochemical structures, properties, functions and interactions, including enzyme kinetics and central pathways of metabolism.


BCH 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

BCH 493 Special Problems in Biochemistry 1-5. Offered in Fall and Spring. 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.

BCH 495 Special Topics in Biochemistry 1-5. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular BCH departmental courses or for new BCH courses on a trial basis.

BIOMANUFACTURING

BEC 180 Introduction to Applied Bioprocessing 3. Offered in Summer. 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 culture 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.

BEC 220 Introduction to Drug Development and Careers in Biomanufacturing 1. Offered in Fall and Spring. Prerequisite: BIO 183 and Corequisite of CH 221. 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 biomansering 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.

**BEC 320 Fundamentals of Microbial Cell Culture 2. Offered in Fall Spring Summer. Prerequisite: BIO 183.** This is a half-semester course. This introductory module addresses fundamental cell biology concepts and enables students to gain an understanding of the basic principles of microbiology, culture preparation, physiology and genetics of microbial cell cultures. The lab portion of the course provides students with practical experience in basic laboratory and culture techniques. Students who have completed either MB 352 or MB 354 may not take this course for credit.

**BEC 330 Principles and Applications of Bioseparations 2.** Offered in Fall and Spring. Prerequisite: CH 225. Objectives, strategies, and techniques 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.

**BEC 420 Fundamentals of Microbial Cell Biotransformations 2.** Offered in Fall and Spring. Prerequisite: MB 352 or MB 354 or Corequisite: of BEC (MB) 320. 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.

**BEC 436 Introduction to Downstream Process Development 2.** Offered in Fall Spring Summer. Prerequisite: BEC 330 or graduate standing. 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.

**BEC 440 Expression Systems in Biomansering 3. Offered in Fall Only. Prerequisite: BEC(MB) 320 or MB 351/352. Introduction to various expression systems, their advantages and disadvantages. Basic techniques in DNA cloning, cell transformation and optimization of protein expression. Selection, archiving and characterization of production line. Media development and parameters affecting expression and yield. The lab portion of the course provides students with practical experience in DNA cloning and protein expression techniques in diverse expression systems.**

**BEC 442 Insect Cells Protein Expression 2. Offered in Spring Only. Prerequisite: BEC(MB) 320 or BIT410/510. Introduction to the insect cells expression system, and its advantages and disadvantages. Introduction to expression of recombinant proteins with baculovirus. Outline of antibody and antibody fragments as well as other complex proteins. Basic techniques used for growth and maintenance of insect cell cultures. The lab portion of the course provides students with practical experience in protein expression techniques in the insect cells expression system. This is a half-semester course. Students who have completed BEC 442 may not take BEC 542 for credit.

**BEC 462 Fundamentals of Bio-Nanotechnology 3. Offered in Fall Only. Prerequisite: MA 241, PY 208, CH 223. 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.**

**BEC 463 Fermentation of Recombinant Microorganisms 2. Offered in Fall and Spring. Prerequisite: CH 223 and Corequisite: (BEC 320 or BIT 410 or BCH 452 or MB 352). 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.**

**BEC 475 Global Regulatory Affairs for Medical Products 3. Offered in Spring Only.** 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 those preparing for a career in the Regulatory Affairs or Quality Assurance Department within a pharmaceutical, biomanufacturing, or medical device company.

**BEC 480 cGMP Fermentation Operations 2.** Offered in Fall and Spring. Corequisite: BBS/BEC 426. 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.

**BEC 483 Tissue Engineering Technologies 2.** Offered in Fall Only. Prerequisite: BIT 466 or permission of instructor. 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.

**BEC 485 cGMP Downstream Operations 2. Offered in Fall and Spring. Corequisite: BEC 436. 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.**

**BEC 488 Animal Cell Culture Engineering 2. Offered in Spring Only. Prerequisite: CHE 447 or BEC 463 or BEC 420 or BIT 466.** 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,
BIO 105 Biology in the Modern World 3. Offered in Fall Spring Summer. Principles and concepts of biology including cellular structure and function, metabolism and energy transformation, homeostasis, reproduction, heredity, diversity of life, ecology, evolution and animal behavior. Emphasis on human affairs and human examples. For non-science students. Students may not receive credit for both BIO 105 and (BIO 115 or BIO 181 or BIO 183).

BIO 106 Biology in the Modern World Laboratory 1. Offered in Fall Spring Summer. Corequisites: BIO 105. Laboratory experience in biological principles to complement BIO 105. For non-science students. Students may not receive credit for both BIO 106 and (BIO 116, BIO 181 or BIO 183).

BIO 140 Survey of Animal Diversity 3. Offered in Fall Only. 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 ZO 150.

BIO 141 Animal Diversity Laboratory 1. Offered in Fall Only. Prerequisite: BIO 140. 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.

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 4. Offered in Fall and Spring. Emphasis on interactions of organisms with their environments, evolutionary change and role of natural selection in the evolution of life forms, biological diversity in the context of form and function of organisms, and on critical thinking, problem solving, and effective communication. Cannot receive credit for both BIO 181 and (BIO 105 or BIO 106 or BIO 115 or BIO 116).

BIO 183 Introductory Biology: Cellular and Molecular Biology 4. Offered in Fall and Spring. Prerequisite: BIO 181 or CH 101. Basic concepts and principles of molecular, cellular, and developmental biology. Emphasis will be on the physical basis of life, the cell as the fundamental unit of life, the mechanisms involved in the development of multicellular organisms and on critical thinking, problem solving, experimental design, and effective communication. Cannot receive credit for both BIO 183 and (BIO 105 or BIO 106 or BIO 115 or BIO 116).

BIO 212 Basic Human Anatomy and Physiology 4. Offered in Fall Spring Summer. Prerequisite: BIO 183 or ZO 160. Major emphasis on structure and function of the muscular, skeletal, circulatory and nervous systems of humans. Credit in both BIO 212 and BIO 301 or BIO 302 is not allowed.

BIO 220 Marine Biology 3. Offered in Spring Only. Prerequisite: MEA 200 or BIO 181. 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.

BIO 227 Biological Illustration 3. Offered in Spring Only. 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.

BIO 233 Human-Animal Interactions 3. Offered in Fall Only. This course is designed to explore the relationship humans share with other animals and nature. We will study the early history of animal domestication and the influence of animals on human culture and religion. We will also explore our relationships to animals as pets, food, research subjects, and wildlife. All subjects will be covered through interaction with guest speaker, assigned readings, case studies, and class discussion.

BIO 250 Animal Anatomy and Physiology 4. Offered in Fall Only. Prerequisite: BIO 183 or ZO 160. 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.

BIO 295 Special Topics in Biology 1-4. . . Experimental offerings in Biology.
communication, and cognitive. Classes will consist of interactive lectures, films, and class discussions.

**BIO 330 Evolutionary Biology 3. Offered in Spring Only.**
Prerequisite: BIO 181, BIO 183. 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.

**BIO 333 Captive Animal Biology 3. Offered in Spring Only.** 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.

**BIO 350 Animal Phylogeny and Diversity 4. Offered in Spring Only. Prerequisite: BIO 181 and Sophomore standing.** 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 both BIO 350 and BIO 140 or ZO 150.

**BIO 353 Wildlife Management 3. Offered in Fall Only.**
Prerequisite: BIO 181 or ZO 150. 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.

**BIO 360 Ecology 4. Offered in Fall Spring Summer. Prerequisite: BIO 181.** 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.

**BIO 361 Developmental Biology 3. Offered in Fall Only.**
Prerequisite: BIO 183 or ZO 160. 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.

**BIO 370 Developmental Anatomy of the Vertebrates 3. Offered in Spring Only. Prerequisite: BIO 181 or BIO 140 or ZO 150.** An integrated study of the functional anatomy, phylogeny, and embryonic development of organ systems in vertebrate animals.

**BIO 375 Developmental Anatomy Laboratory 2. Offered in Spring Only. Prerequisite: BIO 181 or BIO 140 or ZO 150.** 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, salmonander, and mink.

**BIO 402 Invertebrate Zoology 2. Offered in Spring Only.**
Prerequisite: (BIO 181 or ZO 150) and (BIO 183 or ZO 160). Survey of invertebrate phyla, excluding the Protista, emphasizing their functional biology.

**BIO 403 Invertebrate Zoology Laboratory 2. Offered in Spring Only. Corequisite: BIO 402.** Examination of living and preserved invertebrates to study their distinguishing characteristics and to observe anatomical modifications for function.

**BIO 405 Functional Histology 3. Offered in Summer. Prerequisite: BIO 183 or ZO 160.** 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.

**BIO 410 Introduction to Animal Behavior 3. Offered in Fall Only.**
Prerequisite: BIO 181, BIO 183. 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.

**BIO 414 Cell Biology 3. Offered in Spring Only. Prerequisite: (BIO 183 or ZO 160) and CH 221.** The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.

**BIO 419 Limnology 4. Offered in Fall Only. Prerequisite: BIO 260 or BIO/PB 360.** Structure and function of lakes and ponds, including physical, chemical and biological controls of productivity and species composition of aquatic plants and animals, and effects of pollution on water quality. One local weekend field trip is required. Credit in both ZO 419 and ZO 519 is not allowed.

**BIO 420 Introduction to Fisheries Science 3. Offered in Fall Only. Prerequisite: BIO 181 or ZO 150, BIO 260 or PB 360.** Role of fish in aquatic ecosystems, fish biology, fish ecology, fisheries management and conservation. Emphasis on aquatic ecosystems and food webs, life history and ecology of important sport and commercial fishes, population and community dynamics, and theory and practice of fisheries management and conservation. Case studies from freshwater, estuarine and marine systems.

**BIO 421 Advanced Human Anatomy and Physiology 3. Offered in Fall Spring Summer. Prerequisite: BIO 250 or BIO 212 or BIO 412.** A comprehensive survey of the processes involved in the function of specialized cells, tissues and organ systems. Emphasis on basic concepts with orientation toward mammalian and human systems.

**BIO 422 Biological Clocks 3. Offered in Spring Only. Prerequisite: BIO 250 or BIO 212.** The anatomy, physiology, and development of biological clocks in a variety of organisms, including humans. Credit in both BIO 422 and ZO 522 is not allowed.


**BIO 424 Endocrinology 3. Offered in Fall Only. Prerequisite: BIO 250 or BIO 212.** 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.

BIO 425 General Entomology 3. Offered in Fall and Summer. Prerequisite: BIO 181 or BIO 140 or ZO 150 or BIO 350. Explores the science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and control of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments.

BIO 426 Advanced Human Anatomy & Physiology Lab 1. Offered in Fall and Spring. Prerequisite: BIO 212 or BIO 250; Corequisite: BIO 421. A comprehensive laboratory course surveying the process involved in the function and structure of specialized cells, tissues, and organ systems. Emphasis will be on problem solving and critical thinking skills.

BIO 430 Fisheries and Wildlife Administration 3. Offered in Spring Only. Prerequisite: PS 201, PS 202; FW/BIO 420, FW/BIO 353. Describes and compares the administrative structures and programs of federal and state fish and wildlife agencies and develops an understanding of the basis on which these agencies function. Evaluates the interrelationships that fisheries-wildlife professionals, special interest groups, public agencies and legislative bodies play in resource management programs.

BIO 441 Biology of Fishes 3. Offered in Spring Only. Prerequisite: BIO 260 or PB 360. Behavior, evolution, physiology and ecology of fishes, emphasizing their adaptations for life in streams, lakes, and oceans.

BIO 442 Biology of Fishes Laboratory 1. Offered in Fall Only. Corequisite: BIO 441. 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.

BIO 449 Principles of Biological Oceanography 3. Offered in Fall Only. Biological productivity and trophic relationships in plankton, nekton and benthos; community ecology of selected habitats (estuaries, intertidal zones, coral reefs, deep sea); and adaptation of organisms to the marine environment. Credit is not allowed for both MEA/BIO 449 and MEA/BIO 549.

BIO 460 Field Ecology and Methods 4. Prerequisite: ST 311 and (BIO 260 or BIO 360 or PB 360/365). 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 experiments to global studies of patterns and diversity. Course is restricted to seniors.

BIO 482 Capstone Course in Molecular, Cellular, and Developmental Biology 3. Offered in Fall and Spring. Prerequisite: BIO 361, BIO/PB 414, and one of the following: BCH 351 or BCH 451 or BT 410 or GN 311. Topical 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.

BIO 483 Capstone Course in Integrative Physiology and Neurobiology 3. Offered in Fall and Spring. Prerequisite: BIO 424, BIO 488, and one of the following: BCH 351 or BCH 451 or GN 311 or ST 311. Topical 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 IPN curriculum; other students with the necessary prerequisites will be admitted on a space available basis.

BIO 484 Capstone Course in Human Biology 3. Offered in Fall and Spring. Prerequisite: BIO 421, MB 351 and one of the following: BCH 351 or BCH 451 or GN 311 or ST 311. Topical 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.

BIO 485 Capstone Course in Ecology, Evolution, and Conservation Biology 3. Offered in Fall and Spring. Prerequisite: BIO/PB 330, BIO/PB 360, and one of the following: BIO 460 or GN 311 or NR 406 or ST 311. Topical 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.

BIO 486 Capstone Course in Zoology 3. Offered in Fall and Spring. Prerequisite: BIO 250, BIO/PB 360, and one of the following: BIO 350 or BIO 402/403 or GN 311 or ST 311. 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 on 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.

BIO 488 Neurobiology 3. Offered in Fall Only. Prerequisite: BIO 250 or BIO 212. 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.

BIO 491 Seminar on Professional Development in Biological Sciences 1. Offered in Fall Only. Planning and analyzing strategies for professional development in the biological sciences utilizing discussion, guest lecturers, and field trips to nearby research laboratories and industrial plants. Intended primarily for juniors and seniors in any biophysical discipline.

BIO 492 External Learning Experience 1-6. Offered in Fall and Spring. Learning experience in agriculture and life sciences within an academic framework with facilities and resources external to the campus. Contact and arrangements with prospective supervisors by the
student. Prior approval by faculty advisor, prospective supervisor, and departmental teaching coordinator.

BIO 493 Special Problems in Biological Sciences 1-6. Offered in Fall and Spring. Learning experience in agriculture and life sciences within an academic framework with campus facilities and resources. Contact and arrangements with prospective supervisors by the student. Prior approval by faculty advisor, prospective supervisor, and department teaching coordinator.

BIO 495 Special Topics in Biology 1-6. Offered in Fall Spring Summer. Individualized study, under faculty supervision, of biological topics, and developmental course on a trial basis.

BIOTECHNOLOGY

BIT 100 Current Topics in Biotechnology 4. 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.

BIT 210 Phage Hunters 3. Offered in Fall Only. 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.

BIT 211 Phage Genomics 2. Offered in Spring Only. Prerequisite: BIT/MB 210. This course offers first-year students an opportunity for mentored research. Student 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.

BIT 295 Special Topics in Biotechnology 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

BIT 410 Manipulation of Recombinant DNA 4. Offered in Fall and Spring. Prerequisite: BIO 185 or ZOBIO 160 and CH 223 with a C- or better. 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.

BIT 461 Sequencing cDNA Libraries 2. Offered in Fall Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. Basic techniques in automated DNA sequencing and robotics. Colony picking and ordering cDNA libraries, use of PCR to amplify insert DNA, and strategies for large-scale automated sequencing. Principles of database management for ordering and accessing sequencing information. Half semester course, first part.

BIT 462 Gene Expression Analysis: Microarrays 2. Offered in Fall Only. Prerequisite: BIT 410 or BIT 510. 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.

BIT 464 Protein Purification 2. Offered in Spring Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. Comparison of several different chromatography techniques for protein purification. Construction of purification tables and SDS-native-PAGE analysis. Cost-benefit analysis of industrial-scale procedures. Half semester course, second part.

BIT 465 Real-time PCR Techniques 2. Offered in Spring Only. Prerequisite: BIT 410 or BIT 510. 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.

BIT 466 Animal Cell Culture Techniques 2. Offered in Spring Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. 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, second part.

BIT 467 PCR and DNA Fingerprinting 2. Offered in Fall Only. Prerequisite: BIT 510. 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 amounts of sample and forensic identification of individuals using isolated human hairs. Credit is not allowed for both BIT 467 and BIT 567.

BIT 468 Genome Mapping 2. Offered in Spring Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. 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.

BIT 470 Advanced Animal Cell Culture: Bioreactor Culture 2. Offered in Spring Only. Prerequisite: BIT 466 or BIT 566 or PO 566. Principles of scaling animal cell seed-stock from frozen storage to three liter culture. Students will learn to assemble and operate a three-liter
bioreactor to produce antibodies, as well as assess final product quantity using antibody techniques. This is a half-semester course.

**BIT 471 RNA Interference and Model Organisms** 2. Offered in Fall Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. 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.

**BIT 473 Experimental Analysis of Protein-Protein Interactions** 2. Offered in Fall and Spring. Prerequisite: BIT 410 or BCH 454. 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.

**BIT 474 Plant Genetic Engineering** 2. Offered in Fall Only. Prerequisite: BIT 410 or BIT 510 or BCH 454 or PR 421. 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.

**BIT 476 Applied Bioinformatics** 2. Offered in Fall Only. Prerequisite: BIT 410 or BCH 454 or GN 311. 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.

**BIT 481 Plant Tissue Culture and Transformation** 2. Offered in Spring Only. 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.

**BIT 492 External Learning Experience** I-6. Offered in Fall Spring Summer. 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.

**BIT 493 Special Problems in Biotechnology** I-6. Offered in Fall Spring Summer. 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 of Program Director of the Biotechnology Program.

**BIT 495 Special Topics in Biotechnology** 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

**BME 201 Computer Methods in Biomedical Engineering** 3. Offered in Fall Only. 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 those 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.

**BME 203 Introduction to the Materials Science of Biomaterials** 3. Offered in Fall Only. Prerequisite: C- or better in CH 101, CH 102 and PY 205. 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.

**BME 204 Biomedical Measurements** 3. Offered in Spring Only. 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.

**BME 210 Biomedical Electronics** 4. Offered in Spring Only. Prerequisite: MA 242, PY 208. For BME Majors only. 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.

**BME 252 Biomedical Engineering Design and Manufacturing I** 1. Offered in Fall and Spring. Students will learn the basic tools of design such as solid modeling by means of web-based tutorials and a series of small CAD project assignments. Students will learn to use current software for design, analysis, and computer-aided manufacturing (CAM). Students will also be introduced to modern manufacturing through the transition from CAD (Computer-Aided Design) to CAM using modern rapid manufacturing equipment to carry out small one, well-defined design and manufacturing project.

**BME 301 Human Physiology for Engineers** 1. Offered in Fall Only. Prerequisite: BME 201 and either ZO 160 or BIOL 183. BME Majors, Corequisite: BME 311. This course includes a quantitative approach to human physiology from the biomedical engineering perspective with an emphasis on neural, sensory, muscle, and cardiovascular physiology. Autonomic neural 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.

BME 302 Human Physiology for Engineers II 3. Offered in Spring Only. Prerequisite: BME 301. For BME Majors only. 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.

BME 311 Linear Systems in Biomedical Engineering 3. Offered in Fall Only. Prerequisite: BME 201 and (ECE 331 or BME 210). Corequisite: BME 301 and MA 341. For BME Majors only. 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. Fourier analysis in continuous and discrete domains. Laplace transform. Frequency response and its application in biomedical systems. Filter design. Circuit analysis to mechanical and thermal problems and their applications in modeling biomedical systems. Applications in biomedical instrumentation. Students use MATLAB to simulate and analyze biomedical linear systems. BME majors only.

BME 312 Analog and Digital Circuits Laboratory 1. Offered in Fall Only. Prerequisite: ECE 331, BME Majors. 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.

BME 342 Analytical and Experimental Methods for Biomedical Engineers 3. Offered in Spring Only. Prerequisite: BME 201; MAE 208 or CE 215; MAE 314 or CE 313; MA 341. 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 are introduced for experimental analysis and testing. Students learn advanced software packages such as the finite element program ANSYS and the dynamic analysis program ADAMS to assist in their analyses.

BME 352 Biomedical Engineering Design and Manufacturing II 2. Offered in Spring Only. Prerequisite: BME 252; BME majors. 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.


BME 422 Fundamentals of Biomedical Instrumentation 3. Offered in Spring Only. Prerequisite: BME 210 or BME 312. 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.

BME 425 Bioelectricity 3. Offered in Spring Only. Prerequisite: BME 302 or (ZO 421 and a course in electrical circuits). 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.

BME 441 Biomechanics 3. Offered in Fall Only. Prerequisite: ZO 160 or BIO 183; BME 342; ST 370. 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.

BME 443 Cardiovascular Biomechanics 3. Offered in Spring Only. Prerequisite: BME 302, BME 342 and (MAE 305 or CE 382). Engineering principles as 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. Credit is not allowed for both BME 443 and BME 543.

BME 451 Biomedical Engineering Senior Design I 3. Offered in Fall Only. Prerequisite: BME 302, BME 352, and either ENG 331 or ENG 333, and completion of two of the suggested BME electives for their area of emphasis; BME majors. Design concepts of engineering problems: objectives, specifications, manufacturing, prior art, and analysis. Oral and written exercises in reverse engineering. Lectures in national and international standards, quality control, intellectual property law, and engineering ethics. Team projects to design, build, and deliver a prototype device to aid a disabled person or other appropriate biomedical engineering project that provides an opportunity for real world engineering design and community outreach.

BME 452 Biomedical Engineering Senior Design II 3. Offered in Spring Only. Prerequisite: BME 451, BME majors. Continuation of BME 451. Project analysis, design, scheduling, construction, and testing. Advanced written and oral technical communication. Teamwork and the function of engineering design in society. Major team project with a biomedical engineering theme.

BME 466 Polymeric Biomaterials Engineering 3. Offered in Fall Only. Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 and MAE 206 or CE 214). 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. Bioreversible polymers.

BME 467 Mechanics of Tissues & Implants Requirements 3. Offered in Spring Only. Prerequisite: (ZO 160 or BIO 183) and (MAE 314 or CE 313). 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.

BME 480 Biomedical Microcontroller Applications 3. Offered in Fall Only. Prerequisite: BME 422. BME Majors only. 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.

BME 483 Tissue Engineering Technologies 2. Offered in Fall Only. Prerequisite: BIT 466 or permission of instructor. 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.

BME 484 Tissue Engineering Fundamentals 3. Offered in Spring Only. Prerequisite: (ZO 160 or BIO 183), CH 221, and (MAE 301 or MSE 301 or CHE 315 or TE 303). 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.

BME 495 Special Topics in Biomedical Engineering 1-4. Offered in Fall Spring Summer. Prerequisite: Consent of instructor. Special topics in biomedical engineering. Subject matter will vary depending on faculty resources and student interest.

BME 498 Undergraduate Research in Biomedical Engineering 3. Offered in Fall Spring Summer. 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 independent research culminating in a final paper and presentation at the NC State Undergraduate Research Symposium or other appropriate venue. Students must identify an advisor from within the BME faculty with whom to work on a regular basis. The advisor must approve the student prior to the student registering for the course. The BME Undergraduate Coordinating Committee must approve the use of this course as a restricted elective for the BME degree. Departmental Approval Required.

BUS 225 Personal Finance 3. Offered in Fall and Spring. 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, deferred savings, insurance, retirement planning, estate planning, and real estate finance.

BUS 295 Special Topics in Business Management 1-6. Experimental course development. Special topics in Business Management at the introductory level.

BUS 305 Legal and Regulatory Environment 3. Offered in Fall and Spring. Introduction to contract, tort, and agency law, the judicial system, common law, statutory law, and constitutional law. Review and discussion of the major legal and regulatory issues affecting business including ethics, fiduciary duty, white collar crime, dispute resolution, intellectual property, international and product safety laws.

BUS 320 Financial Management 3. Offered in Fall and Spring. Prerequisite: ACC 210 and EC 201 or ARE 201 or EC 205; College of Management Majors must have passed Software Applications Proficiency Requirement. 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.

BUS 340 Information Systems Management 3. Offered in Fall and Spring. Prerequisite: M110. 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.

BUS 350 Economics and Business Statistics 3. Offered in Fall Spring Summer. Prerequisite: MA 114; College of Management Majors must have passed Software Applications Proficiency Requirement. 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.

BUS 360 Marketing Methods 3. Offered in Fall and Spring. Prerequisite: BUS 201, Sophomore standing, College of Management Majors must have passed Software Applications Proficiency Requirement. 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.

BUS 370 Operations Management 3. Offered in Fall and Spring. 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.

BUS 406 Sports Law 3. Offered in Fall Only. 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.

BUS 420 Financial Management of Corporations 3. Offered in Fall and Spring. Prerequisite: BUS 320 and (BUS/ST 350, or ST 302,

**BUS 422 Investments and Portfolio Management 3. Offered in Fall and Spring. Prerequisite: BUS 320 and (BUS/ST 350, or ST 302, or ST 311, or ST 361, or ST 370, or ST 372).** 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.

**BUS 425 Advanced Personal Financial Management 3. Offered in Fall and Spring. Prerequisite: BUS 320.** Detailed economic, financial and legal analysis of risk management, retirement planning, nontraditional investments, estate planning. Strong emphasis on personal financial planning for those interested in personal finance as a career. Directly applicable for needs of small business.

**BUS 426 International Financial Management 3. Offered in Spring Only. Prerequisite: BUS 320 and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372).** Foreign exchange markets and their implications for direct and portfolio investment abroad. International capital markets. Multinational company exchange rate exposure measurement and management. Techniques and instruments of financing international trade and investment. Multinational capital budgeting and capital cost measurement. Techniques of international cash management. Credit for both BUS 426 and EC 449 not allowed.

**BUS 435 Leadership and Management 3. Offered in Fall and Spring. Prerequisite: MIE 330.** 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.

**BUS 440 Database Management 3. Prerequisite: ACC 340 or BUS 340.** The fundamentals of database management within business applications. Data structures, user requirements, structured query language, query by example, application development, user interface design.

**BUS 441 Business Data Communications and Networking 3. Offered in Fall and Spring. Prerequisite: ACC 340 or BUS 340.** 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.

**BUS 442 Information Systems Development 3. Offered in Fall and Spring. Prerequisite: BUS 440.** Concepts and skills necessary for developing information systems to aid in managerial decisions. Hands-on experience with development theory and concepts; object-oriented design concepts, graphical user interface design concepts, algorithm design concepts, and data structures.

**BUS 443 Decision Support Systems 3. Prerequisite: ACC 340 or BUS 340.** This is an introductory course in designing and building Decision Support Systems (DSS) for business applications. The course is directed to business school students seeking a career with a company that is a user of technology or is a member of a technology driven industry.

**BUS 444 Systems Analysis and Design 3. Prerequisite: ACC 340 or BUS 340.** Overview of methodical approaches to developing information systems throughout the systems analysis, design and implementation processes. Topics include SDLC, project management, feasibility studies, requirements analysis, etc.

**BUS 449 Information Technology Capstone 3. Offered in Spring Only. Corequisite: BUS 440.** 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 industry-based management team. Field trips and/or outside class activities (including client/consultant work) are a major part of this course. Students who are unable to participate in these types of events should not enroll in this course.

**BUS 455 Quantitative Methods for Management 3. Offered in Spring Only. Prerequisite: (EC 201 or ARE 201) and ((BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372).** Formulation and use of quantitative techniques for analyzing management problems. Linear programming, decision making under uncertainty and recasting methods applied to problems in operations management, marketing, finance, human resource management, accounting, other areas. Use of computer software.

**BUS 461 Services Marketing 3. Prerequisite: BUS 360.** This course focuses on the unique challenges of managing services and delivering quality service to customers. The attraction, retention, and building of strong customer relationships through service quality and customer satisfaction is at the heart of the course content.

**BUS 462 Marketing Research 3. Offered in Fall and Spring. Prerequisite: BUS 360 and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372).** 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.

**BUS 464 International Marketing 3. Offered in Spring Only. Prerequisite: BUS 360.** 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.

**BUS 465 Integrated Marketing Communications Management 3. Offered in Fall and Spring. Prerequisite: BUS 360.** Development of marketing communication theory and exploration of integrated marketing communication (IMC) practice. Topics include: IMC planning, management and budgeting; IMC strategy development and execution; media strategy and research; advertising research; ethical and legal issues; creativity; IMC ideation, campaign development; and campaign presentation. This is partially web-based course.

**BUS 466 Personal Selling 3. Offered in Fall and Spring. Prerequisite: BUS 360.** 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.

**BUS 467 Product and Brand Management 3.** Prerequisite: BUS 360. 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 successfully manage existing products and brands.

**BUS 468 Marketing Strategy 3.** Prerequisite: BUS 360. 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.

**BUS 469 Integrated Marketing Communication Project 3.** Offered in Spring Only. Prerequisite: BUS 360 and either BUS 462 or BUS 465. Development of an Integrated Marketing Communications (IMC) project, including marketing research, marketing and IMC planning, media planning, budgeting, creative strategy development, creative production, plansbook writing and final competitive presentation to marketing communications professionals.

**BUS 472 Operations Planning and Control Systems 3.** Offered in Fall Only. Prerequisite: BUS 370. Design and management of operations planning and control systems for manufacturing and service firms. Forecasting, capacity management, production and work force scheduling, project management, just-in-time and time-based competition, the impact of information technologies on planning and control systems.


**BUS 474 Logistics Management 3.** Offered in Fall and Spring. Prerequisite: BUS 370. 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.

**BUS 475 Purchasing and Supply Management 3.** Prerequisite: BUS 370. 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.

**BUS 478 Business Process Management 3.** Offered in Fall Only. Prerequisite: BUS 370 and BUS/ST 350 or ST 302 or ST 361 or ST 370 or ST 372. Major tools, techniques, and strategies used for designing and improving business processes, including process mapping, process analysis, continuous process improvement tools and techniques, strategies for process design, and process reengineering. Major group project in process analysis and improvement.

**BUS 479 Supply Chain Management Undergraduate Practicum 3.** Prerequisite: BUS 370 and one 400-level Operations/Supply Chain Management course. 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. Student groups need to provide their own transportation to off-campus sites.

**BUS 495 Special Topics in Business Management 1-6.** Prerequisite: Minimum GPA =/> 2.5, C- or better in PY 205. Corequisite: MA 242. 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.

**BUS 498 Independent Study in Business Management 1-6.** Offered in Fall Spring Summer. Prerequisite: Minimum GPA =/> 2.5, Grade of C- or better in CE 214, and MA 242. 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.

**CIVIL ENGINEERING**

**CE 214 Engineering Mechanics-Statics 3.** Offered in Fall Spring Summer. Prerequisite: Minimum GPA =/> 2.5, C- or better in PY 205. Corequisite: MA 242. 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.

**CE 215 Engineering Mechanics-Dynamics 3.** Offered in Fall Spring Summer. Prerequisite: Minimum GPA =/> 2.5, Grade of C- or better in CE 214, and MA 242. 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.

**CE 261 Construction Engineering Systems 3.** Offered in Spring Only. Prerequisite: CEM Majors; Corequisite: ST 370. Introduction to engineering economy, and principles and techniques of optimization for Construction Engineering and Management, including risk assessment. Credit may not be received for both CE 261 and CE 375.

**CE 297 Current Topics in Civil Engineering 1-4.** Offered in Fall Spring Summer. Prerequisite: Minimum GPA =/> 2.5. Grade of C- or better in CE 214. 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.

**CE 301 Civil Engineering Surveying and Geomatics 3.** Offered in Fall and Spring. 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 CEM, CE, ENE majors. Credit will not be given for both BAE 325 and CE 301.

**CE 305 Traffic Engineering 3.** Offered in Fall and Spring. Prerequisite: CE or CEM Majors, and ST 370. 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.

**CE 313 Mechanics of Solids 3.** Offered in Fall Spring Summer. Prerequisite: Minimum GPA =/> 2.5, Grade of C- or better in CE 214, and MA 242. 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.

CE 324 Structural Behavior Measurement 1. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CE 313. Theory and application of strain, displacement, and acceleration measurements. Verification of structural theories. Error Analysis. Bending of determinant and indeterminate beams, twisting of circular tubes, buckling of columns, and vibration of shear buildings.

CE 325 Structural Analysis I 3. Offered in Fall and Spring. Prerequisite: CSC 112; Grade of C- or better in CE 313. Analysis of determinate and indeterminate bars, trusses, beams and frames using the matrix displacement method. Qualitative deflected shapes and shear and bending moment diagrams. Computer implementation of analysis procedures using MATLAB and commercial structural analysis software.

CE 327 Reinforced Concrete Design 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CE 313; CE 332. Behavior, strength, and design of reinforced concrete members subjected to moment, shear, and axial forces. Introduction to the design of reinforced concrete structures.

CE 332 Materials of Construction 3. Offered in Fall and Spring. Prerequisite: MSE 200 and Junior standing in CE or CEM. Manufacture and properties of mineral and bituminous cements and mineral aggregates. Mechanical properties and durability of Portland cement concrete, bituminous mixtures, masonry units, timber products, and miscellaneous construction materials. Materials testing.

CE 337 Civil Engineering Computing 3. Offered in Spring Only. Prerequisite: CSC 112 and Corequisite: MA 341 or MA 305. 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.

CE 339 Civil Engineering Systems 3. Offered in Fall Only. Prerequisite: CSC 112 and Corequisite: MA 341 or MA 305. 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.

CE 342 Engineering Behavior of Soils and Foundations 4. Offered in Fall and Spring. Prerequisite: C- or better in CE 313, Corequisite: CE 382. 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.

CE 367 Mechanical and Electrical Systems in Buildings 3. Offered in Spring Only. Prerequisite: CE 382. Introduction to mechanical and electrical systems in building construction. Includes HVAC, lighting and electrical systems, focusing on design concepts, equipment application and design of the construction process for modern building systems.

CE 373 Fundamentals of Environmental Engineering 3. Offered in Fall and Spring. Corequisite: CHE 205 or CE 382. 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.

CE 378 Environmental Chemistry and Microbiology 4. Offered in Fall Only. Prerequisite: Junior standing in Environmental Engineering, MEA 323, and C- or better in CE 373 and Corequisite: ST 370. Principles of Environmental Chemistry and Microbiology, experimental techniques for assessing water and air quality; sampling; statistical interpretation of data.

CE 381 Hydraulics Systems Measurements Lab 1. Offered in Fall and Spring. Corequisite: CE 382. Introduction to experimental techniques for the analysis of hydraulic systems; measurement of viscosity, fluid pressures, velocity distributions, flow rates; investigations into the friction, momentum transfer, and turbulence on fluid flow.

CE 382 Hydraulics 3. Offered in Fall and Spring. Prerequisite: CE 214, Junior standing in CE, CEM, ENE, BE, or BME, Corequisite: MA 341, MA 305, or ST 370. 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 CE 382 and MAE 308.

CE 383 Hydrology and Urban Water Systems 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CE 382; For CE, ENE, and CEM Majors. 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, onquantity and quality of streamflow.

CE 390 Engineering Economics 1. Offered in Fall and Spring. Prerequisite: CSC 112 and Corequisite: MA 341 or MA 305. 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.

CE 400 Transportation Engineering Project 3. Offered in Spring Only. Prerequisite: CE 390, C- or better in CE 305, and one of the following courses: CE 401, 402, 403, or 413. Integrated team approach to design of major transportation engineering projects. Professional topics in transportation engineering practice.

CE 401 Transportation Systems Engineering 3. Offered in Fall Only. Prerequisite: C- or better in CE 305. Multi-modal transportation systems; railroads, airports, highways, and other modes. Planning, analysis, and design. Fundamental concepts; supply, demand, flows, impacts, and network optimization.

CE 402 Traffic Operations 3. Offered in Fall Only. Prerequisite: C- or better in CE 305. Highway capacity; traffic control systems; intelligent vehicle/highway systems; and other advanced topics. Credit for both CE 402 and CE 502 is not allowed.

CE 403 Highway Design 3. Offered in Spring Only. Prerequisite: C- or better in CE 305. 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.

CE 413 Principles of Pavement Design 3. Offered in Fall Only. Prerequisite: CE 332, and Corequisite: CE 342. Basic principles of analysis, design and performance of highway and airport pavements with critical evaluation of current design and maintenance strategies.

CE 421 Structural Engineering Senior Project - Bridge Design 3. Offered in Full Only. Prerequisite: CE 327, CE 390, and CE 426. Corequisite: CE 425. 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, prestressed 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.

CE 425 Structural Analysis II 3. Offered in Fall Only. Prerequisite: C or better in CE 325. 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 framing elements include shear 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.

CE 426 Structural Steel Design 3. Offered in Fall and Spring. Prerequisite: C or better in CE 313. Design and behavior of structural steel members and their connections subjected to moment, shear, and axial forces. Introduction to the design of steel structures.

CE 435 Engineering Geology 3. Offered in Spring Only. Prerequisite: MEA 101 and Junior standing in colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences or Textiles. Application of both geology and geotechnical engineering to engineering projects. Illustrations of relevant materials properties and techniques utilized in describing subsurface conditions.

CE 440 Geotechnical Engineering Project 3. Offered in Fall Only. Prerequisite: C or better in CE 342, CE 390. 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.

CE 443 Seepage, Earth Embankments and Retaining Structures 3. Offered in Fall and Spring. Prerequisite: C or better in CE 342, CE 390. Review of shear strength concepts; ground water hydraulics; slope stability; lateral earth pressure problems; placement of fills.

CE 463 Construction Estimating, Planning, and Control 3. Offered in Fall Only. Prerequisite: CE 261. 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.

CE 464 Legal Aspects of Contracting 3. Offered in Fall Only. Legal aspects of contract documents, drawings and specifications; owner-entrepreneur-contractor relationships and responsibilities; bids and contract performance, Labor laws; governmental administrative and regulatory agencies; torts; business organizations; ethics and professionalism.

CE 465 Construction Equipment and Methods 3. Offered in Spring Only. Corequisite: CE 261 or equivalent and ST 370. 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.

CE 466 Building Construction Engineering 3. Offered in Fall Only. Corequisite: CE 327. 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.

CE 468 Construction Engineering Laboratory 1. Offered in Fall and Spring. Prerequisite: CE 332, Corequisite: CE 327 or CE 426. 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.

CE 469 Construction Engineering Project 3. Offered in Fall and Spring. Prerequisite: CE 465. Last semester in CEM, Corequisite: CE 464. 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.

CE 470 Physical Processes of Environmental Engineering 3. Offered in Spring Only. Prerequisite: CE 280, CHE 225 and Grade of C or better in CE 382, Corequisite: CE 381, and MAE 301 or CHE 315. The fundamentals of physical processes of mass, momentum and energy transfer in fluid systems as applied to environmental engineering. Examples drawn from wastewater treatment, air pollution, surface and groundwater pollution, and solid and hazardous waste.

CE 476 Construction Management Project 1. Offered in Fall Only. Prerequisite: CE 342, MAE 301 and Corequisite: ST 370 or CHE 450 (CHE majors). 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 479 Air Quality 3. Offered in Spring Only. Prerequisite: CE 373, CE 382; or CHE 511(CHE Majors); or MEA 421 (MEA Majors). Corequisites: ST 370; ST 380 (MEA Majors). 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 480 Water Resources Engineering Project 3. Offered in Spring Only. Prerequisite: CE 390 and Grade of C- or better in CE 382 and CE 383. 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.

CE 481 Environmental Engineering Project 3. Offered in Spring Only. Prerequisite: CE 374, 390, 383, 484, Corequisite: Two of: CE 476, 477, 479, 488. Engineering design of selected projects in environmental engineering involving interactions with other scientific and engineering disciplines. Discussion of ethical conduct and professional engineering practice.

CE 484 Water Supply and Waste Water Systems 3. Offered in Fall Only. Prerequisite: CE 373, CE 382. Elements of the design of water supply and wastewater disposal systems.

CE 487 Introduction to Coastal and Ocean Engineering 3. Offered in Spring Only. Prerequisite: Senior standing and CE 382. 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.

CE 488 Water Resources Engineering 3. Offered in Fall Only. Prerequisite: CE 339 or equivalent, Corequisite: CE 383. 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.

CE 497 Current Topics in Civil Engineering 1-4. Offered in Fall Spring Summer. 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.

CE 498 Special Problems in Civil Engineering 1-4. Offered in Fall and Spring. Directed reading in the literature of civil engineering, introduction to research methodology, seminar discussion dealing with special civil engineering topics of current interest.

CHEMISTRY

CH 100 Chemistry and Society 4. Offered in Fall Spring Summer. 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. Credit is not allowed for CH 100 if student has prior credit for CH 101.

CH 101 Chemistry - A Molecular Science 3. Offered in Fall Spring Summer. Prerequisite: One Year of High School chemistry or completion of CH 111 with grade of C- or better; and eligibility for MA 107. Corequisite: CH 102. 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.

CH 102 General Chemistry Laboratory 1. Offered in Fall Spring Summer. Corequisite: CH 101. Laboratory experience to accompany CH 101. Introduction to basic laboratory equipment and skills.

CH 108 Computer Applications in Chemistry II 1. Offered in Spring Only. Prerequisite: CH 106, CH Majors, Corequisite: CH 201. A supplement to CH 202 laboratory, for chemistry majors. The use of computers in mathematical modeling of chemical concepts; applications of computer graphics to structure drawing, molecular modeling, and scientific illustration.

CH 111 Preparatory Chemistry 3. Offered in Fall and Spring. 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.

CH 201 Chemistry - A Quantitative Science 3. Offered in Fall Spring Summer. Detailed quantitative aspects of solutions, solution stoichiometry, thermodynamics, chemical equilibrium, acid-base equilibria, solubility equilibria, electrochemistry, chemical kinetics, and nuclear chemistry.

CH 202 Quantitative Chemistry Laboratory 1. Offered in Fall Spring Summer. Prerequisite: CH 101, CH 102, Corequisite: CH 201. Laboratory experience to complement CH 201. Experimental exploration of thermodynamic, kinetic, and electrochemical behavior.

CH 211 Analytical Chemistry I 3. Offered in Spring Only. Prerequisite: CH 108, Corequisite: CH 212 and PY 208. Methods of quantitative analysis based on solution chemistry, potentiometry, coulometry, chromatography, and molecular absorption and fluorescence spectroscopy. Statistics of measurement precision. Credit not allowed for both CH 211 and CH 315.

CH 212 Analytical Chemistry Laboratory I 1. Offered in Spring Only. Corequisite: CH 211. Laboratory experiments in volumetric analysis, ion selective electrodes, potentiometry, molecular absorption and fluorescence spectroscopy, acid/base chemistry, and computer applications. Precision, accuracy, and statistical analysis emphasized.

CH 220 Introductory Organic Chemistry 4. Offered in Fall Spring Summer. Prerequisite: CH 101. 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.

CH 221 Organic Chemistry I 3. Prerequisite: CH 101 and CH 102; Corequisite: CH 222. 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.

CH 222 Organic Chemistry I Lab 1. Prerequisite: CH 101 and CH 102; Corequisite: CH 221. Laboratory experience to accompany CH 221. Introduction to basic organic laboratory equipment and techniques.
CH 223 Organic Chemistry II 3. Prerequisite: CH 221 and CH 222 and a Corequisite of CH 224. 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.

CH 224 Organic Chemistry II Lab I. Prerequisite: CH 221 and CH 222; Corequisite: CH 223. Laboratory experience to accompany CH 223. Introduction to basic organic laboratory equipment and techniques.

CH 230 Computational Chemistry Lab I 1. Offered in Fall Only. Prerequisite: CH 221; Corequisite: MA 242. 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 sequence.

CH 232 Computational Chemistry Lab II 1. Offered in Spring Only. Prerequisite: CH 221; Corequisite: MA 241. 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.

CH 295 Special Problems in Chemistry 1-3. Offered in Fall Spring Summer. Special topics in chemistry at the early undergraduate level. Trial offerings of new or experimental courses in chemistry. Enrollment requires permission of the department.

CH 315 Quantitative Analysis 4. Offered in Fall Spring Summer. Prerequisite: CH 201 and (CE 373 or any MEA course). Chemistry of the element and coordination chemistry. Introduction to quantum mechanics, including atomic and molecular orbitals and molecular orbital theory with applications to inorganic chemistry.

CH 323 Earth System Chemistry 3. Offered in Spring Only. Prerequisite: CH 201 and (CE 373 or any MEA course). Chemistry of the element and coordination chemistry. Introduction to quantum mechanics, including atomic and molecular orbitals and molecular orbital theory with applications to inorganic chemistry.

CH 331 Introductory Physical Chemistry 4. Offered in Fall Spring Summer. Prerequisite: CH 201/202; MA 231 or 241, PY 205 or PY 211. Fundamental physicochemical principles including chemical thermodynamics, physical and chemical equilibrium, electrochemistry and reaction kinetics. For students requiring only a single semester of physical chemistry.

CH 401 Systematic Inorganic Chemistry I 3. Offered in Fall Spring Summer. Prerequisite: CH 201. 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 coordination chemistry. Major paper required.

CH 402 Inorganic Chemistry Laboratory 1. Offered in Fall and Spring. Prerequisite: CH 401. A laboratory program that builds on the knowledge gained in CH 401, for B.S. chemistry majors. Synthesis and characterization of transition metal complexes, including inert atmosphere and high temperature techniques, and spectroscopic and magnetic measurements.

CH 403 Systematic Inorganic Chemistry II 3. Offered in Fall and Spring. Prerequisite: CH 401, CH 431. 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, organometallic chemistry, and inorganic solid state chemistry.

CH 415 Analytical Chemistry II 3. Offered in Fall Only. Prerequisite: CH 211 or CH 315 or TC 412; Corequisite: CH 416, CH 433. 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.

CH 416 Analytical Chemistry Laboratory 1. Offered in Fall Only. Corequisite: CH 415. Experiments in spectroscopy, electrochemistry, chromatography and electronics; computer applications to experimental design and data smoothing.

CH 428 Qualitative Organic Analysis 3. Offered in Fall and Spring. Prerequisite: CH 223. Introduction to organic chemistry research techniques and to the systematic identification and separation of organic compounds. Application of both physical and chemical procedures. Experimental and research techniques including infrared and nuclear magnetic spectroscopy, chemical classification tests, and the preparation of derivatives.

CH 431 Physical Chemistry I 3. Offered in Fall Spring Summer. Prerequisite: CH 201, MA 242, PY 203 or 208; Corequisite: MA 341. An intensive study of physical chemical principles including states of matter, classical thermodynamics, physical and chemical equilibria, and electrochemistry.

CH 433 Physical Chemistry II 3. Offered in Fall Spring Summer. Prerequisite: CH 431, MA 341. An intensive study of physical chemical principles including molecular spectroscopy, statistical thermodynamics, reaction kinetics, kinetic theory, and transport properties. Credit may not be claimed for both CH 433 and CH 437.

CH 434 Physical Chemistry Laboratory 3. Offered in Fall and Spring. Prerequisite: CH 211 or CH 315 or TC 412; CH 431, Corequisite: CH 433. A project-oriented course to acquaint students with modern physical chemistry laboratory techniques. Experiments in chemical thermodynamics, kinetics, molecular structure and spectra.

CH 435 Introduction to Quantum Chemistry 3. Offered in Fall and Spring. Prerequisite: CH 431. An introduction to the basic principles of quantum theory and its application to atomic and molecular structure and spectroscopy.

CH 437 Physical Chemistry for Engineers 4. Offered in Fall and Spring. Prerequisite: PY 208; CHE 355, MA 341. Selected physicochemical principles including quantum theory, spectroscopy, statistical thermodynamics, and rates of chemical reactions. Credit may not be claimed for both CH 433 and CH 437.

CH 441 Forensic Chemistry 3. Offered in Spring Only. Prerequisite: CH 223, CH 201. Chemical identification (recognition), and chemical separation techniques (identification) used to demarcate class and individual characteristics relevant in legal claims.
CH 442 Advanced Synthetic Techniques 4. Offered in Fall and Spring. Prerequisite: CH 223. Corequisite: CH 401. 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.

CH 444 Advanced Synthetic Techniques II 4. Offered in Fall Only. Prerequisite: CH 442. 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.

CH 452 Advanced Measurement Techniques I 4 . Prerequisite: CH 431. 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.

CH 454 Advanced Measurement Techniques II 4. Offered in Spring Only. Prerequisite: CH 311 or CH 315. Laboratory course designed on systematic method development in practical applications for the separation and analysis of environmental, pharmaceutical and biologically important samples. Isocratic and gradient elution HPLC separations and temperature programming in GC are covered. In addition to GC, the three major HPLC modes of Reversed Phase, Ion Exchange, and Hydrophilic Interaction will be studied for separations of mixtures of small organic molecules and biologically important molecules such as peptides and carbohydrates.


CH 463 Molecular Origins of Life 3. Offered in Fall Only. Prerequisite: BCH 351 or BCH 451 or Permission of Instructor. 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, tetapyrroles) 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.

CH 473 Principles of Chemical Oceanography 3. Offered in Fall Only. Prerequisite: CH 201, MEA 200. 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. Credits not allowed for both MEA 473 and MEA 573.

CH 491 Honors Chemistry 1-4. Offered in Fall and Spring. Prerequisite: CH 223. Admission to Honors Program. Independent study and research projects in chemistry.

CH 499 Undergraduate Research in Chemistry 1-3. Offered in Fall, Spring Summer. Independent investigation of a research problem under the supervision of a chemistry faculty member.

CHE 205 Chemical Process Principles 4. Offered in Fall and Spring. Prerequisite: Grade of C- or better in MA 241, PY 205, and (CH 201 or CH 221). Engineering methods of treating material balances, stoichiometry, phase equilibrium calculations, thermophysics, thermochemistry and the first law of thermodynamics. Introduction to equation solving packages and spreadsheets for solving problems related to chemical engineering calculations.

CHE 225 Introduction to Chemical Engineering Analysis 3. Offered in Spring and Summer. Prerequisite: C- or better in CHE 205 and MA 242; Corequisite: MA 341. Introduction of mathematical and computational tools for analyzing chemical engineering problems. Sequential modular and equation-based simulation of steady-state chemical processes using advanced spreadsheet methods and multivariate root-finding algorithms. Material and energy balances on transient processes and their solution using analytical and numerical methods. Introduction to microscopic material and energy balances using the "shell balance" approach to develop the governing differential equations. Solutions to steady-state boundary value problems in heat conduction and Fickian diffusion.

CHE 311 Transport Processes I 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in both CHE 225 and MA 341. Fundamental aspects of momentum and heat transfer, and the use of these fundamentals in solving problems in transport operations.

CHE 312 Transport Processes II 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CHE 311. Fundamental aspects of mass transfer and the use of these basic principles in solving problems in transport operations.

CHE 315 Chemical Process Thermodynamics 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CHE 225. Laws of thermodynamics and their application to chemical engineering problems, both in theory and in practice. Criteria of equilibrium in physical and chemical changes. Behavior of real fluids, including mixtures.

CHE 316 Thermodynamics of Chemical and Phase Equilibria 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CHE 315. Systematic study of chemical reaction equilibria and phase equilibria. Use of fugacity, activity and chemical potential concepts for predicting the effect of such variables as temperature, pressure on equilibrium compositions. Methods for measuring and estimating thermodynamic properties important to equilibrium calculation in real systems.

CHE 330 Chemical Engineering Lab I 4. Offered in Fall and Spring. Prerequisite: CHE 311. Laboratory experiments in unit operations of heat transfer and fluid flow. Laboratory safety, technical report writing, statistics, experimental design, error analysis and instrumentation.

CHE 331 Chemical Engineering Lab II 2. Offered in Fall and Spring. Prerequisite: CHE 312, CHE 330. Laboratory experiments in mass transfer and reaction kinetics. Experimental planning, technical report writing and oral presentations are emphasized.

CHE 395 Professional Development Seminar 1. Offered in Fall and Spring. Professional development and topics of current interest in chemical engineering.
CHE 435 Process Systems Analysis and Control 3. Offered in Fall and Spring. Prerequisite: (MA 341 and TE 205) or CHE 312. 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.

CHE 446 Design and Analysis of Chemical Reactors 3. Offered in Fall Only. Prerequisite: CHE 316. 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 466.

CHE 447 Bioreactor Engineering 3. Offered in Fall Only. Prerequisite: BCH 451, CHE 312, CHE 316. 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.


CHE 451 Chemical Engineering Design II 3. Offered in Spring Only. Prerequisite: CHE 450, and (CHE 446 or CHE 447). 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.

CHE 455 Polymer Technology and Engineering 3. Offered in Spring Only. Prerequisite: MSE 380. 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.


CHE 461 Polymer Sciences and Technology 3. Offered in Fall Only. Prerequisite: CH 223, CHE 316. Concepts and techniques for polymerization of macromolecules. Structure, properties, and applications of commercially important polymers.

CHE 462 Fundamentals of Bio-Nanotechnology 3. Offered in Fall Only. Prerequisite: MA 241, PY 208, CH 223. 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.

CHE 463 Fermentation of Recombinant Microorganisms 2. Offered in Fall and Spring. Prerequisite: CH 223 and Corequisite: (BEC 320 or BIT 410 or BCH 452 or MB 352), 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.

CHE 464 Protein Purification 2. Offered in Spring Only. Prerequisite: BIT 410 or BIT 510 or BCH 454. Comparison of several different chromatography techniques for protein purification. Construction of purification tables and SDS and native-PAGE analysis. Cost-benefit analysis of industrial-scale procedures. Half semester course, second part.

CHE 465 Diffusion in Polymers 3. Offered in Spring Only. Prerequisite: CHE 461/543. The theory of small molecule transport in polymers; application of membrane transport processes in the chemical, polymer, textile, coatings and natural fibers industries. Credit will not be given for both CHE 465 and CHE 565.

CHE 466 Polymers, Surfactants, and Colloidal Materials 3. Offered in Spring Only. Prerequisite: CHE 316, CH 223. Relationships between molecular structure and bulk properties of nonmetallic materials applied to commercial products and chemical engineering processes. Applications of surface and colloidal chemistry and polymer science to product development and process improvement. Credit will not be given for CHE 466 and CHE 769.

CHE 467 Polymer Rheology 3. Offered in Spring Only. Prerequisite: CHE 311. Theoretical principles and experimental techniques associated with flow and deformation of polymer systems. Systems include: mels and solutions, suspension, gels, emulsions, and thixotropic materials.

CHE 469 Polymers, Surfactants, and Colloidal Materials 3. Offered in Spring Only. Prerequisite: CHE 316, CH 223. Relationships between molecular structure and bulk properties of nonmetallic materials applied to commercial products and chemical engineering processes. Applications of surface and colloidal chemistry and polymer science to product development and process improvement. Credit will not be given for CHE 469 and CHE 769.

CHE 470 Colloidal and Nanoscale Engineering 3. Offered in Fall and Spring. 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 biosays. These emerging technologies will be presented and discussed in the second half of this course.


CHE 488 Animal Cell Culture Engineering 2. Offered in Spring Only. 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, and single-use (disposal) bioreactors. This is a half-semester course.

CHE 497 Chemical Engineering Projects I 3. Offered in Fall Spring Summer. . Introduction to chemical engineering research through experimental, theoretical and literature studies. Oral and written presentation of reports..

CHE 498 Chemical Engineering Projects II 1-3. Offered in Fall Spring Summer. . Projects in research, design or development in various areas of chemical engineering.

COMPARATIVE LITERATURE

CL 495 Special Topics in Comparative Literature 3. . 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.

COLLEGE OF NATURAL RESOURCES

CNR 110 Forest Resources Scholars Forum 0. Offered in Fall and Spring. .

CNR 111 Forest Resources Scholars Forum 0. Offered in Fall and Spring. . 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.

CNR 210 Forest Resources Scholars Forum 0. Offered in Fall and Spring. . 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.

CNR 211 Forest Resources Scholars Forum 0. Offered in Fall and Spring. . 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.

CNR 490 Senior Honors Seminar 2. Offered in Spring Only. . Oral presentations of the results of the senior honors projects. Additional special seminars and group discussions to enrich and broaden student perspectives.

COMMUNICATION

COM 103 Introduction to the Theater 3. Offered in Fall Spring Summer. . Artistic, technical, historical, and literary areas of theater, including acting, directing, design, stagecraft, lighting, costuming, makeup, and criticism.

COM 110 Public Speaking 3. Offered in Fall Spring Summer. . Research skills, topic selection, speech organization, skills in speech delivery. Listening for analysis and evaluation of in-class speech presentation.

COM 112 Interpersonal Communication 3. Offered in Fall Spring Summer. . Interpersonal communication competence: self-concept, self-disclosure, active listening, verbal and nonverbal communication, and conflict management.

COM 200 Communication Media in a Changing World 3. Offered in Fall and Spring. . Communication in a Changing World traces the evolution of media from prehistory to today. The course examines the place and influence of the major media companies that control to an unrealized extent both access to, and the content of, the contemporary mediascape. The course challenges students to examine their use of media from cellphone, to computer, music and gaming platforms.

COM 201 Introduction to Persuasion Theory 3. Offered in Fall Spring Summer. . Impacts of persuasive communication on attitudes and behavior. Uses humanistic and social scientific theories to explain the persuasive process.

COM 202 Small Group Communication 3. Offered in Fall and Spring. . 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.

COM 203 Theory and Practice of Acting 3. Offered in Fall Spring Summer. . 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.

COM 211 Argumentation and Advocacy 3. Offered in Fall and Spring. . Theory-based analysis of public argument in specialized settings of law, politics, academic debate, business and organizations, and interpersonal relations.

COM 223 Stagecraft 3. Offered in Fall and Spring. . Fundamentals of scenery design, set construction, and related technical activities. Practical applications with use of design media and shop facilities. Required production participation in University Theater presentations.

COM 226 Introduction to Public Relations 3. Offered in Fall Spring Summer. . 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.

COM 230 Introduction to Communication Theory 3. Offered in Fall and Spring. . 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.

COM 233 Introduction to Stage Lighting 3. Offered in Fall Only. . Fundamentals and uses of stage lighting equipment and stage lighting design. Practical application of design media and shop facilities. Participation in production activity for University Theater presentations.

COM 240 Communication Inquiry 3. Offered in Fall and Spring. . 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 for research-based information.
COM 250 Communication and Technology 3. Offered in Fall and Spring. Examination of past and current intersections of technology, culture, and communication. Implications for future intersections. Impact of technology and communication policy. Methods of message evaluation. Exposure to technology applications in the discipline. Basic technology skills for the competent communicator. Practical experience in interactive communication technology.

COM 257 Media History and Theory 3. Offered in Fall and Spring. Prerequisite: COM 230. Historical development and social implications of telecommunications, 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.


COM 293 Theater Practicum 1-6. Offered in Fall Spring Summer. 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.

COM 296 Communication Internship-Non-Local 1. Offered in Spring Only. 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.

COM 298 Special Projects in Communication 1-3. Offered in Fall and Spring. A special projects course to be utilized for guided research or experimental classes at the sophomore level, topic determined by instructor.

COM 301 Presentational Speaking 3. Offered in Fall and Spring. Prerequisite: COM 110. Design, organization and delivery of oral presentations for policy determination, policy implementation, and sales.

COM 302 Managing Meetings 3. Offered in Fall Only. Rules and customs of meetings in committees, assemblies and organizations; meeting management and group leadership; parliamentary motions and strategies.

COM 303 Stage Directing 3. Offered in Spring Only. 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.

COM 307 Digital Audio Production 3. Offered in Fall and Spring. Prerequisite: COM 267. Basic principles of digital audio production, including studio operation, performing, writing and producing.


COM 315 Phonetics 3. Offered in Spring Only. Articulatory and acoustic phonetics; application of the International Phonetic Alphabet with vocal and ear training.

COM 316 Public Relations Writing 3. Offered in Fall and Spring. Prerequisite: COM 226 and ENG 316. Communication processes and procedures of public relations programs. Media techniques, preparation of materials, channels of distribution.

COM 317 Television Production 3. Offered in Fall and Spring. Prerequisite: COM 267. Basic techniques of television studio production, including producing, writing, directing and electronic graphics production.

COM 321 Survey of Rhetorical Theory 3. 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.

COM 322 Nonverbal Communication 3. Offered in Fall and Spring. Prerequisite: COM 112. 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.

COM 323 Introduction to Scenic Design 3. Offered in Spring Only. Prerequisite: COM 103 or 223. Aesthetics, elements, and principles of scenic design. Theories and applications to the physical stage in relation to the script. Practical applications with the use of design media in University Theater productions.

COM 325 Anatomy and Physiology of Speech 3. Offered in Fall Only. Anatomy and physiology of the speech mechanism including the muscular, skeletal, and nervous system structures involved in respiration, phonation, and articulation.

COM 327 Critical Analysis of Communication Media 3. Offered in Fall and Spring. Prerequisite: COM 240 and COM 257. Corequisite: COM 240. 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.

COM 332 Relational Communication 3. Offered in Fall and Spring. Prerequisite: COM 112. Communication patterns in the development and deterioration of interpersonal relationships. Functional and dysfunctional communication behaviors in family relationships.

COM 333 Advanced Acting 3. Offered in Spring Only. Prerequisite: COM 203 or demonstrated competence in acting. 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.

COM 335 Language Development 3. Offered in Fall Only. Syntactic, semantic, morphologic, and pragmatic development from birth through adolescence. The influence of cognitive and social development on language development. First language acquisition versus second language learning.
COM 340 African American Theatre 3. Offered in Spring Only. This course examines African American dramaticurgy 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.

COM 342 Interviewing 3. Offered in Fall and Spring. Theory and practice of effective communications skills applied in various types of professional interviews. In-class interviewing.


COM 362 Communication and Gender 3. Offered in Fall and Spring. Prerequisite: Junior standing, COM 112. 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.

COM 364 History of Film to 1940 3. Technological developments and aesthetic movements that shaped cinema production and direction from the beginning of the industry to 1940. Evolution in camera movement, editing, sound storyline, and the documentary. Rise to prominence of the Hollywood studio systems and the contributions of foreign filmmakers.


COM 374 History of Film From 1940 3. Technological developments and aesthetic movements that have shaped cinema production and direction from 1940 to the present. Evolution in camera movement, editing, sound, storyline, and the documentary. Post-war decline and re-emergence of the Hollywood film industry and the contributions of foreign filmmakers.

COM 377 Television Writing Seminar 3. Offered in Fall Only. Prerequisite: COM 204. Development of advanced skills in writing for television in such formats as news, documentary, commercials and public service announcements, drama and non-broadcast video. Discussions with working professionals.

COM 385 Speech Science 3. Offered in Spring Only. Prerequisite: COM 325. Acoustic properties of speech sounds and the dynamics of speech sound production. Initial experience with basic clinical instrumentation used to measure respiratory, phonautic, and articulatory movements and the acoustic events that result from these movements. Lab assignments using basic instrumentation and computer software are completed outside of class.

COM 386 Quantitative Communication Research Methods 3. Offered in Fall Spring Summer. Prerequisite: COM 240. Design and implementation of communication research methods, including experimental and survey research procedures. Use of computer software for statistical analysis.

COM 387 Advanced Television Production 3. Offered in Spring Only. Prerequisite: COM 224. 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.


COM 395 Studies in Rhetoric and Digital Media 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.

COM 402 Advanced Group Communication 3. Offered in Spring Only. Prerequisite: COM 202. 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.

COM 403 Touring Theatre 3. Offered in Spring Only. A touring performance experience consisting of text analysis, characterization, role development, and performance of scripts.

COM 411 Rhetorical Criticism 3. Rhetorical analysis of public speeches, social movements, political campaigns, popular music, advertising, and religious communication. Neo-Aristotelian criticism, movement studies, genre criticism, dramaturgic analysis, content analysis, fantasy theme analysis.

COM 417 Advanced Topics in Communication and Race 3. Offered in Fall and Spring. Prerequisite: COM 257, Corequisite: COM 250. 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.

COM 421 Communication Law 3. Offered in Fall Only. 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.

COM 427 Game Studies 3. Exploration of inter-relationships 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 reality games. Discussion of interconnections among games, education, and art. Jr/Sr Standing.

COM 431 Communication in Political Campaigns. Offered in Fall Only. Prerequisite: COM 110 or COM 201. Roles of analysis and criticism of oral communication in political campaigns; analysis of special political communication situations; ghostwriting, news conferences, negative advertising.

COM 436 Environmental Communication. Offered in Fall Only. Prerequisite: COM 230 or STS 214. 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 Junior/Senior standing.

COM 437 Advanced Digital Video. Offered in Spring Only. Prerequisite: COM 357. 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.

COM 441 Ethical Issues in Communication. Offered in Spring Only. Prerequisite: COM 110, 112. Critical analysis of ethical problems in interpersonal and public communication practices.

COM 442 Communication and Conflict Management. Offered in Fall Only. Prerequisite: COM 112. 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.

COM 447 Communication and Globalization. Offered in Fall Only. Prerequisite: COM 237. 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.

COM 451 Visual Rhetoric. Offered in Spring Only. Prerequisite: COM 201 or COM 321. Examine the rhetorical strategies employed in various public 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.

COM 456 Organizational Communication. Offered in Fall Spring Summer. Prerequisite: COM 230. 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 employemotivation.


COM 466 Nonprofit Leadership & Development. Offered in Spring Only. Nonprofit Leadership and Development is a service-learning course in which students will be expected to make a 20-hour commitment to service in a local nonprofit organization. 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.

COM 474 Video in Business and Industry. Offered in Fall Only. Prerequisite: COM 224 or COM 354. Planning and controlling the use of video for training, employee communication, public relations, and other purposes in organizations. Applications, organizational variables, and technologies.

COM 476 Public Relations Campaigns. Offered in Fall and Spring. Prerequisite: COM 226, COM 316, COM 386 and Corequisite: COM 346. Management of the public relations function in organizations and public relations counseling; communication theory and nature of materials emanating from public relations department and counseling firms, practical analysis and development of public relations publicity and campaigns.

COM 477 Mobile Tech Cultur. 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.

COM 487 Internet and Society. Offered in Fall Only. Prerequisite: COM 230 and COM 257. 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.

COM 493 Audition and Interpretation Techniques. Offered in Fall and Spring. Cold-reading scenes broken down to meet challenges of theatrical auditions. Personal techniques developed to interpret texts through exercises, monologues, and scenes. Promotion of self-awareness, confidence, and understanding of dramatic literature as reflector of contemporary and historic lives.
COM 496 Communication Internship 3. Offered in Fall and Spring. Directed work experience for Communication majors with supervision from the work site and the University.

COM 498 Advanced Topic in Communication 1-3. Offered in Fall and Spring. Prerequisite: Nine hours of communication courses, Junior standing. Advanced study of contemporary theories, methods, practices, processes, or issues related to the field of communication. Topic varies.

COM 499 Advanced Independent Study in Communication 1-3. Offered in Fall and Spring. Prerequisite: Nine credits in Communication courses. Junior standing or Senior standing in Communication. 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.

COOPERATIVE EDUCATION

COP 100 Co-Op Work 1st Alt 0. Offered in Fall Spring Summer.

COP 101 Co-Op Work 1st Par 0. Offered in Fall Spring Summer.

COP 200 Co-Op Work 2nd Alt 0. Offered in Fall Spring Summer.

COP 201 Co-Op Work 2nd Par 0. Offered in Fall Spring Summer.

COP 300 Co-Op Work 3rd Alt 0. Offered in Fall Spring Summer.

COP 301 Co-Op Work 3rd Par 0. Offered in Fall Spring Summer.

COP 400 Co-Op Work 4th Alt 0.

COP 401 Co-Op Work 4th Par 0. Offered in Fall Spring Summer.

CROP SCIENCE

CS 103 Introductory Topics in Crop, Soil and Turfgrass Sciences 1. Offered in Fall Only. Introduction to the scope, purpose, and objectives of a university education with an emphasis on areas related to Crop, Soil and Turfgrass Sciences. Students will explore university, college and departmental resources, academic policies and procedures, opportunities for minors, career opportunities, and current trends and issues in our related disciplines. Students cannot receive credit for both CS 103 and ALS 103. Freshman Only; PAA, PAB, PAC, PAE, PCB, SST, TFG.

CS 200 Introduction to Turfgrass Management 4. Offered in Fall Only. Prerequisite: BIO 181(preferred) or ZO 160(alternate) BO 200, or CS 213. 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.

CS 210 Lawns and Sports Turf 3. Offered in Fall Spring Summer. 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.


CS 213 Crops: Adaptation & Production 4. Offered in Fall and Spring. Prerequisite: BIO 181(preferred) or ZO 160(alternate) or BO 200. Fundamental structure and reproductive features of crops. Their adaptation and importance in global agriculture. Practices and inputs needed for economic production of a quality product and interaction of these factors within the constraints of climate, soils, and topography in maintaining a quality environment.

CS 216 Oilseed Crop Production 3. Offered in Fall Only. Fundamental agronomic practices associated with the production of oilseed crops (soybean, peanuts and cotton). Discussions will include crop growth and development stages, variety characteristics, planting strategies, fertility and pest management programs, harvest and storage options, and the use of technologies associated with the production and maintenance of quality oilseed crops.

CS 218 Cereal Grain Crop Production 2. Offered in Spring Only. Fundamental agronomic practices associated with the production of cereal grain crops (corn and small grains). 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 grain.

CS 224 Seeds, Biotechnology and Societies 3. Offered in Fall Only. 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.

CS 230 Introduction to Agroecology 3. Offered in Fall Only. Prerequisite: BIO 105 or BIO 181 or BIO/ZO 160 or BO 200 or BO 250 or HS 201 or CS 213. 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.

CS 290 Professional Development in Plant & Soil Sciences 1. Offered in Fall Only. This course is designed to prepare students for careers in Plant and Soil Sciences. Student discussions with faculty
and industry professionals will center on structure and requirements for internship and jobs, research and extension opportunities, resume building and writing, professionalism and professional development, interpersonal skills, undergraduate program management, and career planning. Student development of an e-portfolio is required. Must hold sophomore or junior standing in: TAA, TAB, TAC, TSS, TFG.

CS 312 Grassland Management for Natural Resources Conservation 3. Offered in Fall Only. Prerequisite: BIO 181(preferred) or ZO 160(alternate) CS 213, SSC 200. Basic principles and practices of production and use 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.

CS 400 Turf Cultural Systems 3. Offered in Spring Only. Prerequisite: C- or better in CS 200. Topics include: golf course design considerations, fertilizer characteristics and application techniques, irrigation programming, construction of high use turfgrass areas, calibration of spreaders and sprayers, aerification, pesticide fate and development of effective management systems.


CS 413 Plant Breeding 2. Offered in Spring Only. Prerequisite: GN 411 or ANS 215. Discussion of reproductive systems of higher plants; the genetic basis for plant improvement and the selection, evaluation, and utilization of crop varieties.

CS 414 Weed Science 4. Offered in Fall Only. Prerequisite: CH 220. 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.

CS 415 Integrated Pest Management 3. Offered in Fall Only. Prerequisite: BIO 181(preferred) or ZO 160(alternate) or BO 200 or BO 250. 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.

CS 424 Seed Physiology 3. Offered in Spring Only. Prerequisite: PB 321 or PB 421 or FOR 303. 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.

CS 430 Advanced Agroecology 4. Offered in Spring Only. 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.

CS 440 Geographic Information Systems in Production Agriculture 3. Offered in Spring Only. Prerequisite: SSC 341. Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

CS 462 Soil-Crop Management Systems 3. Offered in Spring Only. Prerequisite: CS 213, CS 414, SSC 342, SSC 452, Senior standing. 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.

CS 465 Turf Management Systems and Environmental Quality 3. Offered in Fall Only. Prerequisite: CS 400 and Senior standing. 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 cannot be received for both CS 465 and CS 565. Senior standing.

CS 470 Advanced Turfgrass Pest Management 2. Offered in Spring Only. Prerequisite: C- or better in CS 200. 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.

CS 490 Senior Seminar in Crop Science and Soil Science 1. Offered in Spring Only. Review and discussion of current topics in crop science, soil science, agronomy and natural resource management. Preparation and presentation of scientific information in written and oral form. Senior standing in Agronomy, Plant and Soil Sciences, or Turfgrass Science.

CS 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

CS 493 Special Problems in Crop Science 1-6. Offered in Fall and Spring. 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.

CS 495 Special Topics in Crop Science 1-6. Offered in Fall Spring Semester. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.
CSC 100 Computer Literacy 2. . . Survey of computer hardware and software systems, how programs are created, how computers are used in organizations, and the effects of the computer society. Four written assignments and a final exam. Credit for CSC 100 is not allowed if student has prior credit in another computer science course or computer-related course. Offered only through Independent study by Extension..

CSC 112 Introduction to Computing-FORTRAN 3. Offered in Fall and Spring. Corequisite: (E115 or PMS 100) and (MA 121 or MA 131 or MA 141). 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..

CSC 114 Introduction to Computing-C++ 3. . Corequisite: (E115 or PMS 100) and (MA 121 or MA 131 or MA 141). An introductory course in computing in C++. Emphasis on algorithm development and problem solving. Particular elements include: careful and methodical development of C++ programs from specifications; documentation and style; appropriate use of control structures, data types and subprograms; data abstraction and verification; numeric and nonnumeric applications; introduction to object-oriented programming and design..

CSC 116 Introduction to Computing - Java 3. Offered in Fall and Spring. Corequisite: (E115 or PMS 100) and (MA 121 or MA 131 or MA 141). An introductory course in computing in Java. Emphasis on algorithm development and problem solving. Careful and methodical development of Java applications and applets from specifications; documentation and style; appropriate use of control structures; classes and methods; data types and data abstraction; object-oriented programming and design; graphical user interface design..

CSC 200 Introduction to Computers and Their Uses 3. Offered in Fall Spring Summer. . 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.

CSC 214 Programming Concepts 3. . Prerequisite: CSC 114 with a grade of C- or better. Software design in a high-level language: abstract data types, modular programming, management of large programs. Dynamic memory management: linked lists, pointers, allocation and deallocation. Alternate programming paradigms: recursive list processing, object-oriented programming..

CSC 216 Programming Concepts - Java 3. Offered in Fall and Spring. Prerequisite: CSC 116 with a grade of C- or better. The second course in computing, intended for majors. Emphasis is placed on interpretation of inductive definitions (functions and data types); testing strategies; specification and implementation of finite-state machine; encapsulation; polymorphism; inheritance; class invariants; and resource management.


CSC 230 C and Software Tools 3. Offered in Fall Spring Summer. Prerequisite: CSC 216 with a C- or better and CSC or CSU Majors and Minors.. 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..

CSC 234 Computer Organization and Assembly Language 3. . Prerequisite: CSC 214 with a grade of C- or better. Number systems, von Neuman machines, instruction sets and machine code, data representation, assemblers and assembly language programming, compilers, external and internal processor organization, memory, /O organization and devices. Detailed study of a contemporary processor architecture..

CSC 236 Computer Organization and Assembly Language for Computer Scientists 3. Offered in Fall and Spring. Prerequisite: CSC 216 with a C- or better and CSC or CSU Majors and Minors.. Computer architecture topics required by professional software developers, including binary and hexadecimal numbers, hardware component organization, machine instruction sets, assembler language programming, linking assembler language with high-level languages, program testing, computer hardware design issues, computer software design issues, and trends in current computer design..

CSC 244 Concepts and Facilities of Operating Systems 3. . Corequisite: CSC 234. The history and evolution of operating systems, concepts of process management, memory addressing and allocation, files and protection, deadlocks and distributed systems..

CSC 246 Concepts and Facilities of Operating Systems for Computer Scientists 3. Offered in Fall and Spring. Prerequisite: CSC 230; Corequisite: CSC 236; CSC and CSU Majors and Minors. 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.

CSC 251 Web Page Development 1. Offered in Spring Only. Prerequisite: E 115 or equivalent knowledge of EOS/Unity system. 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..

CSC 252 Introduction to Software Testing 1. Offered in Fall Spring Summer. Prerequisite: CSC 112 or CSC 114 or CSC 116. Introduction to software testing provides an understanding of what software testing is and its key role in determining the quality of a software application for the customer. It covers the software test life cycle phases; test planning, acquisition and execution, how the software test life cycle aligns with the software development life cycle, and the different levels of software testing.
CSC 253 C and C++ for Java Programmers 1. Offered in Fall and Spring. Prerequisite: CSC 116. Programming in the C and C++ languages. Concentrates on aspects of the language that differ from the Java language, with the assumption that students already have a basic knowledge of programming, so builds upon an understanding of loops, conditional logic, and a basic understanding of objects.

CSC 254 Visual C++ 1. Offered in Fall Only. Prerequisite: CSC 214 or CSC 216. Programming in Windows 95/NT using the Visual C++ compiler and tools. The focus is on using the Microsoft Foundation Classes (MFC), understanding the Win32 API, and modern operating systems concepts.

CSC 255 String Processing Languages 1... 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.

CSC 256 Leadership in Technology 1. Offered in Fall Only. This "executive seminar" course provides CSC students exposure to highly successful technology leaders, introduces them to the essential leadership skills required to be successful in their own careers in technology, and exposes them to a proven approach and road map for effectively managing change. Development of sound business communications skills.

CSC 257 Introduction to Java 1. Offered in Fall Only. Prerequisite: CSC 214. Introduction to the Java programming language. Object-oriented techniques and language syntax. Java class libraries including strings, graphical interfaces, events, exceptions, arguments, threads, file i/o, and networking.

CSC 295 Special Topics in Computer Science 1-3. Special topics in CSC at the early undergraduate level.

CSC 302 Introduction to Numerical Methods 3. Offered in Fall and Spring. Prerequisite: CSC 116 and MA 305, CSC Majors or 2.75 GPA. 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 differentiation and integration; linear systems of equations; curve fitting; solutions of non-linear equations; numerical solutions of ordinary differential equations.

CSC 312 Computer Organization and Logic 4. Offered in Fall and Spring. Prerequisite: CSC 236 and a grade of C- or better in CSC 226. Combinational logic circuits and their relation to Boolean algebra. Functional properties of combinational and sequential components and their realizations in integrated circuit forms. Organization of digital computer components; processors, control units, memories, switches, and peripherals. Architecture of computer systems. Computer arithmetic. Microprogrammed control. Interrupt mechanisms. Laboratory exercises involve logical, functional, and electrical properties of components from gates to microprocessors.

CSC 314 Data Structures 3. Offered in Fall Spring Summer. Prerequisite: CSC 214 and CSC 224 with a grade of C- or better. A survey of fundamental abstract data types along with efficient implementations for each. Emphasizes asymptotic running time as a measure of program performance. Lists, stacks, queues, sparse arrays, binary trees, heaps, balanced search trees, and hash tables. Illustrative applications such as graph, text-processing, or geometric algorithms.

CSC 316 Data Structures for Computer Scientists 3. Offered in Fall and Spring. Prerequisite: CSC 216 and CSC 226 with a grade of C- or better. CSC, CSU Majors and Minors and CPE Majors. 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.

CSC 326 Software Engineering 3. Offered in Fall and Spring. Prerequisite: CSC 230 and either CSC 314 or CSC 316. Application of product engineering methods to software: quality assurance, project management, requirements analysis, specifications, design, development, testing, production and maintenance.

CSC 333 Automata, Grammars, and Computability 3. Offered in Fall and Spring. Prerequisite: Grade of C- or better in CSC 226, CSC Majors or 2.75 GPA. 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.

CSC 340 Information Systems Management 3. Offered in Fall and Spring. Prerequisite: M110. 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.

CSC 342 Applied Web-based Client-Server Computing 3. Prerequisite: CSC 216 with a grade of C- or better. 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 delivery.

CSC 370 Computing: Professionalism and Social Responsibility 3... Professional and social issues associated with computing, and their ethical dimensions. Basics of ethical theory, including utilitarianism and duty-based ethics. Codes of ethics and professional responsibility. Intellectual property, privacy and security, software safety. Malware, including viruses and worms. Hacking and cracking. The impact of new technologies such as artificial intelligence and virtual reality. Social impacts, including depersonalization, accessibility, gender issues and the "digital divide." Credit may not be earned in both CSC 370 and CSC 379. CSC 370 does not carry CSC restricted elective credit.

CSC 379 Ethics in Computing 1. Offered in Spring Only. 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 case studies to relate to ethical theory. Ethical and legal use of software. Conflicts of interest.

CSC 401 Data and Computer Communications Networks 3. Offered in Fall and Spring. Prerequisite: ST 370 and CSC 246. Basic concepts of data communication networking and computer communications architectures, including packet/circuit/virtual-circuit switching, layered communication architecture and OSI layers, general description of DLC, network and transport layers, some detailed protocol study of Ethernet, ATM and TCP/IP. Credit is not allowed for both CSC 401 and ECE 407.

CSC 402 Network Projects 3. Prerequisite: CSC 401. Under the supervision of faculty members, students engage in projects that may...
include communication architecture implementation, networking technology assessment, network performance evaluation, and network administration. Comprehensive written and oral project report required. No auditing.

CSC 405 Introduction to Computer Security 3. Offered in Fall Only. Prerequisite: CSC 246. 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.

CSC 411 Introduction to Artificial Intelligence 3. Offered in Spring Only. Prerequisite: CSC 316. 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 clauses, 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.

CSC 413 Electronic Commerce Technology 3. Offered in Spring Only. Prerequisite: CSC 316. An introduction to the technologies underlying electronic commerce. Topics include Web protocols and languages, Web mining, product ontologies, security anonymity, privacy, recommendation systems, personalization, auctions, trading agents, and intellectual property.

CSC 416 Introduction to Combinatorics 3. Offered in Spring Only. Prerequisite: MA 225 or CSC 226. 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.

CSC 417 Theory of Programming Languages 3. Offered in Fall and Spring. Prerequisite: CSC 316. 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.

CSC 422 Automated Learning and Data Analysis 3. Offered in Spring Only. Prerequisite: ST 370 and MA 365, and a grade of C- or better in either CSC 226 or LOG 201. Introduction to the problems and techniques 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.

CSC 423 Information Resources Management 3. Prerequisite: CSC/BUS 340. Information Resources Management as a process that encompasses strategic planning, the implementation of new technology, dramatic changes to both the corporate Management Information Services and traditional information systems architecture, and the emerging role of end user computing to enable a business enterprise to operate effectively. May not be used as a CSC restricted elective.

CSC 425 Engineering Knowledge-Based Services 3. Offered in Fall Only. Prerequisite: CSC 316. Applied knowledge representation and reasoning, including formal methods for explicit representation of knowledge, pragmatics of methods for acquiring knowledge from experts, and reasoning methods organized to support configuration, diagnosis, scheduling, information, integration and interpretation, and other major service types. Credit is not allowed for both CSC 425 and CSC 525.

CSC 427 Introduction to Numerical Analysis I 3. Offered in Fall Only. Prerequisite: MA 301 and programming language proficiency. 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.

CSC 428 Introduction to Numerical Analysis II 3. Offered in Fall and Spring. Prerequisite: MA 405 and programming language proficiency; MA (CSC) 427 is not a prerequisite. 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.

CSC 431 File Organization and Processing 3. Offered in Fall and Spring. Prerequisite: CSC 230 and CSC 316. 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 tries. Dynamic hashing techniques. Structures including grid files. Applying file structures to practical problems.

CSC 440 Database Management Systems 3. Offered in Fall Only. Prerequisite: CSC 316, CSC Majors. 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.

CSC 441 Introduction to Simulation 3. Offered in Fall and Spring. Prerequisite: MA 242, ST 372, programming language proficiency. 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.

CSC 450 Web Services 3. Offered in Spring Only. Prerequisite: CSC 316. 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.

CSC 451 Operating Systems 3. Offered in Fall and Spring. Prerequisite: CSC 246, CSC 230, and CSC 316. Design and implementation of operating system internals. Structure of an operating system kernel, process synchronization primitives, interrupt handlers, and device drivers. Details of the run-time environment supporting high level languages for concurrent programming. Programming required.

CSC 454 Human-Computer Interaction. Offered in Spring Only. Prerequisite: CSC 316. A survey of concepts and techniques for user interface design and human computer interaction. Emphasizes user-centered design, interface development techniques, and usability evaluation.

CSC 456 Computer Architecture and Multiprocessors. Offered in Spring Only. Prerequisite: CSC 236 and CSC 316. 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.

CSC 460 Digital Systems Interfacing. A grade of C- or better in either ECE 206 or CSC 312. Concepts of microcomputer system architecture and applications to fundamental computer hardware. Theoretical and practical aspects of interfacing and a variety of microprocessor peripheral chips with specific microprocessor/microcomputer systems from both hardware and software points of view.

CSC 461 Computer Graphics. Offered in Fall Only. Prerequisite: MA 305, CSC 230 and CSC 316. 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++.

CSC 462 Advanced Computer Graphics Projects. Offered in Spring Only. Prerequisite: CSC 461. CSC Majors. 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.

CSC 467 Multimedia Technology. Offered in Spring Only. Prerequisite: CSC 246. 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.

CSC 471 Software Process and Development Tools. Offered in Fall Only. Prerequisite: CSC 246 and CSC 316. A study of project software management, development and computer-based software engineering tools. Topics include: team-work, software standards and processes, personal software process, computer-based software engineering (CASE) tools (e.g., CASEtools for classical and object-oriented software specification, analysis, design, verification, validation, testing, and maintenance.).

CSC 474 Network Security. Offered in Spring Only. Prerequisite: CSC 230. 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.

CSC 481 Computer Game Design and Development. Offered in Fall Only. Prerequisite: CSC 316. An introduction to the technologies and practices underlying computer and console game development and the principles involved in effective game design and production. Topics include computer game graphics, sound and audio, level design, principles of gameplay, interactive storytelling, character control and artificial intelligence, user interface design. Programming project required.

CSC 482 Advanced Computer Game Projects. Offered in Spring and Fall Only. Prerequisite: CSC 481. 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.

CSC 485 Innovating in Technology. Offered in Fall Only. Prerequisite: CSC 316. Importance of innovation to the success of the technical individual, State, and Nation. Techniques for becoming more innovative. Innovations important to recent generations. Innovations needed to help humankind. Applying new technologies, e.g. search engines and the Internet, to innovation. Strategies for innovation. Why ideas fail. Why failures are important to successes. Factors influencing success, especially the human interface. Students will develop proof-of-concept prototype or requirements document, write proposal for potential funding, and make oral presentation of innovation. Teamwork encouraged.

CSC 489 Fundamentals of Computer Science. Offered in Fall Only. Provides the background for graduate students who do not have an undergraduate degree in computer science to take selective, graduate-level computer science courses. Computer organization from both hardware and software viewpoints is discussed. Includes computer system organization, digital logic, microprogramming, conventional machine language, operating systems, assembly language, advanced computer architectures, and data structures.

CSC 492 Senior Design Project. Offered in Fall and Spring. Prerequisite: CSC 326; CSC Majors. 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.

CSC 495 Special Topics in Computer Science 1-6. Offered in Fall Spring Summer. 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.
CSC 499 Independent Research in Computer Science 1-6. Offered in Fall Spring Summer. Independent investigation of a research problem under faculty supervision. Departmental Approval Required.

D 100 Design Thinking I 2. Offered in Fall Only. Design topics including: processes, methods, philosophies, theories and special topics such as making choices in a consensus driven organization or in a collaborative venture. A companion course to the second semester discipline specific Fundamental Studios.

D 101 Design Thinking II 2. Offered in Spring Only. Prerequisite: D100. This course evolves from the direct application of design thinking principles in the various design disciplines. It is intended to give a variety of perspectives from which to proceed into the design process. Students are expected to write reflections on the material presented in class, to develop a personal philosophy of design statement and to conclude with the construction of a design thought model that represents each student's thinking process. A review of relevant films and invited lecturers from the design disciplines.

D 102 Design Culture and Context I 3. Offered in Fall and Summer. Design Culture and Context I is an interdisciplinary survey of the impact of culture on the ideas, styles and expressions of art and design during the 19th and 20th centuries. With a focus on the United States and societies around the globe, a variety and material references from architecture, industrial design, textile and clothing manufacture, the arts, graphic design, film and new media will be used to explore the "big picture" of the things people create--material culture--within a frame of significance, utility and public need.

D 103 Design Culture and Context II 3. Offered in Spring and Summer. Prerequisite: D 102. Design Culture and Context II examines design action and the relationships between design and other systems, chiefly the natural and built environment, society and culture, and technology and economics. Case studies presented by affiliate College of Design faculty, professionals and principle investigators in Universal Design, Natural Learning and Museum Practice will introduce students to the cultural implications of crafting meaningful solutions to current challenges and public needs.

D 104 First Year Studio I 4. Offered in Fall Only. Prerequisite: D 100 and D 102; restricted to Design majors only. First Year Studio I provides College of Design freshman with a comprehensive introduction to foundational design concepts and methods representative of creative thought and activity across design and artistic disciplines. An integral component of the larger interdisciplinary curricular framework that is a "First Year Experience." This 4-credit Fall semester course encourages entering freshman to think creatively through design and, the world around them, as they secure a skillful level of craftsmanship in the development and making of all studio-based work.

D 105 First Year Studio II 4. Offered in Spring Only. Prerequisite: D 101 and D 103; restricted to Design majors only. First Year Studio II 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 First Year Studio I. Spring semester is an integral component to the larger interdisciplinary curricular framework that is a "First Year Experience". This four credit Spring semester course encourages First Year Students to think critically about phenomena such as Light Effects, Mechanics and Motion and Human Measurements and Scale. The topics are related to design and students are guided and encouraged to act creatively through design as they secure a skillful level of craftsmanship in the development and making of all studio-based work.

In this second semester studio, the students will further exercise their design thinking abilities, and improving their skills, methods and knowledge of design practice through assignments related to more focused and smaller scale than the first semester. The students will have a larger scope of context understanding and a practice designing small projects. Students will reaffirm a personal commitment to the development of design thinking and skills, and students are expected to purchase design materials.

D 231 Design History for Engineers and Scientists 3. Offered in Fall and Spring. 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 "revolutions" and their impact upon each other and upon other intellectual and practical endeavors.

D 292 Special Topics in Design I-3. Offered in Fall Spring. Summer. Topics of current interest in the college of Design. Used to develop new courses.

D 492 Special Topics in Design I-6. Offered in Fall Spring. Summer. Topics of current interest in the College of Design. Used to develop new courses.

DANCE

DAN 210 Current Trends in Afrocentric and World Dance I. Offered in Fall and Spring. 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.

DAN 264 Ballet 1. Offered in Fall and Spring. Beginning level ballet technique course. Fundamental ballet concepts and vocabulary introduced through barre and center exercises and combinations.

DAN 272 Dance Composition I. Offered in Fall and Spring. Prerequisite: PE 264 or PE 274. Creative problem-solving using the components of movement composition. Development of movement vocabulary through structured improvisation. Development of a thematic phrase. Manipulation of the thematic phrase through various choreographic devices. Structure of the developed materials.

DAN 274 Modern Dance I. Offered in Fall and Spring. Introduction of movement and dance concepts and techniques through theory and analysis, improvisation and composition, structured dance exercises combinations.

DAN 275 Modern Dance II. Offered in Fall and Spring. Prerequisite: PE/DAN 274 Continuation of Modern Dance I. Emphasis on design of body in space, movement qualities and musicality through structured technical exercises and combinations.

DAN 290 Special Topics in Dance I-4. Examination of selected topics in dance. May be repeated for credit provided course content is different each time.
**Design Fundamentals**

**DS 101 Design Fundamentals Studio I & II**  
Introduction to the design disciplines and departments of the College of Design. A studio course examining the techniques and attitudes for dealing with identification, solution and evaluation of problems arising from the design of physical artifacts in the natural and built environment. The design studio process includes the acquisition of languages and skills appropriate to design studies.

**Design Studies**

**DS 101 History of Design I, From Before the Apple to Xia Gui 3. Offered in Fall Only.**  
DS 101 covers the history of design from caves and ‘rude stone monuments’ through the Renaissance. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures, while providing insight into the impact of early design on later periods of art and design. Required for all Design Studies majors. 15 seats per year will be reserved for Design Studies majors.

**DS 102 History of Design II: From Xia Gui to Newton’s Centotaph 3. Offered in Spring Only. Prerequisite: DS 101 for DS Majors, None for Non-Majors.**  
DS 102 covers the history of design from the 1200s through the 1700s. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures. Required for all Design Studies majors. 15 seats reserved for Design Studies majors.

**DS 203 History of Design III: From Newton’s Centotaph to After Apple 3. Offered in Spring Only.**  
DS 203 covers the history of design from the Industrial Revolution to the present day. It covers both western or European history, as well as the design history of Asia, India, and the Americas. The course will provide students a way of seeing the parallel development of the arts in these various cultures. Required for all Design Studies majors. 15 seats per year will be reserved for Design Studies majors.

**DS 244 Material Culture and Industrial Design 3. Offered in Spring Only.**  
DS 244 covers the history of technology and industrial design. The course is divided into three major units: technology, design, and materials before the industrial revolution; the impact of the industrial revolution; and current and future developments of the field. Required for all Design Studies majors. 15 seats reserved for Design Studies majors.

**DS 251 History of Aesthetics I, From the Pre-Socratics throughout the Renaissance 3. Offered in Spring Only.**  
This course examines in depth and from a cross-disciplinary perspective the history of aesthetics from Plato through the Renaissance. The course focuses on Plato's theory of beauty and compares it to Aristotle and follows this tradition through the middle ages and the Renaissance. Additionally, time will be spent looking at and studying artifacts from various periods in light of aesthetic theories.

**DS 352 History of Aesthetics II, Seventeenth and Eighteenth Centuries 3. Offered in Fall Only. Prerequisite: DS 251.**  
This course examines the nascent period of modern aesthetic theory. Beginning with Newton's science and Locke's epistemology, it looks at how this arid, mathematical, and additive view of the physical world and the imagination altered over the course of the eighteenth century to the entirely new vision of the Romantics, engendered by a century of reaction to Locke and systemized by Immanuel Kant, who saw the physical world as acausal and the imagination as a faculty more significant that reason.

**DS 353 History of Aesthetics III, Nineteenth Century 3. Offered in Spring Only. Prerequisite: DS 352.**  
The course analyzes the effects of nineteenth century science on aesthetic theory, and opposing metaphysical theories. Of significant importance to the course will be the contributions of Caisriner and Panofsky's Philosophy of Symbolic Form. The idea of Modernism, as embodied in the philosophy of the Bauhaus will form a core component of the course. The research process, current theories will be examined, including Marxism and Capitalism, Feminism, and Post-Modernism.

**DS 454 History of Aesthetics IV, Twentieth Century 3. Offered in Fall Only. Prerequisite: DS 353.**  
The course analyzes the effects of twentieth century science on aesthetic theory, and opposing metaphorical theories. Of significant importance to the course will be the contributions of Cassirer and Panofsky’s Philosophy of Symbolic Form. The idea of Modernism, as embodied in the philosophy of the Bauhaus will form a core component of the course. Towards the end of the course, current theories will be examined, including Marxism and Capitalism, Feminism, and Post-Modernism.

**DS 481 Design Studies Senior Research Seminar 3. Offered in Fall Only.**  
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.

**DS 482 Design Studies Capstone Seminar 1. Offered in Spring Only. Prerequisite: DS 481.**  
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.

**DS 483 Design Studies Capstone Research Paper 2. Offered in Spring Only. Prerequisite: DS 481.**  
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.

DS 494 Design Studies Internship 1-6. Offered in Fall Spring Summer. 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.

ENGINEERING

E 101 Introduction to Engineering & Problem Solving 1. Offered in Fall Only. 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.

E 110 Engineering Scholars Forum 0. Offered in Fall and Spring. 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.

E 111 Engineering Scholars Forum 0. Offered in Fall and Spring. 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.

E 115 Introduction to Computing Environments 1. Offered in Fall Spring Summer. 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.

E 123 Engineering 1-2-3: Product and Processing Engineering 2. Offered in Fall and Spring. Introduction to product and process (1) usage, (2) assembly, and (3) engineering calculations and design through the case study approach. Working in teams of two, students explore bar code scanners and inventory systems, compact disc audio and CD-ROM information storage and retrieval, photocopier and FAX devices, optical fiber communications and probes, video camera and video cassette recorder, and water purification technologies.

E 144 Academic and Professional Preparation for Engineering I 1. Offered in Fall Only. 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.

E 145 Academic and Professional Preparation for Engineering II 1. Offered in Spring Only. Engineering as a field of study and profession. Career and professional development, goal setting, decision making and effective communication strategies.

E 210 Engineering Scholars Forum 0. Offered in Fall and Spring. 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.

E 211 Engineering Scholars Forum 0. Offered in Fall and Spring. 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.

E 298 Special Topics Engineering 1-3. Offered in Spring Only.

E 432 Patents, Trademarks and Copyrights 3. Offered in Spring Only. Patent, trademark and copyright problems that arise in engineering, scientific and industrial pursuits. Includes the rights and remedies available to individual inventors and authors as well as companies. Patent Office procedures and practices.

E 490 Fundamentals of Engineering(FE) Exam Preparation 1. Offered in Fall and Spring. 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.

E 497 Engineering Research Projects 1-3. Offered in Fall Spring Summer. Projects in research, design or development in engineering or computer science.

ADULT & HIGHER EDUCATION

EAC 301 Introduction to Leadership Fundamentals 3. Offered in Fall and Spring. 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.

EAC 496 Special Topics in Adult Learning and Leadership 1-6. Exploration of specialized areas and topics of current interest in adult learning and leadership.

ECONOMICS

EC 201 Principles of Microeconomics 3. Offered in Fall Spring Summer. 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.

EC 202 Principles of Macroeconomics 3. Offered in Fall Spring Summer. Prerequisite: EC 201 or ARE 201. 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.
EC 205 Fundamentals of Economics 3. Offered in Fall Spring Summer. 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.

EC 301 Intermediate Microeconomics 3. Prerequisite: MA 121 or 131 or MA 141; EC 201 or EC 205 or ARE 201. 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. Credit not allowed in more than one of EC 301, 310, 401.

EC 302 Intermediate Macroeconomics 3. Offered in Fall Spring Summer. Prerequisite: (EC 201 or EC 205 or ARE 201) and (MA 121 or MA 131 or MA 141). 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.

EC 304 Introduction to Financial Markets and Institutions 3. Offered in Fall Spring Summer. Prerequisite: EC 201 or EC 205 or ARE 201. Financial assets, markets and institutions. Stock and bond markets. Measurement and determination of rates of return on financial assets. Banks and other financial intermediaries including their management and regulation. Roles of the Federal Reserve System and monetary policy in determining interest rates, economic activity and foreign exchange rates. Credit will not be given for both EC 304 and EC 404.

EC 305 A Closer Look at Capitalism 3. Prerequisite: EC 201 or EC 205 or ARE 201. 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.

EC 310 Managerial Economics 3. Prerequisite: EC 201 or EC 205 or ARE 201. Microeconomic principles applied to decision-making in the firm. Present value analysis. The relationship between accounting and economic concepts of cost. Criteria and procedures for decision-making under uncertainty. Economic allocation by markets and the price system. Sources of market power and competitive advantage. Applications to product pricing and advertising. Credit not allowed in more than one of EC 301, 310, 401.


EC 336 Introduction to Resource and Environmental Economics 3. Offered in Fall and Spring. Prerequisite: ARE 201 or EC 201 or EC 205. 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.

EC 348 Introduction to International Economics 3. Offered in Fall Spring Summer. Prerequisite: EC 201 or EC 205 or ARE 201. 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.

EC 351 Data Analysis for Economists 3. Offered in Fall Only. Prerequisite: (BUS/ST 350 or ST 302 or ST 361 or ST 370 or ST 372). 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.

EC 372 Evolution of American Business 3. Offered in Fall and Spring. Prerequisite: EC 201 or EC 205 or ARE 201. Historical development of modern business enterprise from the Colonial Era through World War II. Emphasis on the transformation of business practices in response to technological change, evolution of capital markets, growth of international trade, changes in distribution techniques, entrepreneurship, and the influence of government regulation.

EC 377 The Political Economy of the Market Process 3. Offered in Spring Only. Prerequisite: EC 201 or EC 205 or ARE 201. The institutional, philosophical and economic foundations of markets. Social and political implications of private property, voluntarism and the forms of social cooperation derived from markets. The effects of public policies intended to alter the economic outcomes of markets. The morality of markets, legal and institutional settings, cooperation and the nature of exchange, the social function of prices.

EC 404 Money, Financial Markets, and the Economy 3. Prerequisite: (EC 302 or BUS 320) and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372). Roles of money, credit, and financial institutions in the modern economy. Determination of level and structure of interest rates and exchange rates, determination of security prices. Management and regulation of financial institutions. Federal Reserve System and monetary policy. Statistical analysis of financial and monetary data. Credit will not be given for both EC 304 and EC 404.

EC 410 Public Finance 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. 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.

EC 413 Competition, Monopoly and Public Policy 3. Offered in Spring Only. Prerequisite: EC/ARE 301 or EC 310. Current theories of industrial organization with specific reference to such topics as cartels, industrial concentration, vertical integration, franchise contracts, ownership and control of firms, multipart and discriminatory pricing, and tie-in sales. Economic aspects of antitrust law and government regulation of industry.

EC 431 Labor Economics 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. 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.

EC 436 Environmental Economics 3. Offered in Spring Only. Prerequisite: EC/ARE 301 or EC 310. Usefulness of economics in understanding pollution, congestion, conservation and other environmental problems. Relevant economic tools such as pricing schemes, abatement cost curves, damage functions and benefit-cost analysis. Pollution taxes, regulations, marketable permits and subsidies considered in designing alterations, in the incentive system. Current public policy alternatives in the context of non-market decision-making.

EC 437 Health Economics 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. Application of micro-economic tools to the analysis of public and private policy issues concerning health care financing and delivery in the United States.

EC 442 Evolution of Economic Ideas 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. General development of economic ideas from ancient times through the post-Keynesian period. Emphasis on the classical school and developments thereafter. The evolution of economic ideas in the context of the changes in technology and the increasing complexity of economic activity.

EC 448 International Trade 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. Determinants of commodity composition of trade and analysis of tariffs, quotas, and transport costs. Treatment of international investment including multinational corporations. Analysis of the effects of tariffs and quotas. Relationship between international trade and economic growth.

EC 449 International Finance 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. 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.

EC 451 Introduction to Econometrics 3. Offered in Spring Only. Prerequisite: (EC/ARE 301 or EC 310) and EC 302 and BUS/ST 351. 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.

EC 452 Forecasting for Business and Economics 3. Prerequisite: EC 351. The use of statistical tools to develop forecasts for business and economics. Data collection problems and types of data. Time series approach to forecasting. Use of regressions and surveys for forecasting. Forecast evaluation and presentation of forecasts.

EC 471 Evolution of the American Economy 3. Offered in Spring Only. Prerequisite: EC/ARE 301 or EC 310. Relationship of modern economic development to the history of America. Analysis of contemporary problems and issues with reference to their origins in the historical growth of the economy.

EC 472 The Rise of Industrialism 3. Offered in Fall and Spring. Prerequisite: EC/ARE 301 or EC 310. Historical development of the modern industrial economy from origins in medieval and early modern Europe. The industrial revolution in England and its diffusion throughout the western world and beyond.

EC 474 Economics of Financial Institutions and Markets 3. Offered in Spring Only. Prerequisite: MA 121 or MA 131 or MA 141), and (BUS 320 or EC 302). Management, development and regulation of U.S. financial markets and institutions. Management of major financial intermediaries and their historical development. Analysis of major financial assets and their markets. The role and history of the Federal Reserve and other financial regulators.

EC 480 Introduction to Economic Research 3. Offered in Spring Only. Prerequisite: (EC 301 or EC 310) and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372). Finding economic data. Critically analyzing newspaper and journal articles using economic reasoning. Developing, writing, and presenting economic analysis.

EC 490 Research Seminar in Economics 3. Offered in Fall and Spring. Prerequisite: (EC/ARE 301 or EC 310) and EC 302; and (BUS/ST 350, or ST 302, or ST 361, or ST 370, or ST 372). 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.


EC 495 Special Topics in Economics 1-6. 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. Offered in Fall Spring Summer. 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.

COUNSELOR EDUCATION

ECD 220 College Student Development and Peer Counseling 2. Offered in Fall and Spring. Developmental issues of young adulthood with opportunity for the acquisition of paraprofessional counseling skills and crisis intervention skills. Major consideration is given to self-awareness and values clarification through utilization of personality inventories and self-assessment instruments. Priority will be given to resident advisors and students active in student organizations or volunteer programs.

ECD 221 Career Planning and Personal Development 3. Offered in Fall and Spring. 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.

ECD 222 Sexual Violence Prevention for Peer Educators 3. 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.

ECD 224 Student Development and Peer Mentoring 2. Offered in Fall Only. 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.

ECD 296 Special Topics in Education: Counselor Education 1-3. Offered in Fall Spring Summer. 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.

ECE 109 Introduction to Computer Systems 3. Offered in Fall Spring Summer. Introduction to key concepts in computer systems. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps.

ECE 200 Introduction to Signals, Circuits and Systems 4. Offered in Fall Spring Summer. Prerequisite: Cumulative GPA 2.5 or above, C- or better in MA 241, PY 205, and CSC 116. Introduction to key concepts in computer organization. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps, direct memory access, structured program development.

ECE 206 Introduction to Computer Organization 3. Offered in Fall Spring Summer. Prerequisite: GPA 2.5 or above, with a C- or better in MA 241, PY 205, and CSC 116. Introduction to key concepts in computer organization. Number representations, switching circuits, logic design, microprocessor design, assembly language programming, input/output, interrupts and traps, direct memory access, structured program development.

ECE 209 Computer Systems Programming 3. Offered in Fall Spring Summer. Prerequisite: Grade of C- or better in ECE 109. Computer systems programming using the C language. Translation of C into assembly language. Introduction to fundamental data structures: array, list, tree, hash table.

ECE 211 Electric Circuits 4. Offered in Fall Spring Summer. Prerequisite: C- or better in ECE 200 and Corequisite: ECE 220. Introduction to theory, analysis and design of electric circuits. Voltage, current, power, energy, resistance, capacitance, inductance, Kirchhoff's laws node analysis, mesh analysis, Thevenin's theorem, Norton's theorem, steady state and transient analysis, AC, DC, phasors, operational amplifiers, transfer functions.

ECE 212 Fundamentals of Logic Design 3. Offered in Fall Spring Summer. Prerequisite: C- or better in ECE 109 or ECE 200. 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.

ECE 220 Analytical Foundations of Electrical and Computer Engineering 3. Offered in Fall Spring Summer. Prerequisite: C- or better in ECE 200. The modeling, analysis and solution of circuit theory, control, communication, computer, and other system arising in electrical and computer engineering using various analytical techniques. Numerical solutions to ECE problems using MATLAB and SPICE.

ECE 292 Special Topics in Electrical and Computer Engineering 1-3. Offered in Fall Spring Summer. Special topics in electrical and computer engineering at the early undergraduate level.

ECE 301 Linear Systems 4. Offered in Fall Spring Summer. Prerequisite: A grade of C- or better in ECE 211 and ECE 220. Representation and analysis of linear systems using differential equations: impulse response and convolution, Fourier series, and Fourier and Laplace transformations for discrete time and continuous time signals. Emphasis on interpreting system descriptions in terms of transient and steady-state response. Digital signal processing.

ECE 302 Microelectronics 4. Offered in Fall Spring Summer. Prerequisite: A grade of C- or better in ECE 211. Introduction to the physics of semiconductors, PN Junctions, BIT and MOS field Effect Transistors: Physics of operation, IV characteristics, circuit models, SPICE analysis; simple diode circuits; Single Stage Transistor Amplifiers: Common Emitter and Common Source configurations, biasing, calculations of small signal voltage gain, current gain, input resistance and output resistance; Introduction to Differential Amplifiers, Operational Amplifiers.

ECE 303 Electromagnetic Fields 3. Offered in Fall Spring Summer. Prerequisite: A grade of C- or better in ECE 211 and ECE 220. Static electric and magnetic fields. Maxwell's equations and force laws. Propagation, reflection and refraction of plane waves. Transient and steady-state behavior of waves on transmission lines.

ECE 305 Electric Power Systems 3. Offered in Fall and Spring. Prerequisite: C- or better in ECE 209 and ECE 212. Principles, performance and characteristics of power-system components, including direct-current and alternating-current machinery, transformer banks and transmission lines. Principles and analysis of system power flow.

ECE 306 Introduction to Embedded Systems 3. Offered in Fall and Spring. Prerequisite: C- or better in ECE 206 and ECE 212. Introduction to designing microcontroller-based embedded computer systems using assembly and C programs to control input/output peripherals. Use of embedded operating system.


ECE 331 Principles of Electrical Engineering 13. Offered in Fall Spring Summer. Prerequisite: MA 241, PY 208. 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, transformers, motors and control systems. Not available to EE and CPE majors..

ECE 380 Engineering Profession for Electrical Engineers 1. Offered in Fall and Spring. Prerequisite: ECE 212, ECE 301, and ECE 302. 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..

ECE 381 Engineering Profession for Computer Engineers 1. Offered in Fall and Spring. Prerequisite: ECE 212, ECE 301, and ECE 302. 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..

ECE 383 Introduction to Entrepreneurship and New Product Development 1. Offered in Fall and Spring. 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 design and implementation of the prototype product..

ECE 402 Communications Engineering 3. Offered in Fall Spring Summer. Prerequisite: ECE 301, ST 371. 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..

ECE 403 Electronics Engineering 3. Offered in Fall and Spring. Prerequisite: ECE 301, ECE 302. Design and analysis of discrete and integrated electronic circuits, from single-transistor stages to operational amplifiers, using bipolar and MOS devices. Feedback in operational amplifier circuits, compensation and stability. Laboratory design projects..

ECE 404 Introduction to Solid-State Devices 3. Offered in Fall and Spring. Prerequisite: ECE 302. 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..

ECE 406 Design of Complex Digital Systems 3. Offered in Fall and Spring. Prerequisite: A grade of C- or better in ECE 212. Design principles for complex digital systems: Iteration, top-down/bottom-up, divide and conquer, and decomposition. Descriptive techniques, including block diagrams, timing diagrams, register transfer, and hardware-description languages. Consideration of transmission-line effects on digital systems..

ECE 407 Introduction to Computer Communications 3. Offered in Fall and Spring. Prerequisite: ECE 301. Engineering principles of computer communications: Summary of digital transmission, media and switching, error control, layering concept, overview of protocols; architectures for local, metropolitan, and wide-area networks; emerging issues in digital communications systems..

ECE 420 Wireless Communication Systems 3. Offered in Fall and Spring. Prerequisite: ECE 402. 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..


ECE 422 Transmission Lines and Antennas for Wireless 3. Offered in Fall Only. Prerequisite: ECE 403. 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..

ECE 435 Elements of Control 3. Offered in Fall and Spring. Prerequisite: ECE 301. Analog system dynamics, open- and closed-loop control, block diagrams and signal flow graphs, input-output 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..


ECE 437 Distributed Real Time Control Systems 3. Prerequisite: ECE 301 and ECE 306. Principles for designing an intelligent distributed control system which includes multiple embedded microprocessors communicating over a computer network. Design of basic components, modes, input/output interface, and communication network. Real-time implementation issues, such as sampling, task scheduling, and network traffic control. Lab experiments on design of basic components, plus a major design project.

ECE 442 Integrated Circuit Technology and Fabrication 3. Offered in Fall Only. Prerequisite: ECE 404. Semiconductor device and integrated-circuit processing and technology. Wafer specification and preparation, oxidation, diffusion, ion implantation, photolithography, design rules and measurement techniques..

ECE 445 Frontiers of Nanoelectronics 3. Offered in Fall Only. Prerequisite: ECE 302. This course will discuss frontiers of nanoelectronics including fundamentals of silicon based devices and their impact on scaled logic and memory devices as well as organic based devices such as carbon nanotubes and molecular electronics. Additional topics include recent uses of polymer films for memory and photovoltaic applications, quantum confinements in 1D, 2D, and 3D, quantum dots, nanowires and resonant tunneling devices. Included are methods to create and measure nanostructures..

ECE 451 Power System Analysis 3. Offered in Fall Only. Prerequisite: ECE 305. 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.

ECE 452 Renewable Electric Energy Systems 3. Offered in Spring Only. Prerequisite: ECE 305 or ECE 331. Principles and characteristics of renewable energy based electric power generation technologies such as photovoltaic systems, wind turbines, and fuel cells. Major system design issues. Integration of these energy sources into the power grid. Economics of distributed generation.


ECE 455 Computer Control of Robots 3. Offered in Spring Only. Prerequisite: ECE 435. 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.

ECE 456 Mechatronics 3. Offered in Fall Only. Prerequisite: ECE 435. 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.

ECE 460 Digital Systems Interfacing 3. Prerequisite: ECE 406. Concepts of microcomputer system architecture and applications to fundamental computer hardware. Theoretical and practical aspects of interfacing and a variety of microprocessor peripheral chips with specific microprocessor/microcomputer systems from both hardware and software points of view.

ECE 461 Embedded System Design 3. Offered in Spring Only. Prerequisite: Grade of C- or better in ECE 306. 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.

ECE 463 Advanced Microprocessor Systems Design 3. Offered in Fall and Spring. Prerequisite: ECE 406. Advanced topics in microprocessor systems design, including processor architectures, virtual-memory systems, multiprocessor systems, and single-chip microcomputers. Architectural examples include a variety of processors of current interest, both commercial and experimental. Major design project.

ECE 464 ASIC Design 3. Offered in Spring Only. Prerequisite: ECE 406, ECE 302. Design of digital application specific integrated circuits (ASICs) based on hardware description languages (Verilog, VHDL) and CAD tools. Emphasis on design practices and underlying algorithms. Introduction to deep sub-micron design issues like interconnections and low power and to modern applications including multi-media, wireless. Telecommunications and computing. Required design project.


ECE 466 Compiler Optimization and Scheduling 3. Offered in Fall Only. Prerequisite: ECE 306 and either ECE 309 or CSC 316. Provide insight into current compiler designs dealing with present and future generations of high performance processors and embedded systems. Investigate dataflow analysis and memory disambiguation, classical and parallelism enhancing optimizations, scheduling and speculative execution, and register allocation. Review of techniques used in current research compilers.

ECE 470 Internetworking 3. Offered in Fall and Spring. Prerequisite: ECE 407 or CSC 401. 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.

ECE 480 Senior Design Project in Electrical Engineering 3. Offered in Fall and Spring. Prerequisite: ECE 301, ECE 302, ECE 303, ECE 380, and any two ECE specialization Courses. 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.

ECE 481 Senior Design Project in Computer Engineering 3. Offered in Fall and Spring. Prerequisite: ECE 381, ECE 301, ECE 302, ECE 303, ECE 406 and an ECE specialization elective. Application of engineering and basic sciences to the total design of computer 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.

ECE 482 Engineering Entrepreneurship and New Product Development I 3. Offered in Fall and Spring. Prerequisite: ECE 383 (with a grade of C- or better). 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.

ECE 483 Engineering Entrepreneurship and New Product Development II 3. Offered in Fall and Spring. Prerequisite: ECE 301, ECE 302, ECE 303, ECE 583, and any two ECE specialization courses. 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.
CURRICULUM & INSTRUCTION

ECI 102 Introduction to Middle Grades Education 2. Offered in Fall and Spring. Introduction to the Middle Grades Academy and middle school teaching from the perspective of “What do I bring to teaching?” Students will formulate an initial teaching philosophy as well as engage in an introspective examination of their beliefs, values, and skills in relation to teaching early adolescents. Students are required to provide their own transportation.

ECI 185 Introduction to Academic Discourse & Learning 3. Offered in Fall Only. Socializes students to the intellectual conventions of the university by focusing on the learning process and critical thinking with academic discourse, both written and oral.

ECI 201 Intro to Instructional Technology for Educators 2. Offered in Spring Only. Beginning teachers in North Carolina are required to demonstrate mastery of technology skills, to be able to use that technology in their classrooms and teach the state computer skills curriculum. This hands-on course covers the basic skills included in the National Educational Technology Standards for Teachers. In this course students will begin the process of creating technology artifacts for the teaching portfolio, required for initial licensure.

ECI 204 Intro to Teaching 1-2. Offered in Fall and Spring. Prerequisite: Sophomore standing; Corequisite: ED 204. 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.

ECI 205 Introduction to Teaching Humanities and Social Sciences 3. Offered in Fall and Spring. 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 avarity of education settings including an extended period in one curriculum area.


ECI 296 Special Topics in Education 3-3. Offered in Fall and Spring. Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ECI 303 Planning for Student Vocational Organizations 3 . . .

ECI 305 Principles of Teaching Diverse Populations 3. Offered in Fall and Summer. Prerequisite: ECI 205 or ECI 206. Impact of cultural factors on experiences of teachers and students in contemporary schools. Teaching techniques and development of instructional plans to enhance schooling experiences of culturally diverse students.

ECI 306 Middle Years Reading 3. Offered in Spring Only. Prerequisite: Six hours in ED or PSY. Reading skills in middle years education developed with emphasis on application of the reading process to content area.

ECI 307 Teaching Writing Across the Curriculum 3. Offered in Spring Only. Prerequisite: ENG 112. 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 (LTL) majors.

ECI 309 Teaching in the Middle Years 3. Offered in Fall and Spring. Prerequisite: Six hours in ED or PSY. 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.

ECI 331 Health Professions 3. Offered in Summer. An examination of key occupations and professions in the health cluster. Emphasis is on educational preparation, requirements for practice, potential advancement, inter- and intra-professional relationships, ethical foundations of practice, and the concept of commitment. Theoretical concept of role structure and function.

ECI 332 Health Promotion and Disease Prevention 3. Offered in Spring Only. Emphasis on education of the public regarding general health concerns including cancer, cardiovascular disease, accidents prevention, nutrition, drugs, alcohol, mental health, sexuality, and environmental hazards.

ECI 333 Health Care Delivery 3 . . . The historical basis of healthy 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 healthy care workers.


ECI 336 Strategies for Teaching a Health Occupations Course 3. Offered in Spring Only. 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.

ECI 405 Literature for Adolescents 3. Offered in Fall Only. 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.
ECI 414 Human Relations and Discipline in the Classroom 3. Prerequisite: PSY 304 or EDP 304 and 6 hours of education. Designed to help prospective teachers foster positive interpersonal relationships in classrooms, build a sense of community and create a purposeful environment for learning. Investigates issues such as group building, active listening, and major approaches to discipline. Uses case studies and problem solving methods.

ECI 415 The Arts and Adolescence 2. Offered in Spring Only. Prerequisite: 6 hours ED/PSY, Middle Grades Majors (MSL, MSD). Relationship of the arts to the academic work of adolescent learners. Arts and adolescent development; arts and learning processes within and outside of the classroom; experimentation and skill development in graphic arts, sculpture, music, drama, dance/movement, film, and poetry.

ECI 416 Teaching Exceptional Students in the Mainstreamed Classroom 3. Offered in Spring Only. Prerequisite: Six hours in ED or PSY. 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.

ECI 423 Methods and Materials in Teaching Modern Foreign Languages 5. Offered in Fall Only. Prerequisite: Admission to Professional Semester, Corequisite: ECI 424. Methods and materials for teaching modern foreign languages K-12 including the use of instructional media. Taught M-F during first 7 weeks of the semester.

ECI 424 Student Teaching in French or Spanish 8. Offered in Fall Only. Prerequisite: Admission to Professional semester, Corequisite: ECI 423. Ten-week teaching experience for prospective teachers of French or Spanish in a selected elementary, middle or high school under the supervision of a cooperating teacher and a university faculty supervisor.


ECI 430 Methods and Materials for Teaching Language Arts in the Middle Grades 4. Offered in Fall Only. 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.

ECI 434 Clinical Supervision in Health Occupations 3. Offered in Spring Only. Prerequisite: Six hours of Health Occupations courses. Supervisory techniques for health care professionals in initial levels of administrative positions. Internal and external factors affecting and staffing and supervision process. Organization of the supervisory process. Government and labor relations in the health industry.

ECI 435 Methods and Materials for Teaching Social Studies in the Middle Grades 4. Offered in Fall Only. 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.


ECI 437 Health Occupations Teaching Practicum 1-3. Offered in Fall and Spring. Practical teaching experience in health occupations. Certification majors complete 15 weeks of student teaching in secondary programs (8 credit hours). Non-certification majors teach in a hospital, community college, technical institute, private health industry, or other health-care setting (3-8 credit hours).

ECI 438 Medical Law and Ethics 3. Offered in Fall Only. 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.

ECI 440 Internship in Teaching English as a Second Language 3. Offered in Summer. 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.

ECI 442 Field Experience in Business and Marketing Education 3. Offered in Fall and Summer. 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. 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.

ECI 444 Administration of Business and Marketing Education 3. Offered in Fall Only. Prerequisite: ED 204 and ECI 204 and MKE Business and Marketing Education Major. 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.

ECI 446 Curriculum and Methods of Teaching Business and Marketing Education 3. Offered in Fall Only. 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.

ECI 447 Student Teaching in Business and Marketing Education 8. Offered in Spring Only. Prerequisite: Admission to Professional Semester; MKE Business and Marketing Education Majors. Corequisite: ECI 494. Fifteen weeks full time student teaching business and marketing subjects in the public schools under the supervision of a cooperating teacher and university supervisor. Instruction, evaluation, advisement, administration, observation. Students are expected to provide their own transportation to and from assigned public schools.
ECI 448  E-Business Applications in Business and Marketing Education 3. Offered in Fall and Summer.  . 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..

ECI 450  Methods and Materials in Teaching English 4. Offered in Fall Only.  . 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..

ECI 451  Improving Reading in Secondary Schools 2. Offered in Fall Spring Summer. Prerequisite: Six hours in ED or PSY. A study of methods and materials for teaching reading in the secondary school, with an emphasis on the effective use of written materials for content area instruction..

ECI 454  Student Teaching in English/Language Arts 1-8. Offered in Spring Only. Prerequisite: Admission to Student Teaching Professional Semester.  For MSL students: ECI 430; 416, 464. For LTN students: ECI 450. Provides the prospective teacher with experience in the techniques and skills involved in teaching English or Language Arts. Ten weeks in a selected off-campus station. Student teachers become familiar with the total school program and participate in selected school and community activities..

ECI 460  Methods and Materials in Teaching Secondary Social Studies 4. Offered in Fall Only.  . 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..

ECI 464  Student Teaching in Social Studies 1-8. Offered in Fall Only. Prerequisite: Admission to professional semester, Corequisite: For LTH, LTP, LTS students: ECI 460. For MSL students: ECI 454, 430, 416. 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..

ECI 471  Educational Implications of Learning and Developmental Theory 3. Offered in Summer.  . Topics related to human psychological development. Cognitive, social, physical changes, and their interaction among adolescence. Departmental Approval Required..

ECI 472  Interaction of Classroom Management and Instruction 3. Offered in Summer. Prerequisite: ECI 471; NC TEACH Participants. 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..

ECI 473  Subject Specific Methods 3. Offered in Fall Only.  . 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.

ECI 474  Curriculum and Instruction Practices 1 3. Offered in Fall Only. Prerequisite: ECI 472 ; NC TEACH participants, Corequisite: ECI 473. 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..

ECI 475  Peer Mentoring in Alternative Licensure 3. Offered in Spring Only. Prerequisite: ECI 474 ; NC TEACH Participants, Corequisite: ECI 476. 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..

ECI 476  Curriculum and Instruction Practices 2 3. Offered in Spring Only. Prerequisite: ECE 474 ; NC TEACH Participants, Corequisite: ECI 475. Topics related to inquiry, activity based instruction, and constructivist principles. Analysis of principles, strategies and application of new teaching approaches. Departmental Approval Required..


ECI 488  Basic American Sign Language 3. Offered in Fall and Spring.  . Conversational sign language skill development and introduction to aspects of American Sign language, deafness, and deaf culture..

ECI 494  Senior Seminar in Business and Marketing Education 3. Offered in Spring Only. Prerequisite: Admission to Professional Semester ; MKE Business and Marketing Education Majors, Corequisite: ECI 447. Discussion and analysis of problems, trends, and issues experienced while student teaching in the public schools.

ECI 496  Special Topics in Education 1-3. Offered in Fall and Spring.  . 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.

ED 100  Intro to Education 2. Offered in Fall and Spring.  . This course serves as an introduction to teaching and learning in 21st century K-12 classrooms and as an orientation to the College and University experience. through technology-assisted plenary and small group seminars, students will examine the knowledge, skills and dispositions necessary to become globally aware, ethical, reflective teachers of diverse populations in the 21st century. Topics include academic skills, student success strategies, standards for teachers, and programs in the College of Education. This course is restricted to Teacher Education majors only..

ED 101  Freshman Teaching Fellows Forum I 1. Offered in Fall Only.  . 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.
ED 102 Freshman Teaching Fellows Forum II 1. Offered in Fall and Spring Only. 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.

ED 103 Teaching Fellows Seminar 1. Offered in Fall Only. An orientation to academic requirements of higher education, a review of teacher education components and elements of teacher education curricula, identification of characteristics of an effective student, and an introduction to instructional methods and issues in the field of education.

ED 111 Education and Psychology Scholars Forum 0. Offered in Fall and Spring. Interdisciplinary seminar 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.

ED 150 Students Advocating for Youth I 1. Offered in Fall Only. Building upon a passion for advocacy. Investigating issues related to youth in today's North Carolina. Exploring youth advocacy and ethics. Exploring youth advocacy and diversity. Exploring youth advocacy as a vocation. Practical youth advocacy field work. Participation in field experiences required. Restricted to students admitted to the SAY program.

ED 151 Students Advocating for Youth II 1. Offered in Spring Only. Prerequisite: ED 150. 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 field work. Participation in field experiences required. Field experience may extend beyond normal class time. Restricted to students admitted to the SAY program.

ED 200 Teach ED Candidacy 0. . .

ED 201 Sophomore Teaching Fellows Forum I 1. Offered in Fall Only. Topics related to educational issues and requirements of the Teaching Fellows program. Topics will include current practices, policies and research in education.

ED 202 Sophomore Teaching Fellows Forum II 1. Offered in Spring Only. 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.

ED 204 Introduction to 21st Century Teaching 2. Offered in Fall and Spring. Prerequisite: Sophomore standing. Corequisite: ECI 204 or EMS 204, or TDE 202. Overview of teaching as work and a profession in the 21st century. Course focuses on establishing a respectful environment for a diverse student population, dispositions and practices required for effective teaching, and processes and outcomes of collaborative lesson study. 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.

ED 211 Education and Psychology Scholars Forum 0. Offered in Fall and Spring. Second level of interdisciplinary seminar series with presentations by distinguished faculty members and experts drawn from technical, academic, business and government communities.

ED 290 Special Topics in Education 1-3. Offered in Fall and Spring. Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ED 301 Junior Teaching Fellows Forum I 1. Offered in Fall Only. 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.

ED 302 Junior Teaching Fellows Forum II 1. Offered in Spring Only. 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.

ED 310 Tutoring Adolescents 1. Offered in Fall and Spring. Prerequisite: ECI 205 or EOE 207, Corequisite: EMS 203. Developing skills in tutoring adolescent students. Emphases include identifying adolescent learning difficulties, using a variety of tutoring methods and a tutorial self-evaluation process. Requires off-campus field work.

ED 311 Classroom Assessment Principles and Practices 2. Offered in Fall Spring Summer. Prerequisite: Admission to Teacher Education Candidacy; Co-requisite: ED 312. This course will enable students to understand and use appropriate classroom assessment practices to promote positive student achievement. Students will apply knowledge of pedagogy and development to high-quality strategies for formative and summative assessment. Students will explore 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. 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.

ED 312 Classroom Assessment Principles and Practices Professional Learning Lab 1. Offered in Fall Spring Summer. Prerequisite: Admission to Teacher Education Candidacy; Co-requisite: ED 311. This class is a co-requisite professional learning lab to ED 311, Classroom Assessment Principles and Practices. It will enable students to engage in the application of assessments using both case study and classroom data sets. The course will help students understand and use appropriate formative and summative classroom assessment in a learning community/learning team to improve student learning. Students will explore best practices in assessment through the guidance of professional educators and the use of commercially available products for formative and summative assessment. 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.

ED 362 Curr Met Indus Art 4. . .
ED 403 Teaching Fellows Senior Seminar 1. Offered in Fall and Spring. 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.

ED 496 Special Topics in Education 1-3. Offered in Fall and Spring. 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.

ED 605 Special Problems in Teaching 1-3. In-depth study of topical problems in teaching selected from areas of current concern to K-12 teachers.

EDP 304 Educational Psychology 3. Offered in Fall Spring Summer. 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.

EDP 370 Applied Child Development 3. Offered in Fall Only. 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.

EDP 476 Psychology of Adolescent Development 3. Offered in Fall Spring. Prerequisite: PSY 200 or EDP 304. Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.

EGM 180 Introduction to Mechatronics Laboratory 2. Offered in Spring Only. The objective of this course is to introduce students to the mechatronic engineering discipline as a synergistic combination of mechanical and electrical engineering, computer science, control and information technology. Foundational concepts in mechatronics are addressed including analog and digital electronics, sensors, actuators, microprocessors, and microprocessor interfacing to electromechanical systems through hands on laboratory exercises. Offered only at UNCA.

EGM 360 Advanced Mechatronics Design Laboratory 1. Offered in Fall Only. Prerequisite: EGM 180. An introduction to the design and construction of microprocessor-controlled electromechanical systems, this laboratory course builds on fundamental mechatronics concepts. The course is project and design oriented to provide hands on working knowledge of real time software, real time programming, computer interfacing, mechanical design fabrication and control system design and the integration of these areas. For EGM students only; offered only at UNCA.

EGM 482 Senior Design Project in Mechatronics Engineering 4. Offered in Spring Only. Prerequisite: EGM 360, senior standing. Applications of engineering and basic sciences to the total design of electro-mechanical systems. Consideration of the design process including feasibility study, preliminary design detail, cost effectiveness, along with the development and evaluation of a prototype accomplished through design-team activity. Complete written and oral engineering report required. For EGM students only; offered only at UNCA.

ENTREPRENEURSHIP INITIATIVE

EI 201 Exploring Interdisciplinary Entrepreneurial Thinking 3. Offered in Fall and Spring. 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. Prerequisite: EI 201. 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 travel might be required. Students are responsible for their own transportation to off campus activities.

This course will be offered at least once per semester.

ELEMENTARY EDUCATION

ELM 250 Introduction to Elementary Education in a Global Society 3. Offered in Spring Only. 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 may be required in lieu of lecture on occasion. Students are responsible for their own transportation and from their school based experiences. Students interested in Elementary Education.

ELM 310 Children's Thinking and Additive Reasoning 3. Offered in Fall Only. Prerequisite: ELM 250, Junior standing. 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 may be required in lieu of lecture on occasion. Students are responsible for their own transportation and from their school based experiences.

ELM 320 Teaching Science in the Primary Grades 3. Offered in Fall Only. Prerequisite: ELM 250, Junior standing. Examination of science knowledge and thinking in primary-grade 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 may be required in lieu of lecture on occasion. Students are responsible for transportation to and from their school based experiences.

ELM 330 Teaching Reading in Elementary School: K-2 3. Offered in Fall Only. Prerequisite: ELM 250, Junior standing.
Elementary Education Majors. 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.

ELM 335 Teaching Reading in the Elementary School 3. 3-5 3. Prerequisite: ELM 330, Junior standing, Elementary Education Majors. 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.

ELM 340 Children Design, Create and Invent 3. Offered in Spring Only. Prerequisite: ELM 370, Junior standing, Elementary Education Majors. 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.

ELM 350 Assessment of Learning and Behavior 3. Offered in Fall Only. Prerequisite: ELM 250, Junior standing, Elementary Education Majors. 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.

ELM 370 Connections Seminar I The Elementary Classroom and School Community 3. Offered in Fall Only. Prerequisite: ELM 250, Junior standing, Elementary Education Majors. First of four seminars required for undergraduate elementary education majors. This course introduces preservice teachers to the world of public school classrooms, the tasks of teaching, and to their perspectives regarding a career in teaching. Examines relationships between theory and practice of teaching in mathematics, science, literacy, and assessment. 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.

ELM 375 Connections Seminar II Cultural Identity, Social Justice and Diverse Learners 3. Offered in Spring Only. Prerequisite: ELM 370:Junior standing, Elementary Education majors. This seminar is the second of four seminars required for undergraduate elementary education majors who are pursuing K-6 teacher licensure. The purpose of the course is to help prospective elementary grades teachers develop competencies for increasing student achievement by focusing on multicultural education, teaching to diversity, and understanding the classroom culture. 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.

ELM 400 Connections Seminar III Instructional Design and Assessment 3. Offered in Fall Only. Prerequisite: ELM 375, Senior standing, Elementary Education Majors. This seminar is the third of four seminars required for undergraduate elementary education majors who are pursuing K-6 teacher licensure. 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. Candidates will complete a capstone project that will be taught during their student teaching experience. Weekly fieldwork in schools and related settings is required. Students are responsible for transportation to and from their school based experiences.

ELM 410 Children's Thinking and Multiplicative Reasoning 3. Offered in Spring Only. Prerequisite: ELM 310, Junior standing, Elementary Education Majors. 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 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.

ELM 420 Teaching Science in the Intermediate Grades 3. Offered in Fall Only. Prerequisite: ELM 320, Senior standing, Elementary Education Majors. 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 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.

ELM 430 Teaching Language Arts in the Elementary School 3. Offered in Fall Only. Prerequisite: ELM 355, Senior standing, Elementary Education Majors. 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 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.

ELM 440 Teaching Children with Special Needs in the Elementary Classroom 3. Offered in Fall Only. Prerequisite: ELM 350, ELM 375, Senior standing, Elementary Education Majors. Corequisite: ELM 420. 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. 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.

ELM 450 The Arts for Elementary Education 3. Offered in Fall Only. Prerequisite: ELM 375, Senior standing, Elementary Education Majors. 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.

ELM 460 Social Studies for the Young Learner 3. Prerequisite: ELM 370, Junior standing, Elementary Education Majors. 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. Emphasizes 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.

EDUCATIONAL LEADERSHIP & PROGRAM EVALUATION

ELP 296 Special Topics in Education: General Studies 1-3. Offered in Fall Spring Summer. Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

ELP 344 School and Society 3. Offered in Fall Spring Summer. The interrelationship between the school and other institutions, values, and patterns of thought in American society.

ELP 496 Special Topics in Education: General Studies 1-3. Offered in Fall Spring Summer. 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.

MATH & SCIENCE EDUCATION

EMS 101 Orientation to Mathematics and Science Education 0. Offered in Fall and Spring. Overview of departmental expectations and procedures and introduction to practical aspects of academic life. Opportunity for interaction of students with advisors and with other undergraduates who are nearing completion of programs. Open only to students in Math and Science Education.

EMS 102 Introduction to Middle Grades Education 2. Offered in Fall and Spring. Introduction to the Middle Grades Academy and middle school teaching from the perspective of “What do I bring to teaching?” Students will formulate an initial teaching philosophy as well as engage in an introspective examination of their beliefs, attitudes, talents, strengths, and weaknesses in relation to teaching early adolescents. Students are required to provide their own transportation.

EMS 203 Introduction to Teaching Mathematics and Science 3. Offered in Fall and Spring. Introduces prospective teachers to the teaching of mathematics and science in the middle school and high school. As an important part of the course, students serve as teacher assistants to a classroom teacher. Ideas and questions arising from this experience provide an integral part of the classroom instruction on campus.

EMS 204 Introduction to Mathematics Education 2. Offered in Fall and Spring. Prerequisite: ED 100; Corequisite: ED 204. 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.

EMS 205 Introduction to Teaching Science 2. Offered in Fall and Spring. Prerequisite: Sophomore standing; Corequisite: ED 204. Introduces prospective 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.

EMS 296 Special Topics in Education 1-3. Individual or group study of particular areas of education at the freshman and sophomore levels. Specific topics will vary from semester to semester.

EMS 373 Instructional Materials in Science 3. Offered in Fall Only. Development and selection of teaching materials that reflect concepts of content and emphasis in middle and secondary school science. Experimental and laboratory approaches, including use of microcomputer and video technologies. 2 lecture hours and 6 lab hours per week for 7 weeks.

EMS 375 Methods of Teaching Science I 3. Offered in Spring Only. Prerequisite: EMS 377, Corequisite: EMS 203. 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 inquiry-based learning environments.

EMS 470 Methods and Materials for Teaching Mathematics 3. Offered in Fall Only. Purposes, methods, curricula and evaluation practices for teaching mathematics in middle school and high school. Taught during the first seven weeks of the semester.

EMS 471 Student Teaching in Mathematics 1-12. Offered in Fall and Spring. Prerequisite: Admission to professional semester; Corequisite: EMS 470. 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.

EMS 472 Teaching Mathematics Topics in Senior High School 3. Offered in Fall and Spring. Prerequisite: EMS 204 passed with a B- or better. Preparation for teaching mathematics from both the college repertoire (algebra, geometry, trigonometry, advanced mathematics) and general courses (pre-algebra, technical and consumer mathematics) offered in grades 9-12. This course includes a school-based field experience. Students are required to provide their own transportation. MED Majors only.

EMS 474 Teaching Mathematics Topics in the Middle Grades 3. Offered in Spring Only. Prerequisite: EMS 204 passed with a B- or better. 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.
**EMS 475** Methods of Teaching Science II 3. Offered in Fall Only. **Prerequisite:** EMS 203, ELP 144, PST 304 or EDP 304, Corequisite: EMS 476. Goals, methods, curricula, and evaluation practices in teaching the physical and biological sciences at the middle and secondary school levels. Taught during the first seven weeks of the semester.

**EMS 476** Student Teaching in Science 1-8. Offered in Fall Only. Supervised classroom experience in developing the skills and techniques for teaching science in a selected middle or secondary school for 10 weeks.

**EMS 480** Teaching Mathematics with Technology 3. Offered in Fall and Spring. **Prerequisite:** EMS 203 or MA 131 or 141. 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.

**EMS 490** School Mathematics from an Advanced Perspective 3. Offered in Fall and Spring. **Prerequisite:** MA 403 or MA 407, MA 308 or MA 408, MA 205 or MA 305 or MA 405. This course will serve as a culminating experience for all students majoring in mathematics education and intending to become high school 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.

**EMS 495** Senior Seminar in Mathematics and Science Education 1-3. In-depth investigation of one or more teaching areas in mathematics or science education.

**EMS 496** Special Topics in Education 1-3. 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.

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**ENG 201** Writing Literary Analysis 3. Offered in Fall Spring. **Prerequisite:** ENG 219. Writing about literature for a variety of audiences. Strategies for writing close textual analysis—including attention to versification, narrative technique, and dramatic structure—and for articulating biographical, literary-historical, and cultural-historical contexts. Conventional genres of literary analysis, including "close readings," reviews, and editorial introductions; conventions of organization and prose style in both academic and professional literary discourse; MLA conventions for prose style and documentation.

**ENG 206** Studies In Drama 3. Offered in Fall and Spring. 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.

**ENG 207** Studies in Poetry 3. Offered in Fall and Spring. 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.

**ENG 208** Studies In Fiction 3. Offered in Fall Spring. 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.

**ENG 209** Introduction to Shakespeare 3. Offered in Fall and Spring. 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.

**ENG 210** Introduction to Language and Linguistics 3. Offered in Fall and Spring. **Prerequisite:** ENG 101. 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.

**ENG 214** Introduction to Editing 3. Offered in Fall Spring. **Prerequisite:** ENG 101. 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.

**ENG 216** Technologies for Texts 3. Offered in Spring Only. **Prerequisite:** ENG 101. 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.

**ENG 219** Studies in Great Works of Non-Western Literature 3. Offered in Fall and Spring. **Prerequisite:** ENG 101. 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 Sundial, Gilgamesh, A Thousand and One Nights, and the Quran and such authors as Confucius, Oe Kenzaburo, Omar Khayyam, Rumi, and Amos Oz.
ENG 220 Studies in Great Works of Western Literature 3. Offered in Fall Spring Summer. 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, Augustine, 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.

ENG 221 Literature of the Western World I 3. Offered in Fall Only. 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.

ENG 222 Literature of the Western World II 3. Offered in Spring Only. 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.

ENG 223 Contemporary World Literature I 3. Offered in Fall Only. Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

ENG 224 Contemporary World Literature II 3. Offered in Spring Only. Twentieth-century literature of some of the following cultures: Asian, Arabian, African, Caribbean, Native-American.

ENG 232 Literature and Medicine 3. Offered in Fall and Spring. Study of literature about illness, epidemics, and the science and practice of medicine. Readings will include works by such authors as Boccaccio, Defoe, George Eliot, Kafka, William Carlos Williams, Susan Sontag, and Tony Kushner.

ENG 233 The Literature of Agriculture 3. Offered in Spring Only. A study of writings on the role of farming in the creation of culture and on the connection between the attention to words necessary for good writing and the attention to the land necessary for good farming. Readings may include ancient and modern texts from a variety of cultures and genres. Possible authors include Virgil, Jefferson, Hardy, Cather.


ENG 249 Native American Literature 3. A survey of Native American literatures from before contact with Europeans to contemporary culture. Writers may include: Apess (Pequot), Ridge (Cherokee), Silko (Laguna Pueblo), Mornaday (Kiowa), Power (Sioux) Gunn Allen (Laguna-Sioux), Harjo (Creek), and Erdrich (Anishinaabe).

ENG 251 Major British Writers 3. Offered in Fall Spring Summer. 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.

ENG 252 Major American Writers 3. Offered in Fall Spring Summer. Significant American writers chosen from among such figures as Franklin, Emerson, Thoreau, Hawthorne, Melville, Douglass, Stowe, Whitman, Dickinson, Twain, James, Frost, Faulkner, Hemingway, and Morrison. Credit will not be given for both ENG 252 and either ENG 265 or 266.

ENG 260 Introduction to Literary Study 3. Offered in Fall Spring Summer. Prerequisite: ENG 101. 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.

ENG 261 English Literature I 3. Offered in Fall Spring Summer. A survey of English literature from 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.

ENG 262 English Literature II 3. Offered in Fall Spring Summer. 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.

ENG 265 American Literature I 3. Offered in Fall Spring Summer. 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.

ENG 266 American Literature II 3. Offered in Fall Spring Summer. 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.

ENG 282 Introduction to Film 3. Offered in Fall and Spring. Examination of basic film techniques and basic methods of film analysis. Emphasis on understanding and appreciating film as a major art form.

ENG 283 Introduction to American Folklore 3. Offered in Spring Only. Principal types of folklore; field work in collecting and assimilating material from various cultural traditions. Emphasis on American folklore and its origins.

ENG 287 Explorations in Creative Writing 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.
ENG 290 Backgr of Eng Lit 3. . .

ENG 292 Writing About Film 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.

ENG 298 Special Projects in English 1-3. Offered in Fall Spring Summer . Faculty-guided independent study, or courses on special topics determined by departmental interest or need.

ENG 301 Critical Approaches to Reading Literature 3. Offered in Fall and Spring . Intensive study of criticism from the Ancient world through the contemporary period, including ancient, medieval, Renaissance, Romantic, and early modern theories; the modern period is represented by the dominant schools of twentieth-century criticism (e.g. Formalism, Structuralism, Post-structuralism and Deconstruction, Narratology, traditional Historicism, New Historicism, Marxism and Feminism).

ENG 305 Women and Literature 3. Offered in Spring Only . Nineteenth- and twentieth-century women's literature, as shaped by the intersecting and competing claims of gender, race, class, sexuality, and culture. Focus on fiction, accompanied by critical readings from American studies, feminist literary criticism, and postmodern theory.

ENG 314 Technical Document Design and Editing 3. Offered in Fall Spring Summer . Prerequisite: ENG 214. 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.


ENG 317 Designing Web Communication 3. Offered in Fall and Spring. Prerequisite: ENG 214, or ENG 216, or ENG 314. A course in the layout, design, and composition of web-based communication. Students will learn to analyze audiences and their uses of information in order to plan, compose, and critically evaluate web-based communication. Students will acquire skill with HTML coding, screen design, and multimedia authoring and will apply those skills to the composition of a variety of web texts (i.e. websites). Course work will require students to become proficient with commercially available HTML and photoeditors.

ENG 321 Survey of Rhetorical Theory 3. . . 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.

ENG 323 Writing in the Rhetorical Tradition 3. Offered in Fall Spring Summer. Prerequisite: ENG 101. 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.

ENG 324 Modern English Syntax 3. Offered in Fall and Spring. Prerequisite: ENG 101. Study of Modern English at the sentence level. Analysis of grammatical structure. Consideration of language variation in English.

ENG 325 Spoken and Written Traditions of American English Dialects 3. Offered in Spring Only. Prerequisite: ENG 101. 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.

ENG 326 History of the English Language 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.

ENG 327 Language and Gender 3. Offered in Spring Only. Prerequisite: ENG 101. 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).

ENG 328 Language and Writing 3. Offered in Spring Only. Prerequisite: ENG 101. Study of rhetoric; emphasis on the role of language in the creation of thought and the expression of ideas. Focus on aspects of language that are important to writers: grammar, style, and rhetoric; the relationship between writing and thought; the role of feedback in the writing process; the relationship between oral and written language; the use of technology in writing.

ENG 330 Screenwriting 3. Offered in Spring Only. Writing for films, story planning, character development, communicating information, building scenes, relationships between script and cinematic dimensions, working with studios and editors.

ENG 331 Communication for Engineering and Technology 3. Offered in Fall Spring Summer. 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.

ENG 332 Communication for Business and Management 3. Offered in Fall Spring Summer. 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.
ENG 333 Communication for Science and Research 3. Offered in Fall and Spring. 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.


ENG 350 Internship in Writing and Editing 3. Offered in Fall and Spring. Prerequisite: Any two ENG 214, ENG 215, ENG 216, ENG 314, ENG 315, ENG 317, ENG 421. Directed work experience for English majors including work-site mentoring and evaluation. Department supervision includes course work directed toward designing employment application materials, developing a portfolio of professional work, and reading the literature on workplace socialization.

ENG 359 Topics in Film Studies 3. Offered in Spring Only. Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester.

ENG 362 The British Novel of the 18th Century 3. Offered in Spring Only. Emphasizes major novelists such as Defoe, Richardson, Fielding, Sterne, and Austen.

ENG 363 The British Novel of the 19th Century 3. Offered in Fall Only. Emphasizes major novelists such as Dickens, Trollope, the Brontes, Eliot, and Hardy.

ENG 364 History of Film to 1940 3. Offered in Fall Only. Technological developments and aesthetic movements that shaped cinema production and direction from the beginning of the industry to 1940. Evolution in camera movement, editing, sound storyline, and the documentary. Rise to prominence of the Hollywood studio systems and the contributions of foreign filmmakers.

ENG 368 American Poetry to 1900 3. Offered in Spring Only. American poetry written in English from the colonial period to 1900. Development of styles and themes in relation to historical context. Emphasis on poets such as Bradstreet, Taylor, Wheatley, Poe, Sigourney, Emerson, Longfellow, Whitman, Dickinson, and Robinson.

ENG 369 The American Novel of the 19th Century 3. Offered in Fall Only. 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.

ENG 370 Early Twentieth-Century Fiction 3. Offered in Spring Only. Study of narrative fiction written during the first half of the twentieth century. Typical subjects: James, Conrad, Stein, Hemingway, Woolf, Faulkner, Hurston, Wright, Beckett.


ENG 372 Early Twentieth-Century Poetry 3. Offered in Fall Only. Study of poetry written in English during the first half of the twentieth century. Typical subjects: Hardy, Robinson, Yeats, Eliot, Pound, H.D., Williams, Hughes, Moore, Stevens.


ENG 374 History of Film From 1940 3. Offered in Spring Only. Technological developments and aesthetic movements that have shaped cinema production and direction from 1940 to the present. Evolution in camera movement, editing, sound, storyline, and the documentary. Post-war decline and re-emergence of the Hollywood film industry and the contributions of foreign filmmakers.


ENG 376 Science Fiction 3. Offered in Fall and Spring. Representative works of science fiction. Emphasis on works written in the twentieth century, with some attention to the history and development of the genre.

ENG 377 Fantasy 3. Offered in Fall and Spring. 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.

ENG 378 Women & Film 3. Offered in Spring Only. This course will introduce students to the rich international history of women's participation in the motion picture industry. Course includes readings, screenings, discussions, and a final examination.

ENG 380 Modern Drama 3. Offered in Fall Only. Major plays and playwrights from Ibsen to Pinter, including at least some of the following: Strindberg, Chekhov, Shaw, O'Neill, Hellman, Pirandello, Brecht, Williams, Miller, Albee.

ENG 381 Creative Nonfiction Writing Workshop 3. Offered in Fall and Spring. Prerequisite: ENG 215, 287, 288, or 289. A workshop in creative nonfiction (literary or magazine journalism) for the student with demonstrated understanding of the basic techniques of creative writing and journalism.

ENG 382 Film and Literature 3. Offered in Fall Only. 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.

ENG 383 Folklore and Literature 3. Offered in Fall Only. Relationships between traditional culture and written literature. Genre theory; interchanges between print media and oral tradition; nature of plot, character, and form in Western and non-Western cultural traditions; performance theory. Influence of regional traditions and American literature.
ENG 384 Introduction to Film Theory 3. Offered in Fall Only. Prerequisite: ENG 282. Survey of critical approaches to film art. Application of theoretical paradigms--formalist, realist, psychoanalytic, feminist, poststructuralist--to individual films, genres, national cinemas and directors..

ENG 385 Biblical Backgrounds of English Literature 3. Offered in Fall Only. Influences of the Bible-principal forms, genres, and topics on major English and American writers such as Milton, Spenser, Melville, Eliot, and Faulkner.

ENG 388 Intermediate Fiction Writing Workshop 3. Offered in Fall and Spring. Prerequisite: ENG 288; Students must have earned a "B" or better in ENG 288. An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing prose fiction.

ENG 389 Intermediate Poetry Writing Workshop 3. Offered in Fall and Spring. Prerequisite: ENG 289; Students must have earned a "B" or better in ENG 289. An intermediate workshop in creative writing for students with demonstrated understanding of the basic techniques of writing poetry.


ENG 391 Special Topics in Modern Drama 3. Offered in Fall Only. 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.

ENG 392 Major World Author 3. Offered in Fall and Spring. 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 Gordiner, Borges and Marquez, Nenuda, Achebe, Soyinka, Calvinio, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.

ENG 393 Studies in Literary Genre 3. Offered in Fall and Spring. 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.

ENG 394 Studies in World Literature 3. Offered in Fall and Spring. 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 Metempsychosis. Subjects vary according to availability of faculty. Readings in English translation.

ENG 395 Studies in Rhetoric and Digital Media 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.

ENG 398 Contemporary Literature I (1900 to 1940) 3. . . British and American literature from 1900 to World War II, with representative authors such as Conrad, Yeats, Eliot, Joyce, Woolf, Faulkner, Shaw, Stein, O'Neill, and Wright. For comparative purposes, continental authors such as Kafka and Mann.

ENG 399 Contemporary Literature II (1940 to Present) 3. Offered in Spring Only. Literature from World War II to the present, with representative authors such as Murdoch, Beckett, Nabokov, Ginsberg, Achebe, Fuentes, Kundera, Naipaul, and Morrison.

ENG 400 Applied Criticism 3. Offered in Fall Only. Prerequisite: LTN Majors, Senior standing, formal admission to the methods and student teaching courses, Corequisite: ECI 450. Types and methods of literary criticism designed specifically for students intending to teach English in high school.

ENG 405 Literature for Adolescents 3. Offered in Fall Only. 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.

ENG 406 Modernism 3. Offered in Fall Only. International Modernist movement in literature, from its nineteenth-century origins to its culmination in the early twentieth century. Definitions of modernity, as embodied in a variety of genres. Placement of Modernist texts within a variety of cultures that produced them.

ENG 407 Postmodernism 3. Offered in Spring Only. Literary expressions of Postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century. Definitions of postmodernity, as embodied in a variety of genres. Placement of Postmodernist texts within a variety of cultures that have produced them.

ENG 410 Studies in Gender and Genre 3. Offered in Fall Only. This course examines the ways in which writers have revised the literary genres to include gendered experience. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

ENG 411 Rhetorical Criticism 3. Offered in Spring Only. 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.


ENG 417 Editorial and Opinion Writing 3. Offered in Spring Only. Prerequisite: ENG 214, ENG 215. 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.

ENG 420 Major American Author 3. Offered in Fall Only. 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.

ENG 421 Computer Documentation Design 3. Offered in Fall Only. Prerequisite: ENG 314, 331, 332 or ENG 333. 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.

ENG 422 Writing Theory and the Writing Process 3. Offered in Fall and Spring. Prerequisite: ENG 101. 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.

ENG 425 Analysis of Scientific and Technical Writing 3. Offered in Spring Only. Prerequisite: ENG 314, 331, 332, or 333. 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 scientific or technological setting.

ENG 426 Analyzing Style 3. Offered in Fall and Spring. Prerequisite: ENG 101. Development of a greater understanding of and facility with style in written discourse. Theories of style, stylistic features; methods of analysis, imitation.

ENG 430 Advanced Screenwriting 3. Offered in Spring Only. Prerequisite: ENG 330. 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.

ENG 439 17th-Century English Literature 3. Offered in Spring Only. Works of major nondramatic literary figures in England during the period 1600-1700, such as Donne, Jonson, Herbert, Marvell, Bacon, and Browne.


ENG 449 16th-Century English Literature 3. Offered in Fall Only. Nondramatic prose and poetry of the sixteenth century, with consideration of literary types and movements. Emphasis on major authors, including Sidney and Spenser.

ENG 451 Chaucer 3. Offered in Fall and Spring. Introduction to the study of Chaucer through an intensive reading of The Canterbury Tales.

ENG 452 Medieval British Literature 3. Offered in Spring Only. 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.

ENG 453 The Romantic Period 3. Offered in Fall Only. 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.

ENG 455 Literacy in the U.S. 3. Offered in Spring Only. Prerequisite: ENG 101; Junior or senior standing. 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. Service-learning component links this academic study to required tutoring (2 hours per week) of children and adults in local community service agencies in addition to attending class. Students will need to provide their own transportation.

ENG 459 Seminar in Film Studies 3. Offered in Spring Only. Prerequisite: ENG 282, ENG 384 and Junior or Senior standing. Advanced critical approaches to focused film topics involving film genres, directories styles, or trends within a national cinema. This seminar-style course will include screenings, readings, regular discussions, and a substantive final research paper. Topics will vary from semester to semester. Junior or senior standing or permission of instructor required.

ENG 460 Major British Author 3. Offered in Spring Only. In-depth study of the works of one (or two) British author(s) within their historical and literary-historical context. Sample authors might include; Spencer and Sidney, Swift and Pope, Austen, Wordsworth and Coleridge, Keats and Shelley, the Brontes, the Brownings, Dickens, George Eliot, Hardy, Joyce, Woolf.

ENG 462 18th-Century English Literature 3. Offered in Fall Only. Major figures in English literature between 1660 and 1790. Works studied in relation to social, cultural, political, and religious developments. Emphasis on writers such as Dryden, Swift, Pope, Johnson.

ENG 463 The Victorian Period 3. Offered in Spring Only. Significant British poets, writers of prose non-fiction, and novelists studied in the social, economic, scientific, intellectual, and theological contexts of the Victorian era.

ENG 464 British Literature, 1900-1945 3. Offered in Spring Only. Variety of writings by British authors between the death of Queen Victoria and the end of World War II. Typical subjects: Hardy, Conrad, Shaw, Yeats, Forster, Joyce, Lawrence, Eliot, Woolf, Beckett.


ENG 467 American Colonial Literature 3. Offered in Spring Only. 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.

ENG 468 American Romantics 3. Offered in Fall Only. Major American writers from 1825 to 1865. Relationship between literary developments and social change. Emphasis on such writers as Emerson, Hawthorne, Cooper, Poe, Melville, Douglass, Stowe, Thoreau, and Whitman.
ENG 469 American Realism and Naturalism 3. Offered in Spring Only. Major American writers from 1865 to 1914, with emphasis on novelists such as Twain, James, Howells, Chopin, and Dreiser.


ENG 471 American Literature, Since 1945 3. Offered in Fall Only. Study of a variety of writings by U.S. authors since World War II. Typical subjects: Ellison, Lowell, Williams, Welty, Bellow, Baldwin, O'Connor, Barthelme, Albee, Mailer, Ashbery, Morrison, McDermott, Delillo.

ENG 475 Literature, the Arts, and Mass Culture 3. Offered in Fall and Spring. A review of the debate regarding art and mass culture, with attention to recent developments in cultural theory and practice.

ENG 476 Southern Literature 3. Offered in Fall Only. 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.

ENG 480 Modern Drama 3 . . .

ENG 486 Shakespeare, The Earlier Plays 3. Offered in Fall Only. Shakespeare's major works before 1600 with emphasis on his development as a playwright.

ENG 487 Shakespeare, The Later Plays 3. Offered in Spring Only. Shakespeare's major works after 1600 with emphasis on his tragedies and the late romances.

ENG 488 Advanced Fiction Writing Workshop 3. Offered in Spring Only. Prerequisite: ENG 388. 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.

ENG 489 Advanced Poetry Writing Workshop 3. Offered in Spring Only. Prerequisite: ENG 389. 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.

ENG 490 Studies in Medieval Literature 3. Offered in Fall Only. 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 cultural and historical backgrounds and contemporary scholarship. Some texts in Middle English, some in translation; no prior knowledge of Middle English needed.

ENG 491 Honors in English 3. Offered in Fall and Spring. Intensive course or independent study project designed as one portion of the Honors Program in English. Subject varies.

ENG 492 Special Topics in Film Styles and Genres 3. Offered in Spring Only. Critical approaches to focused film topics involving film genres, directorial styles, or trends within a national cinema. Topics will vary from semester to semester.

ENG 493 Special Topics in Folklore 3. Offered in Spring Only. Topics and genres in folklore, such as Folktale and Legend, Folklore and Religion, African-American Folklore. Topics will vary from semester to semester.

ENG 494 Special Topics in Linguistics 3. Offered in Spring Only. Prerequisite: ENG 101. (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.

ENG 496 Seminar in Literary Criticism 3. Offered in Fall and Spring. Prerequisite: 9 hours of literature at the 300 level or above. 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.

ENG 497 Senior Seminar in World Literature 3. Offered in Spring Only. Rotating topics in world literature, including treatment of materials from more than one culture and including consideration of the subject's theoretical or methodological framework. Readings in English (original languages encouraged but not required).

ENG 498 Special Topics in English I-6. Offered in Fall Spring. Summer. Prerequisite: Six hours in ENG above the 100 level. Directed individual study or experimental course offerings in language or literature. Individual study arranged through consultation with faculty member and Director of Undergraduate Studies.

ENG 499 Special Topics in Creative Writing 3. Offered in Fall and Spring. 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. 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.

ENT 201 Insects and People 3. . . Introduction to the fascinating world of insects and how they interact with people. Survey of insect history, diversity, structure and function, and behavior. Examples of harmful and beneficial insects in a variety of human activities concluding with some profound impacts insects have had on history, society and culture.

ENT 203 An Introduction to the Honey Bee and Beekeeping 3. Offered in Fall Only. Introduction to honey bee biology and a fundamental understanding of beehive management including crop pollination by bees. Examination of the relationships between honey bees and humans from prehistoric through modern times and the behavior and social system of one of the animal world's most complex and highly organized non-human societies.

ENT 207 Insects and Human Disease 3. Offered in Fall and Spring. 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.

ENT 305 Introduction to Forensic Entomology. 3. Offered in Spring Only. 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.

ENT 401 Honey Bee Biology and Management. 3. Offered in Spring Only. Prerequisite: (ENT 201, ENT 203, ENT 425, BIO 105 or PB 200). 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.

ENT 402 Forest Entomology. 3. Offered in Spring Only. Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.

ENT 425 General Entomology. 3. Offered in Fall and Summer. Prerequisite: BIO 181 or BIO 140 or BIO 350. Explores the science of entomology by focusing on the basic principles of systematics, morphology, physiology, development, behavior, ecology, and control of insects. Field trips provide opportunities to collect insects and study their adaptations to a wide variety of natural environments.

ENT 450 Challenges in Plant Resource Protection. 3. Offered in Spring Only. Prerequisite: CS 414 or ENT 425 or PP 315. This course provides applied training to students in the scientific and regulatory aspects of plant protection using real-world studies, scenarios, and addressing important contemporary issues for safeguarding American agriculture. Students will gain hands-on problem solving abilities regarding the diagnosis, containment, and mitigation of introduced plant pests and pathogens.

ENT 460 Fundamentals of (Post) Risk Analysis. 1. This course provides students with a historical perspective as well as real-time exposure to working professionals involved in the development of risk analysis documents for plant protection. The course uses real world scenarios and addresses contemporary issues facing scientists and regulators tasked with safeguarding American agriculture. Students will gain hands-on problem solving abilities regarding the identification and mitigation of plant pathogens, insects, and noxious weeds that can be introduced into the USA through international trade in agricultural commodities.

ENT 470 Advanced Turfgrass Pest Management. 2. Offered in Spring Only. Prerequisite: C- or better in CS 200. 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.

ENT 490 Critical Issues in Plant Protection. 1. This course is of particular interest to students minoring in plant biosecurity and regulatory science; however, it is open to all students. The course will feature subject-matter experts in the area of regulatory plant science that will deliver one hour lectures on emerging and critical topics in regulatory plant protection.

ENT 492 External Learning Experience. 1-6. Offered in Fall and Spring. 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.

ENT 493 Special Problems in Entomology. 1-6. Offered in Fall and Spring. 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.

ENT 495 Special Topics in Entomology. 1-3. Offered in Fall Spring. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.
ES 100 Introduction to Environmental Sciences 3. . .
Environmental Science majors only, permission of instructor. 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.

ES 200 Climate Change and Sustainability 3. Offered in Fall and Spring. 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 responsible for developing and presenting seminars. Student may incur extra expenses with projects for this course.

ES 295 Special Topics in Environmental Science 1-3. Offered in Fall and Spring. Provides instruction on rapidly emerging current issues. Course is offered on an experimental basis before incorporation into the curriculum. See specific course offering for course details.

ES 300 Energy and Environment 3. Offered in Fall and Spring. Prerequisite: CH 101 or PY 212 or PY 208. This course explores relationships between humans, energy, and the environment with interdisciplinary context. 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. Student may incur extra expenses with projects for this course.

ES 400 Analysis of Environmental Issues 3. Offered in Fall and Spring. Prerequisite: ES 100, ES 200, ES 300 and Senior standing. 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 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.

ES 495 Special Topics in Environmental Science 1-6. Offered in Fall and Spring. 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 details.

ES 496 Environmental Science Internship 1-3. Offered in Fall Spring Summer. 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. Students must provide their own transportation for internship. Students are required to purchase internship liability insurance. Contact university insurance & risk management for details on acquiring the insurance and the current charge.

ES 497 Professional Development in Environmental Science 1-3. Offered in Fall Spring Summer. 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.

ES 498 Research in Environmental Science 1-3. Offered in Fall Spring Summer. 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.

ES 499 Thesis in Environmental Science 3. Offered in Fall Spring Summer. 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.

ET 105 Introduction to Environmental Regulations 1. Offered in Fall Spring Summer. 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.

ET 201 Environmental Technology Laboratory I 1. Offered in Fall Only. 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.

ET 202 Environmental Technology Laboratory II 1. Offered in Spring Only. 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.

ET 203 Pollution Prevention 1. Prerequisite: ES 100. 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.

ET 252 Introduction to Spatial Technologies 3. Offered in Spring Only. Introduction to types of spatial information technologies and their uses in environmental assessments. Topics include: map reading, geographic positioning systems, geographic information systems, and
remote sensing. This course will provide a basic overview of these technologies through lectures, and will afford an exposure to their uses through a series of structured laboratory exercises.

ET 301 Environmental Technology Laboratory III 1. Offered in Fall Only. 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 the class receive Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) certification. Required field trips may extend beyond lab time.

ET 302 Environmental Technology Laboratory IV 1. Offered in Spring Only. 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.

ET 303 Laboratory Safety Systems and Management 1. Offered in Fall Only. Theory and practice of regulation, management, and auditing of laboratory safety. Laboratory field trips may extend beyond class time.

ET 310 Environmental Monitoring and Analysis 3. Offered in Spring Only. Prerequisites: CH 220 or CH 221/222. Monitoring and analysis of chemical, biological, and radiological 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.

ET 320 Fundamentals of Air Pollution 3. Offered in Spring Only. Prerequisite: (MA 121, MA 131, or MA 141) and (PY 131 or PY 201 or PY 205 or PY 211). 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.

ET 330 Environmental Technology Practicum 3. Offered in Summer. 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.

ET 401 Environmental Technology Laboratory V 1. Offered in Fall Only. 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 402 Solar Photovoltaic Energy 1. Offered in Fall Only. This course is a study and practical guide to solar photovoltaics including the economic and environmental benefits, how solar electricity works and can be used and the basics on installation of solar electric systems. Guest Lectures and field trips are part of the course. Field trip may exceed normal classroom hours.

ET 410 Toxic Substances and Society 3. Offered in Spring Only. Interdisciplinary evaluation of past, present and future effects of toxic substances in the environment. Addresses various dimensions of toxic substances; special emphasis on ways to minimize adverse effects in contemporary and future societies.

ET 455 Adaptive Management and Governance 3. Offered in Fall Only. Prerequisite: (PS 320 or ARE 309 or PS 336). 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.

ET 460 Practice of Environmental Technology 3. Prerequisite: ET 310. Preparation and presentation of comprehensive environmental assessments and analyses. Critical roles of quality control and assurance. The ISO 14000 environmental management standard of the American National Standards Institute (ANSI). Preparation for certification as an environmental auditor by ANSI and registration as an Environmental Professional by the National Register of Environmental Professionals. Optional training and exams for Environmental Auditors Registration Association and American National Standards Institute/Register Accreditation Board Written Examination available.

ET 470 Environmental Forensics 3. Offered in Fall Only. Prerequisite: ET 252. ET 301, ET 310. Use of site assessment methodologies and state of the art technologies from analytical chemistry, molecular biology, biogeochemistry, and GIS to solve environmental cases of "Who done it?" with regards to soil/sediment, water, and air contamination. Two field trips which may extend beyond class time are required.

ET 490 Senior Seminar in Environmental Technology 1. Offered in Spring Only. Weekly departmental and university seminars and group discussions to enrich and broaden student perspectives on the practice and development of environmental technology. Oral and written reporting of seminars topics.

FOREIGN LANGUAGES


FL 216 Art and Society in France 3. Offered in Fall Only. 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.

FL 219 Studies in Great Works of Non-Western Literature 3. 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
Concentrated treatment of one literary genre, such as the epic, the lyric, semester to semester. May be repeated for credit with a new literature. Kafka, Proust, Lessing and Gordimer, Borges and Marquez, Neruda, Homer, Virgil and Ovid, Lady Murasaki, Marie de France and Intensive study in English, of the writings of one (or two) author(s). Only Twentieth-century literature of some of the limits of human experience. Offered in Fall Only. Offered in Spring Only. 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.

Literature of the Western World II 3. Offered in Spring Only. 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, 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.

Literature of the Western World I 3. Offered in Fall Only. Readings from English translations of Biblical, Classical, Medieval, and Early Renaissance literature, including works by such authors as Homer, Sophocles, Virgil, Ovid, Augustus, Danta, 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.

Literature of the Western World II 3. Offered in Spring Only. 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, Tolstoy.

Contemporary World Literature I 3. Offered in Fall Only. Prerequisite: ENG 112. Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

Contemporary World Literature II 3. Offered in Spring Only. Prerequisite: ENG 112. Twentieth-century literature of some of the following cultures: Asian, Arabian, African, Caribbean, Native-American.


Special Topics in Foreign Languages and/or Literatures 1-3. Offered in Fall Spring Summer. A special projects course on topics to be determined as needed in the departmental program.

Independent Study in Foreign Language or Literature 1-6. Offered in Fall Spring Summer. 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.

Major World Author 3. Offered in Fall and Spring. 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 and Flaubert, Kafka, Proust, Lessing and Gdimer, Borges and Marquez, Nerveda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.

Studies in Literary Genre 3. Offered in Fall and Spring. 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 three times in different genres.

Studies in Great Works of Western Literature 3. Offered in Fall Spring Summer. 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, Danta, 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.

Literature of the Holocaust 3. Offered in Spring Only. 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.

Prerequisite: ENG 112.

Modernism 3. Offered in Fall Only. International Modernism: Movement and current in its culmination in the early twentieth century. Definitions of modernity, as embodied in a variety of genres. Placement of Modernist texts within a variety of cultures that produced them.

Postmodernism 3. Offered in Spring Only. Literary expressions of Postmodernism, from its origins in the Modernist movement through its culmination in the later decades of the twentieth century. Definitions of post modernity, as embodied in a variety of genres. Placement of Postmodernist texts within a variety of cultures that have produced them.

Special Topics in Foreign Languages and/or Literatures 3. Offered in Fall Spring Summer. A special projects course on topics to be determined as needed in the departmental program.

Independent Study in Foreign Language or Literature 1-6. Offered in Fall Spring Summer. 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.

Major World Author 3. Offered in Fall and Spring. 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 and Flaubert, Kafka, Proust, Lessing and Gdimer, Borges and Marquez, Nerveda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.

Studies in Literary Genre 3. Offered in Fall and Spring. 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 three times in different genres.

Studies in Great Works of Western Literature 3. Offered in Fall Spring Summer. 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, Danta, 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.

Literature of the Western World I 3. Offered in Fall Only. 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.

Literature of the Western World II 3. Offered in Spring Only. 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, Tolstoy.

Contemporary World Literature I 3. Offered in Fall Only. Prerequisite: ENG 112. Twentieth-century literature of some of the following cultures: Russian, Eastern European, Western European, Latin American, Canadian, Australian.

Contemporary World Literature II 3. Offered in Spring Only. Prerequisite: ENG 112. Twentieth-century literature of some of the following cultures: Asian, Arabian, African, Caribbean, Native-American.


Special Topics in Foreign Languages and/or Literatures 1-3. Offered in Fall Spring Summer. A special projects course on topics to be determined as needed in the departmental program.

Independent Study in Foreign Language or Literature 1-6. Offered in Fall Spring Summer. 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.

Major World Author 3. Offered in Fall and Spring. 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 and Flaubert, Kafka, Proust, Lessing and Gdimer, Borges and Marquez, Nerveda, Achebe, Soyinka, Calvino, Walcott and Naipaul. Topics will vary from semester to semester. May be repeated for credit with new topic.

Studies in Literary Genre 3. Offered in Fall and Spring. 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 three times in different genres.

Special Topics in Foreign Languages and/or Literatures 1-3. Offered in Fall Spring Summer. A special projects course on topics to be determined as needed in the departmental program.

Methods and Materials in Teaching English as a Second Language 3. Offered in Fall Only. Reading, writing, 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.

ESL Assessment 3.

Perspectives on English as a New Language 3. Offered in Fall Only. 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).

Internship in Teaching English as a Second Language 3. Offered in Summer. 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.

Special Topics in Foreign Languages and Literatures 3. A concentrated study of a special period, author or genre to be determined as needed in the departmental program.

Senior Seminar in World Literature 3. Offered in Spring Only. Rotating topics in world literature, including treatment of materials from more than one culture and including consideration of the subject's theoretical or methodological framework. Readings in English (original languages encouraged but not required).
FL 498 Independent Study in Foreign Language or Literature 1-6. Offered in Fall Spring Summer. 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.

FOREIGN LANGUAGES - ARABIC

FLA 101 Beginning Arabic 101 3. Offered in Fall Only. 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.

FLA 102 Beginning Arabic 102 3. Offered in Spring Only. Prerequisite: FLA 101 or 111. 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. Credit will be allowed for either FLA 102 or FLA 112, but not for both.

FLA 111 Advanced Beginning Arabic 111 3. Offered in Fall Only. Advanced Beginning Arabic 111 is a beginning course of language study for students who have some knowledge of an Arabic dialect, but have not yet learned to read or write in Arabic. This is the first in a series of courses which develops strong reading, writing, listening and speaking skills in Modern Standard Arabic. In addition to the standard course texts, authentic materials from the Arabic media will be used as well as text-related video and audio materials. FLA 111 and FLA 112 can meet university foreign language requirements instead of FLA 101 and FLA 102. Credit will be allowed for either FLA 111 or FLA 101, but not for both.

FLA 112 Advanced Beginning Arabic 112 3. Offered in Spring Only. Prerequisite: FLA 111 or FLA 101. Continuation of Advanced Beginning Arabic 111. This course further develops strong reading, writing, listening and speaking skills in Modern Standard Arabic for those who have previous knowledge of an Arabic dialect. In addition to the standard course texts, authentic materials from the Arabic media will be used as well as text-related video and audio materials. FLA 111 and FLA 112 can meet university foreign language requirements instead of FLA 101 and FLA 102. Credit will be allowed for either FLA 112 or FLA 102, but not for both.

FLA 201 Intermediate Arabic I 3. Offered in Fall Only. Prerequisite: FLA 102 or FLA 112. 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 acquisition of vocabulary and grammatical tools necessary to undertake more in-depth readings and discussions of news articles from the Arab media. Authentic materials from the Arab media will be used in addition to text-related video and audio materials.

FLA 202 Intermediate Arabic II 3. Prerequisite: FLA 201. 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. A continued emphasis is placed on the acquisition of vocabulary and grammatical tools necessary to undertake more in-depth readings and discussions of news articles from the Arab media. Authentic materials from the Arab media will be used in addition to text-related video and audio materials.

FLA 301 Advanced Intermediate Arabic I 3. Offered in Fall Only. 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 tools necessary to understand and produce all the basic structures of Modern Standard Arabic. Arabic film and media will be used in class. The student will also be introduced to selected short stories from modern Arabic literature.

FOREIGN LANGUAGES - CHINESE


FLC 103 Elementary Chinese I Conversation 1. Offered in Fall Only. Corequisite: FLC 101. 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.

FLC 104 Elementary Chinese II Conversation 1. Offered in Spring Only. Prerequisite: FLC 101 and FLC 103; Corequisite: FLC 102. 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.


FLC 203 Intermediate Chinese I Conversation 1. Offered in Fall Only. Prerequisite: FLC 102 and FLC 104; Corequisite: FLC 201. 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.

FLC 204 Intermediate Chinese II Conversation 1. Offered in Spring Only. Prerequisite: FLC 201 and FLC 203; Corequisite: FLC 202. 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.

FLE 301 Intermediate Chinese III 3. Offered in Fall Only. Prerequisite: FLC 302. 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.


FLE 100 Introduction to Academic Writing 4. Offered in Fall and Spring. 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.

FLE 101 Academic Writing and Research 4. Offered in Fall and Spring. Prerequisite: Grade of C- or better in FLE 100 or placement via ESL testing guidelines. 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 requirement. 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.

FLE 201 Oral Communication in English for International Students 3. Offered in Fall and Spring. 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.


FLE 401 Advanced Oral Communication in English for International Students 3. Offered in Fall and Spring. 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.

FLE 402 Advanced Written Communication in English for International Students 3. Offered in Fall and Spring. 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.

FLE 102 Intermediate French I 3. Offered in Fall Spring Summer. Prerequisite: Placement Test. Includes a refresher of 101 material before covering 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.

FLE 103 Intermediate French II 3. Offered in Fall Spring Summer. Prerequisite: FLC 102 or FLC 110. Intermediate French 101 plus FLC 110. Fulfills the FL 103 requirement. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of France and the Francophone world.

FLE 201 Intermediate French I 3. Offered in Fall Spring Summer. Prerequisite: FLC 102 or FLC 110. Intermediate French 101 plus FLC 110. Fulfills the FL 102 requirement. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of France and the Francophone world.

FLE 202 Intermediate French II 3. Offered in Fall Spring Summer. Prerequisite: FLC 201. 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.

FLE 212 French: Language, Culture, and Technology 3. Offered in Fall Only. Prerequisite: FLE 102 and FLE 110. 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 FL 201 requirement.

FLE 301 Survey of French Literature from the Middle Ages through the Enlightenment 3. Offered in Spring Only. Prerequisite: American language skills course (FLF 308, 310, 315) or FLE 202 with permission of instructor. Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

FLE 302 Survey of French Literature from Romanticism to the Contemporary Period 3. Offered in Fall Only. Prerequisite: An advanced language skills course (FLF 308, 310, 315) or FLE 304 with Consent of Instructor. Reading and discussion of representative works with attention to literary analysis as well as to historical and cultural background.

FLF 307 Business French 3. Offered in Fall Only. Prerequisite: FLF 202. Business French vocabulary and concepts with emphasis on cultural differences and their importance in the new global village business world.

FLF 308 Advanced Conversation: Contemporary French Cultures 3. Offered in Fall and Spring. Prerequisite: FLF 202. 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.


FLF 310 Advanced Written Communication 3. Offered in Fall Only. Prerequisite: FLF 202. 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.

FLF 315 French Civilization and Culture 3. Offered in Spring Only. Prerequisite: FLF 202. 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.

FLF 318 The Heritage of French Cinema 3. Offered in Spring Only. Prerequisite: 3 hrs. in French at 300 level. 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.

FLF 321 French Cultures and contexts 3. Prerequisite: FLF 202. 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.

FLF 398 Independent Study in French I-3. Offered in Fall and Spring. Individualized study in French language, culture, or literature. Topic, mode of study, and credit hours to be determined in consultation with faculty member supervising work. Course may be taken a maximum of two times provided the topic is sufficiently different.

FLF 401 French For Graduate Students 3. Offered in Fall Only. 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.

FLF 411 Approaches to French Translation 3. Prerequisite: at least two French (FLF) 300 level courses. 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.

FLF 414 Studies in French Prose 3. Offered in Fall and Spring. Prerequisite: 3 hrs in French at 300 level with 3 hrs in literature. Major developments in the French essay, letter, novel and other prose forms from the Renaissance to 1900. Readings from such authors as Montaigne, Sevigne, Lafayette, Rousseau, Sand, Balzac, Stendhal, Flaubert.

FLF 425 Literature, Cinema and Culture of the Francophone World 3. Offered in Spring Only. 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.

FLF 492 Seminar in French Studies 3. Offered in Fall Only. Prerequisite: Junior standing and 6 hrs in French literature. 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.

FOREIGN LANGUAGES - GERMAN

FLG 101 Elementary German I 3. Offered in Fall Spring Summer. . 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.

FLG 102 Elementary German II 3. Offered in Fall Spring Summer. Prerequisite: FLG 101. The third consecutive course in German. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

FLG 201 Intermediate German I 3. Offered in Fall Spring Summer. Prerequisite: FLG 102. The third of four consecutive courses in German. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

FLG 202 Intermediate German II 3. Offered in Fall and Spring. Prerequisite: FLG 201. Last of four consecutive courses in German. Emphasis on the acquisition of everyday German and cultural awareness. Active class participation, practice in the language lab and computer lab, and written assignments.

FLG 212 German Language, Culture, Science, and Technology 3. Offered in Fall Only. Prerequisite: FLG 102. The third consecutive courses in German, with a special focus on the language of technology and the topics of science, technology, and society in the German-
treated, and the relevance of the poem to the human experience. 

FLG 301 Advanced German 3. Prerequisite: FLG 202 or a score of 688 on the NC State placement test. 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.

FLG 302 German Oral and Written Expression 3. Prerequisite: FLG 202 or a score of 688 on the NC State placement test. 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.

FLG 307 Business German 3. Offered in Fall Only. Prerequisite: FLG 202. Business German vocabulary and terminology. Readings and discussions on current business topics. Special consideration to intercultural communication relative to international business operations.

FLG 311 Introduction to German Translation 3. Offered in Fall Only. Prerequisite: FLG 202. Introduction to theory, methods, and techniques in translation applied to materials of various fields and professions. Emphasis on written translation.

FLG 315 Germanic Civilization and Culture 3. Prerequisite: FLG 202. 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.

FLG 318 New German Cinema 3. Offered in Spring Only. Prerequisite: FLG 202. Survey of the major contributions to the "New German Cinema" (1970's to 1990's). Attention to film as an artistic medium and to the cinematic representation of German history and culture. Reading, discussion, and viewing of films including films by Schlondorff (Die Blechtrommel), Fassbinder (Die Ehe der Maria Braun), von Trotta (Rosa Luxemburg), Herzog (Stroszek), and Wenders (Der Himmel ueber Berlin).

FLG 320 Introduction to German Literature 3. Offered in Fall Only. Prerequisite: FLG 202. 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, exam.

FLG 323 Twentieth Century German Literature 3. Prerequisite: FLG 202. Twentieth century literature from German-speaking countries. Readings of Mann, Kafka, Rilke, Hesse, Durrenmatt, Frisch, Grass, and a variety of poets.

FLG 325 German Lyric Poetry 3. Offered in Spring Only. Prerequisite: FLG 202. 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.

FLG 390 German Studies Topies 3. Prerequisite: FLG 202. 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.

FLG 398 Independent Study in German 1-6. Offered in Fall Spring. Prerequisite: FLG 202. 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.

FLG 401 German For Graduate Students 3. Offered in Fall Only. 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.

FLG 407 Business German II 3. Prerequisite: FLG 307. Second course in the two-course series on Business German. Topics cover project planning, international marketing, trade fair presentation, financial issues, work place issues, logistics, including all forms of oral and written communication in these areas. Brief lectures, much discussion, oral presentations, written assignments, exam. Course can be used as preparation for certification in the internationally recognized "Zertifikat Deutsch fur den Beruf" (certificate "German for Professionals"). Certification is voluntary, for a fee, and separate from the course.

FLG 420 Current Issues in German-Language Media 3. Offered in Fall Only. Prerequisite: Two courses at the FLG 300 level. 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.

FLG 430 Cultural Artifacts in the German-Speaking Countries 3. Offered in Fall Only. Prerequisite: One FLG 300-level course and one from this list: FLG 300, 315, 316, 318, 323, 390. 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".

FLG 440 Green Germany: Nature and Environment in German Speaking Cultures 3. Offered in Spring Only. Prerequisite: One FLG 300-level course or 3 Hours of 300-Level German. Survey of the long "Green" tradition in German-speaking cultures as reflected in the arts, in literature, and in scientific discoveries that have made Germany, Austria, and Switzerland leaders in development of alternative environmental technologies. Discussion in German of issues such as Romantic nature poetry, industrialization, Nazi attitudes towards nature, deforestation, the Green Party, air and water pollution, waste management, energy production, climate change, transportation systems, green architecture, sustainability, and the latest environmental technologies. Practice and assessment through class debates, group work, writing tasks, student presentations, and a portfolio.

FLG 492 Senior Seminar in German Studies 3. Offered in Spring Only. Prerequisite: Two 300 level FLG courses on literature or culture or film. Capstone seminar in German literature or culture. Student
presentations and either a substantial essay or a series of essays. Topics vary each semester.

FLG 499 Internship in Germany, Austria, or German-Speaking Switzerland 1-6. Prerequisite: Two courses at the FLG 300 level. Professional internship in a company or organization in Germany, Austria, or German-speaking Switzerland, with German as the main language of daily operations. Contract between the student, department, and company or organization about content, scope, and requirements. 1-6 credits for an approved internship. Essay describing and evaluating the internship experience in the context of student's professional development. Students are responsible for their own travel and living expenses. Departmental approval required.

FOREIGN LANGUAGES - HEBREW

FLH 101 Elementary Biblical Hebrew I 3. . . The elements of grammar and syntax essential for a reading knowledge of Biblical Hebrew. Reading is drawn primarily from the Book of Genesis and some attention given to exegetical method.

FLH 102 Elementary Biblical Hebrew II 3. . . Prerequisite: REL (FLH) 101. A continuation of REL (FLH) 101 with increased emphasis upon reading selected prose passages.

FLH 201 Intermediate Biblical Hebrew I 3. . . Prerequisite: REL (FLH) 102. Continuing development of vocabulary and understanding of grammar and syntax through reading of selected prose and poetic passages in the Hebrew Bible. Exegetical matters are considered.


FOREIGN LANGUAGES - ITALIAN

FLI 101 Elementary Italian I 3. Offered in Fall Only. 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.

FLI 102 Elementary Italian II 3. . . Prerequisite: FLI 101. 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.

FLI 201 Intermediate Italian I 3. . . Prerequisite: FLI 102. Third of four consecutive courses to develop skills of speaking, listening, reading and writing. Readings and discussion of Italian culture, civilization, and literature.

FLI 202 Intermediate Italian II 3. . . Prerequisite: FLI 201. Last of four sequential language courses. Increased emphasis on reading and writing. Readings in the literature, culture, and civilization of Italy.


FLI 308 Italian Reading and Conversation 3. . . Prerequisite: FLI 202. Advanced readings and intensive conversational practice in Italian for students beyond the intermediate level.

FLI 318 Italian Society Through Cinema 3. Offered in Fall Only. Prerequisite: FLI 202. 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.

FOREIGN LANGUAGES - JAPANESE


FLJ 102 Elementary Japanese II 3. Offered in Spring Only. Prerequisite: FLJ 101, Corequisite: FLJ 104. Continuation of basic skills. Emphasis on speaking and listening skills; inclusion of Japanese cultural factors in communication. Some reading and writing.

FLJ 103 Elementary Japanese I Conversation 1. Offered in Fall Only. Corequisite: FLJ 101. 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.

FLJ 104 Elementary Japanese II Conversation 1. Offered in Spring Only. Prerequisite: FLJ 101, Corequisite: FLJ 104. Extensive use of speaking skills in a variety of situations. Special attention given to correcting and improving pronunciation and intonation.


FLJ 201 Intermediate Japanese I 3. Offered in Fall Only. Prerequisite: FLJ 102 or FLJ 105, Corequisite: FLJ 203. Continuation of basic skills. Greater emphasis on reading and writing. More exposure to Japanese cultural traditions.

FLJ 202 Intermediate Japanese II 3. . . Prerequisite: FLJ 201, Corequisite: FLJ 204. 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.

FLJ 203 Intermediate Japanese Conversation 1. Offered in Fall and Spring. Prerequisite: FLJ 102, Corequisite: FLJ 201, FLJ 202 or FLJ 301. 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.

FLJ 301 Intermediate Japanese III 3. Offered in Fall Only. Prerequisite: FLJ 300. Continued study of Japanese language. Primary emphasis on spoken Japanese, but attention also given to reading, writing and culture.

FLJ 302 Intermediate Japanese IV 3. Offered in Spring Only. Prerequisite: FLJ 301. Continued training in the foundations of Japanese language. Primary emphasis on spoken Japanese, with increased attention to reading and writing.

FLJ 342 Classical Japanese Literature in Translation 3. Offered in Spring Only. 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.

FLJ 344 Early Modern Japanese Literature in Translation 3. Offered in Spring Only. 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.

FLJ 345 Modern Japanese Literature in Translation 3. Offered in Spring Only. A survey of 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.

FLJ 351 Contemporary Culture in Japan 3. Offered in Spring Only. Prerequisite: FLJ 101. 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.

FLJ 401 Advanced Japanese I 3. Offered in Fall Only. Prerequisite: FLJ 302. Continued training in the foundations of Japanese language, with emphasis on complex verb forms. Increased attention to reading and writing.

FLJ 402 Advanced Japanese II 3. Offered in Spring Only. Prerequisite: FLJ 401. 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.

FLJ 404 Advanced Japanese III 3. Offered in Fall Only. Prerequisite: FLJ 402. Continued training in the foundations of Japanese language, with increased attention to reading and writing, and emphasis on complex verb forms.

FLM 378 Women & Film 3. Offered in Spring Only. This course will introduce students to the rich international history of women's participation in the motion picture industry. Course includes readings, screenings, discussions, and a final examination.

FLM 450 Professional Internship in Film Studies 3. Offered in Fall and Spring. Prerequisite: completed 9 hours of Film Studies coursework. 150 hours of professional work over the course of a semester. Students may undertake any work relevant to the field of Film Studies, but they are required to complete at least one professional project indicating that they have developed a specific skill in film programming, exhibition, production, research, or promotion. A paper is due at the end of the semester, outlining the significance of the professional experience in relation to some aspect of film history, theory, criticism, distribution, or production. Students must provide their own transportation. Restricted to FLM majors. FLM 450 may only be taken once for credit towards the major requirements.

FLM 459 Seminar in Film Studies 3. Offered in Spring Only. Prerequisite: ENG 282, ENG 384 and Junior or Senior standing. Advanced critical approaches to focused film topics involving film genres, directories styles, or trends within a national cinema. This seminar-style course will include screenings, readings, regular discussions, and a substantive final research paper. Topics will vary from semester to semester. Junior or senior standing or permission of instructor required.

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FOREIGN LANGUAGES - HINDI

FLN 101 Elementary Hindi-Urdu I 3. Offered in Fall Only. Corequisite: FLN 103. 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. Offered jointly in teleconferencing format with HIND 101 at the University of North Carolina-Chapel Hill.

FLN 102 Elementary Hindi-Urdu II 3. Offered in Spring Only. Prerequisite: FLN 101. Corequisite: FLN 104. 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. Offered jointly in teleconferencing format with HIND 102 at the University of North Carolina-Chapel Hill.


FLN 201 Intermediate Hindi-Urdu I 3. Offered in Fall Only. Prerequisite: FLN 202, Corequisite: FLN 203. Continuation of basic language skills. Introduction of Urdu writing system (Nastaliq) through Hindi writing system (Devanagari). Introduction to grammatical divergence of Hindi and Urdu. Readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 103 at the University of North Carolina-Chapel Hill.

FLN 202 Intermediate Hindi-Urdu II 3. Offered in Spring Only. Prerequisite: FLN 201. Corequisite: FLN 204. Continuation of FLN 201. Further practice of both Urdu (Nastaliq) and Hindi (Devanagari) writing systems. Further distinction of spoken and literary Urdu and Hindi. Further readings in South Asian culture and civilization. Offered jointly in teleconferencing format with HIND 103 at the University of North Carolina-Chapel Hill.
FLN 203 Intermediate Hindi-Urdu I Conversation. Offered in Fall Only. Prerequisite: FLN 102, Corequisite: FLN 201. 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.


FLN 208 Intermediate Hindi Conversation. Offered in Fall Only. Prerequisite: FLN 201. Intensive practice in speaking and understanding Hindi through role playing, debates, interviews, and use of audio-visual materials.

FLN 301 Twentieth Century Hindi & Urdu Fiction. Offered in Fall Only. Prerequisite: FLN 202. 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.

FLN 302 Modern Hindi & Urdu Poetry. Offered in Spring Only. Prerequisite: FLN 301. 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.

FLN 308 Advanced Hindi Conversation. Offered in Spring Only. Prerequisite: FLN 208. Conversation and reading emphasizing idiomatic and practical usage with attention to contemporary civilization and cultures of the Hindi speaking world. Emphasis on social structures, political features, events, world views and modes of communication.

FLN 401 Hindi Literature and South Asian Cultural Contexts. Offered in Fall Only. 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.

FLR 101 Elementary Russian I. 3. Offered in Fall Only. Prerequisite: FLR 101. Required conversational practice through Russian conversation and reading emphasizing idiomatic and practical usage with attention to contemporary cultural heritages. Emphasis on oral skills and reading comprehension. Nouns and adjectives included. Grammar focus on present tense, regular and irregular verbs, and basic sentence structure. Weekly film screenings. No knowledge of Russian required.

FLR 102 Elementary Russian II. 3. Offered in Spring Only. Prerequisite: FLR 101. Emphasis on acquisition of basic oral skills, with complementary reading and writing exercises and attention to Russian cultural heritage.


FLR 303 Russian Literature in Translation: The Nineteenth Century. 3. Offered in Spring Only. A study of selected plays, short stories and novels of the great Russian writers of the nineteenth century: Pushkin, Lermontov, Gogol, Goncharov, Turgeniev, Dostoevsky, Saltykov-Shchedrin, Leskov, Tolstoy and Chekhov. Examinations of peculiarly Russian as well as the universal aspects of this literature. All readings, lectures and discussions in English.

FLR 304 Russian Literature in Translation: The Twentieth Century. 3. A study of selected poems, plays, short stories and novels by major Russian writers of the twentieth century, such as Chekhov, Gorky, Blok, Mayakovskiy, Esenin, Zamyatin, Okishy, Bulgakov, Babel, Pilnyak, Pasternak, Solzhenitsyn, Evtushenko, and Voznesensky. All readings, lectures and discussions in English.

FLR 318 Russian Cinema and Society. 3. Offered in Spring Only. 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.

PORTUGUESE

FLP 101 Elementary Portuguese I. 3. Introduction to the fundamentals of Brazilian Portuguese: pronunciation, comprehension, and spoken syntax and grammar.

FLP 102 Elementary Portuguese II. 3. Prerequisite: FLP 101. Continuation of the essentials of Brazilian Portuguese. Further stress on pronunciation and comprehension and introduction of reading and writing skills.

FLP 201 Intermediate Portuguese I. 3. Offered in Fall Only. Prerequisite: FLP 102 or placement in course. 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.

SPANISH

FLS 101 Elementary Spanish I. 3. Listening and speaking; development of a balanced foundation in all Spanish languages skills. Idiomatic, everyday Spanish and cultural awareness. Class practice, laboratory and written homework.

FLS 102 Elementary Spanish II. 3. Prerequisite: FLS 101. Use of Spanish through past tenses, regular and irregular, and various morphological and syntactical aspects. Emphasis on oral skills and increased cultural awareness. Written work and laboratory practice assigned daily.
FLS 105 Intensive Elementary Spanish 6... An intensive course aimed at developing a balanced foundation in listening, speaking, reading, and writing Spanish. Equivalent to FLS 101 plus FLS 102.

FLS 110 Accelerated Elementary Spanish 3. Offered in Fall Spring Summer. 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, or those with prior knowledge of another Romance language. Significant amount of work outside of class. Development of a balanced foundation in listening, speaking, reading, and writing Spanish, and understanding Hispanic cultures.

FLS 201 Intermediate Spanish I 3. Offered in Fall Spring Summer. Prerequisite: FLS 102, 105 or 110. The third of four consecutive Spanish courses designed to develop proficiency in Spanish with special attention to reading and writing skills and the cultural heritage of the Spanish-speaking peoples. Class practice, laboratory and written assignments.

FLS 202 Intermediate Spanish II 3. Offered in Fall Spring Summer. Prerequisite: FLS 201. Last of four sequential courses in the foundations of the Spanish language. Attention to writing skills and cultural heritage of Spanish-speaking peoples.

FLS 210 Accelerated Intermediate Spanish 3. Offered in Fall Spring Summer. Content of FLS 102 and FLS 201 at an accelerated pace, for students placed into the course based on results of the Spanish placement test, or those with significant knowledge/experience with another Romance language. Substantial amount of work outside of class. Development of a balanced foundation in listening, speaking, reading, and writing Spanish, and understanding Hispanic cultures.

FLS 212 Spanish: Language, Technology, Culture 3. Offered in Fall and Spring. Prerequisite: FLS 102, FLS 110, and FLS 105. 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 requirement.

FLS 295 Intermediate Special Topics in Spanish 3. Offered in Fall Spring Summer. Prerequisite: FLS 201. 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.

FLS 331 Spanish Oral and Written Expression I 3. Prerequisite: FLS 202. 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.

FLS 332 Spanish Oral and Written Expression II 3. Offered in Fall and Spring. Prerequisite: FLS 331. 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.

FLS 333 The Sounds of Spanish 3. Prerequisite: FLS 202. 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.


FLS 337 Spanish for Tourism in the Hispanic World 3. Prerequisite: FLS 202. 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.

FLS 340 Introduction to Hispanic Literatures and Cultures 3. Prerequisite: FLS 331, Corequisite: FLS 332. 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.

FLS 341 Literature and Culture of Spain I 3. Prerequisite: FLS 332; Corequisite: FLS 340. 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.

FLS 342 Literature and Culture of Spain II 3. Prerequisite: FLS 332; Corequisite: FLS 340. 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.

FLS 343 Literature and Culture of Spain III 3. Prerequisite: FLS 332; Corequisite: FLS 340. 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.

FLS 351 Literature and Culture of Latin America I 3. Prerequisite: FLS 332; Corequisite: FLS 340. 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.

FLS 352 Literature and Culture of Latin America II 3. Prerequisite: FLS 332; Corequisite: FLS 340. 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.

**FLS 353 Literature and Culture of Latin America III 3.**  
**Prerequisite:** FLS 332; Corequisite: 340. 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.

**FLS 360 Hispanic Cinema 3.**  
**Prerequisite:** FLS 331 and Corequisite FLS 332. 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.

**FLS 395 Special Topics in Spanish 3.**  
**Offered in Fall Spring Summer.**  
**Prerequisite:** FLS 202. Special Topics in language and cultures of the Spanish speaking world for students at the 300 level. Includes courses taught in Spanish study abroad programs. Course may be taken up to three times.

**FLS 399 Intensive Spanish Oral Proficiency Workshop 1.**  
**Offered in Fall Spring Summer.**  
**Prerequisite:** 12 Hours of 300-level Spanish.  
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 tasks to support in class activities. Designed to help Spanish majors to achieve the intermediate high oral proficiency level required for graduation. This is a 5-week course. Departmental permission is required.

**FLS 400 Methods and Techniques in Spanish Translation and Interpretation 3.**  
**Prerequisite:** 12 credits of 300-level Spanish. Study and practical application of theory, methods and techniques of translation based on materials relevant to various fields and professions.

**FLS 401 Spanish For Graduate Students 3.**  
**Offered in Fall and Spring.**  
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.

**FLS 402 Introduction to Spanish Linguistics 3.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 405 Spanish-English Comparative Grammar 3.**  
**Offered in Spring Only.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 411 Topics in the Culture of Spain 3.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 412 Topics in the Culture of Latin America and the Caribbean 3.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 413 Spain and the Americas in Transatlantic Perspective 3.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 492 Seminar in Hispanic Studies 3.**  
**Offered in Spring Only.**  
**Prerequisite:** 12 credits of 300-level Spanish. 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.

**FLS 495 Advanced Special Topics in Spanish 3.**  
**Offered in Fall Spring Summer.**  
**Prerequisite:** 12 credits of 300-level Spanish. Advanced special topics in language and cultures of the Spanish speaking world for students at the 400 level. Includes courses taught in Spanish study abroad programs. Course may be taken up to three times.

**FM 425 Feed Manufacturing Technology 3.**  
**Offered in Spring Only.**  
**Prerequisite:** ANS(NTR,PO) 415 or ANS 230 or ANS 225. 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.

**FM 460 Feed Mill Operations and Leadership 2.**  
**Prerequisite:** PO(ANS) 425. Principles and current practices of modern feed mill operations. Topics include managing employees, team building, safety, budgets, regulations, and key performance indicators.

**FM 480 Feed Quality Assurance & Formulation 2.**  
**Offered in Spring Only.**  
**Prerequisite:** PO(ANS) 425. 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.

**FM 490 Feed Science Seminar 1.**  
**Offered in Fall Only.**  
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.

FM 494 Feed Mill Learning Experience 1. Prerequisite: PO(ANS) 425. Hands-on laboratory teaching students how to safely operate feed mill equipment and manufacture feed using a computer system.

FORESTRY

FOR 110 Introduction to Forestry 2. Offered in Fall Only. Overview of the history and policies of forestry, the basis of forest management, the impact of forestry on nature and society, and the opportunities of a career in forestry.

FOR 150 Professional Development I: Critical Thinking in Natural Resources 1. Offered in Spring Only. Techniques of critical thinking applied to a broad range of natural resource and forestry issues.

FOR 172 Forest System Mapping and Mensuration I 2. Offered in Fall Only. 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 characteristics; introduction to forest sampling. Application of spreadsheets and word processing to analyze and summarize resource characteristics. Field trip required.

FOR 202 Wood Anatomy and Properties 3. Offered in Fall Only. Formation, anatomy and properties of wood. Structural features of softwoods and hardwoods and the relationships among anatomy, physiology, physical and mechanical properties. Variability, naturally occurring defects, and wood deterioration are discussed and related to wood utilization. Techniques on hand lens and microscopic identification of wood.

FOR 204 Silviculture 2. Offered in Summer. 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.

FOR 220 Urban and Community Forestry 3. Offered in Fall Only. Introduction to the interdisciplinary study of urban forestry and greenspaces. Study of urban forest history, distribution and ownership patterns, urban ecology and ecosystems, benefits and uses of urban forests, vegetation establishment and maintenance, urban planning and policy, community interactions, urban forestry implementation.

FOR 221 Conservation of Natural Resources 3. Offered in Fall Spring Summer. 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.

FOR 248 Forest History, Technology and Society 3. Offered in Fall and Spring. 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.

FOR 250 Professional Development II: Communications in Natural Resources 1. Offered in Spring Only. 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.

FOR 252 Introduction to Forest Science 3. Offered in Spring Only. 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 Forestry Management majors.

FOR 260 Forest Ecology 3. Offered in Spring Only. Introduction to forest ecosystems, their structure, and the processes that regulate them including: radiation, temperature, water, and biogeochemistry; productivity; plant populations; structure and function of forest communities; succession; wind and fire; and human influences.

FOR 261 Forest Communities 2. Offered in Summer. Prerequisite: FOR 359 or PB 220 or PB 402. 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.


FOR 265 Fire Management 1. Offered in Summer. 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.

FOR 273 Forest System Mapping and Mensuration II 3. Offered in Summer. Prerequisite: FOR 172. 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.

FOR 280 Evolution of Forest machinery and Systems 3. Offered in Fall Only. Introduction to forest resources operations and machinery. Historical account of the evolution of mechanized forest operations: harvesting, inwood transport, processing, hauling, site preparation, planting, forest land maintenance, nursery and seed orchard machines. Discussion of current and future machines for forest harvest and regeneration.
FOR 291 Independent Study in Forestry 1-6. Offered in Fall Spring. Undergraduates under faculty direction on a tutorial basis. Credit and content determined by faculty member in consultation with Undergraduate Program Director or Department Head.

FOR 295 Special Topics in Forestry 1-6. Offered in Fall Spring. Study of forestry topics not covered in existing courses at the introductory level. Development of a new course on a trial basis.

FOR 303 Silvics and Forest Tree Physiology 3. Offered in Fall Only. Prerequisite: CH 101 and (CH 201/202 or PY 211). 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.

FOR 304 Theory of Silviculture 4. Offered in Spring Only. Prerequisite: FOR 260 or BO 360. 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.

FOR 318 Forest Pathology 3. Offered in Spring Only. Prerequisite: PB 200. 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.

FOR 319 Forest Economics 3. Offered in Fall Only. Prerequisite: ARE 201 or EC 205. Economic approaches for evaluating the production and costs of forest management, timber harvesting activities, and non-timber 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.

FOR 320 North Carolina Forests 3. Offered in Fall and Spring. 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.

FOR 330 Operations Research Applications in Natural Resources 1. Offered in Fall Only. 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.

FOR 334 Dendrochronology 4. 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.

FOR 350 Professional Development III: Ethical Dilemmas in Natural Resource Management 1. Offered in Spring Only. 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.

FOR 353 Air Photo Interpretation and Photogrammetry 3. Offered in Fall Only. Prerequisite: MA 114. Theory, principles, and techniques of utilizing air photos for inventory and management of renewable resources, photogrammetric and engineering applications, hydrologic and terrain analysis, and land use/cover mapping.

FOR 374 Forest Measurement, Modeling, and Inventory 3. Offered in Fall Only. Prerequisite: MA 121, MA 114, FOR 273, ST 311. 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.

FOR 402 Forest Entomology 3. Offered in Spring Only. Fundamentals of morphology, classification, biology, ecology and control of insects attacking trees, with emphasis on silvicultural practices.

FOR 403 Forest Wildlife Management 3. Offered in Fall Only. Prerequisite: PB 200, MA 121, MA 114, FOR 273, ST 311. Written and oral reporting.

FOR 404 Forest Wildlife Management 3. Offered in Fall Only. Prerequisite: FOR 319, FOR 374. 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.

FOR 405 Forest Management 4. Offered in Fall Only. Prerequisite: FOR 304, FOR 319, FOR 374. 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.

FOR 411 Forest Tree Genetics and Biology 3. Offered in Spring Only. 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.

FOR 413 Paper Prop and Add 4. . . .
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.

FOR 415 World Forestry Study Tour 1. Offered in Spring Only. Corequisite: FOR 414. 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.

FOR 420 Watershed and Wetlands Hydrology 4. Offered in Fall Only. Prerequisite: SSC 200, BO 360. Principles of hydrologic science; classification and assessment of watersheds and stream networks; hydrologic, engineering, and 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.

FOR 422 Consulting Forestry 3. Offered in Fall Only. 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.

FOR 423 Forest Machinery and Systems 3. Offered in Fall Only. Applications of engineering principles to problems in forest operations: power sources; testing; rating and capabilities of forest machinery; power requirements and utilization efficiencies; effects of vehicle design parameters on stability, safety, and operation under load; traction devices and vehicle mechanics.


FOR 434 Forest Operations and Analysis 3. Offered in Spring Only. Prerequisite: MA 114, MA 121, ST 311 and FOR 319. 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.

FOR 444 Wood Procurement Management 3. Offered in Spring Only. Prerequisite: FOR 374 and FOR 319. Market structure and behavior for wood product raw materials. Evaluation of alternative procurement strategies and introduction to the legal and business principles important in the wood products trade. Practice in appraising multi-product tracts and in predicting future raw material availability. Includes visits to a range of manufacturing facilities and procurement organizations. Required all-day field trips held one week prior to the start of the semester.

FOR 450 Professional Development IV: Leadership 1. Offered in Spring Only. Concepts and applications of leadership principles with emphasis on leadership challenges and opportunities for professionals in natural resources management. Assessment and development of leadership skills.

FOR 485 Natural Resources Advocacy 3. Offered in Fall and Spring. Prerequisite: ENG 333: JR or SR level with at least 10 hrs. of Biology. Analysis of natural resources problems as they affect management agencies and user groups. Emphasis on professional attitudes, policies, and communication skills needed for management of sensitive natural resource issues. Guest professionals sharing their perspectives on dealing effectively with natural resource clientele groups. Student discussions, team projects, technical presentations citing popular articles on natural resources subjects.

FOR 490 Senior Seminar in Forestry 1. Offered in Fall and Spring. Attend departmental or university seminars or group discussions weekly to enrich and broaden student perspectives. Oral or written summaries of these seminars.

FOR 491 Special Topics in Forestry and Related Natural Resources 1-4. Offered in Fall and Spring. 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.

FOOD SCIENCE

FS 201 Introduction to Food Science 3. Offered in Fall and Spring. Science and practice of providing a wholesome, nutritious, economical and readily available supply of basic and processed foodstuffs. Chemical nature of foods, nutritional requirements, health-related dietary considerations, microorganisms, foodborne illnesses, preservation and processing, food additives, food labeling, food safety and the consumer.

FS 231 Principles of Food and Bioprocess Engineering 4. Offered in Spring Only. Prerequisite: PY 211. 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, psychrometry, and selected unit operations found in these industries.

FS 290 Careers in Food and Bioprocessing Sciences 1. Offered in Fall Only. 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.

FS 295 Special Topics in Food Science 1-4. Offered in Fall Spring Summer. Offerings of new or experimental courses in Food Science at the early undergraduate level.

FS 301 Introduction to Human Nutrition 3. Offered in Fall Spring Summer. Functions, dietary sources and deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery. Food science majors may use as a free elective only.
FS 322 Muscle Foods and Eggs 3. Offered in Fall Only. Prerequisite: ZO 160, BIO 181 or BIO 183. 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.

FS 324 Milk and Dairy Products 3. Offered in Fall and Spring. Prerequisite: BIO 181 or 183, CH 101. 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.

FS 330 Science of Food Preparation 3. Offered in Spring Only. Prerequisite: FS 201 and CH 101. 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.

FS 350 Introduction to HACCP 3. Offered in Fall and Spring. This course is one of a series of six courses that are part of North Carolina State University's Food Safety Control. The course examines the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants. Offered only as a world wide web course through the Office of Instructional Telecommunications.

FS 351 Sanitation Standard Operating Procedures in Food Safety Control 3. Offered in Fall and Spring. This course is one of a series of six courses that are part of North Carolina State University's Food Safety Certification program. "Sanitation Standard Operating Procedures (SSOP's) in Food Safety Control" addresses current federal regulatory requirements for seafood, meat, and poultry processing operations. The course also addresses the international dimensions of sanitary standards in import/export of food. The course is designed to provide the student with the background necessary to develop, implement and maintain a sanitation plan based on sanitation standard operating procedures (SSOP's).

FS 352 Introduction to Microbiological Food Safety Hazards 3. Offered in Fall and Spring. 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.

FS 353 Good Manufacturing Practices 3. Offered in Fall and Spring. Food Safety sanitation in the United States is primarily regulated by FDA under their "Good Manufacturing Practices (GMP)." This course will introduce the student to the GMP and consider how and why they were developed. Students will become familiar with the issues of compliance and consider the regulations in light of international laws and current practices. The student should have some familiarity with food processing and safety.

FS 354 Food Sanitation 3. Offered in Fall and Spring. Prerequisite: FS/ANS/PO 350 or equivalent HACCP industry experience. 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.

FS 355 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.

FS 401 Advanced Nutrition and Metabolism 3. Offered in Fall Only. Prerequisite: NTR 301 or NTR 415 or NTR 500 and (CH 221 or CH 220). 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.

FS 402 Chemistry of Food and Bioprocessed Materials 4. Offered in Fall Only. Prerequisite: CH 220 or 221. The course focuses on the properties of biological molecules (e.g., proteins, enzymes lipids, carbohydrates and pigments) found in foods and pharmaceuticals. Basic mechanisms for certain foods or pharmaceuticals 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.

FS 403 Analytical Techniques in Food & Bioprocessing Science 4. Offered in Spring Only. Prerequisite: FS 402. Principles, methods and techniques for quantitative physical and chemical analyses. 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.

FS 405 Food Microbiology 3. Offered in Fall Only. Prerequisite: MB 351. 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.

FS 406 Food Microbiology Lab 1. Offered in Fall Only. Prerequisite: MB 351 and Corequisite: FS 405 or FS 505. 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.

FS 407 Risk Analysis and Hazard Analysis in Food Safety 3. Offered in Fall and Spring. Prerequisite: FS/ANS/PS 350 or equivalent HACCP industry experience. In-depth focus on the application of the first HACCP principle, Hazard Analysis, on the identification of food safety hazards, as well as the emerging importance of risk assessment. Distance Education Only.

FS 416 Quality Control in Food and Bioprocessing 3. Offered in Spring Only. Prerequisite: FS 402, MB 351. Organization and principles of quality control in the food and bioprocessing industries. Regulations and process control to maintain safety and quality. Evaluation of physical, microbiological, chemical, sensory, and stability testing for food and bioprocessed materials. Risk assessment, hazard analysis and critical control point (HACCP), process control and hazards, water quality, waste water analysis and reduction. Cleaning and sanitation and compliance inspection.

FS 421 Food Preservation 3. Offered in Fall Only. Prerequisite: MB 351 and FS 231. 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.

**FS 426 Industrial Microbiology & Biomanufacturing Laboratory**

2. Offered in Fall and Spring. Prerequisite: (MB 351 and FS 231) or MB/BEC 420 or CHE/BEC 463. 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.

**FS 453 Food Laws and Regulations** 2. 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.

**FS 462 Postharvest Physiology** 3. Offered in Spring Only. Prerequisite: PB 421. Preharvest and postharvest factors that affect market quality of horticultural commodities with emphasis on technologies to preserve postharvest quality and extend storage life of fruits, vegetables and ornamentals.

**FS 475 Problems and Design in Food and Bioprocessing Science**

3. Offered in Spring Only. Prerequisite: FS 231, FS 402, FS 405 or BAE(BBS) 425. 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.

**FS 492 External Learning Experience 1-6. Offered in Fall and Spring.** 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.

**FS 493 Special Problems in Food Science 1-6. Offered in Fall and Spring.** 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.

**FS 495 Special Topics in Food Science 1-3. Offered in Fall Spring Summer.** Offered as needed to present materials not normally available in regular course offerings or for offering new courses on a trial basis.

**FASHION & TEXTILE DESIGN**

**FTD 200 Design Skills Workshop** 3. Offered in Spring Only. Prerequisite: TT 105 and Corequisite: D 105. 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.**

**FTD 201 Computer-Aided Textile Design and Color Studio 6. Offered in Fall Only. Prerequisite: D101, D103, D105, and a grade of C or better in FTD 200. 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.**

**FTD 215 Fashion Design I 3. Offered in Fall Only. Prerequisite: Grade of C or better in FTD 200 and Corequisite: FTD 201. 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 practices with computer-aided design will be presented where applicable.**

**FTD majors only.**

**FTD 216 Fashion Workroom Practices 3. Offered in Spring Only. Prerequisite: (Grade of C or better in FTD 200) or (Grade of C or better in FTM 219). 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 various fabrics.**

**FTD majors only.**

**FTD majors only.**

**FTD 319 Fashion Design 2.3. Offered in Fall Only. Prerequisite: Grade of C or better in FTD 215, FTD 216, and FTM 317. 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.**

**FTD 321 Fashion Design by Draping 3. Offered in Fall Only. Prerequisite: (C or better in FTD 215 and FTD 216) or (C or better in FTM 219 and FTM 315). 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 majors only.**

**FTD 373 Yarn Design Studio 3. Offered in Spring Only. Prerequisite: TT 221 and a grade of C or better in FTD 201. 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 slub variations in yarns to address both functional and aesthetic challenges. Studio experiences in creating innovative yarn appropriate for use in different fabric formation technologies. Additional costs may be incurred for course materials/equipment.**
FTD majors only.

FTD 374 Surface Design and Texture 3. Offered in Spring Only. Prerequisite: TT 105 and a grade of C or better in FTD 200 and FTD 201. 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.

FTD 375 Woven Textile Design Studio I 3. Offered in Fall Only. Prerequisite: Grade of C or better in both TT252 and FTD 373. 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 production 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.

FTD 376 Knitted Textile Design Studio I 3. Offered in Fall Only. Prerequisite: Grade of C or better in both TT252 and FTD 373. 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.

FTD 420 Fashion Design 3 3. Offered in Fall Only. Prerequisite: Grade of C or better in FTD 319 and FTD 321. Studio course exploring sources of inspiration requiring students to translate and develop source material into creative garments. Integrates knowledge across the curriculum and works with a firm, contest, or current theme to develop a fashion design statement. Additional costs may be incurred for course materials/equipment. FTD majors: Fashion Design concentration only.

FTD 475 Woven Textile Design Studio II 3. Offered in Spring Only. Prerequisite: Grade of C or better in FTD 375. Design and sample production of specialized jacquard woven structures. Jacquard design for diverse end uses is addressed from art fabrics to unique specialty products. Exploration of advanced structures, color and textural effects. Development of design abilities through electronic production methods, including expanded use of computer-integrated design systems and exposure to industrial processes. Students will be required to complete creative design projects from concept to sample production and presentation of actual fabrics, digital images and presentations. Studio experiences will be augmented, when possible, through outside speakers and field trips to museum, markets, and mills. Additional costs may be incurred for course materials/equipment. FTD majors only.

FTD 476 Knitted Textile Design Studio II 3. Offered in Fall Only. Prerequisite: Grade of C or better in FTD 376. 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 materials/equipment. FTD majors only.

FTD 479 Senior Textile Design Studio 6. Offered in Spring Only. Prerequisite: FTD 374, FTD 475, FTD 476. 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.

FASHION & TEXTILE MANAGEMENT

FTM 170 Textile Design Orientation 1. Offered in Spring Only. Orientation course designed to present the breadth and scope of the Textile Design profession together with future opportunities in this field.

FTM 217 The Textile Industry 3. Prerequisite: TT 105. 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 integrated Textile Complex. One Saturday attendance during the semester is required.

FTM 219 Fashion Product Analysis 3. 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.

FTM 220 Principles of Retailing and Supply Chain Management in Textiles 3. Offered in Fall Spring Summer. Prerequisite: FTM 217. 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 merchandise planning.

FTM 271 Computer-Aided Textile Design 3. Prerequisite: DF 101 or ADN 111. Introduction to the operation of design software for woven, knitted and printed textiles. Adobe Photoshop, Pointcare' and Monarch programs will be taught. Peripheral equipment essential to the design process will be included. Field trips to areatexile 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.

FTM 282 Introduction to Textile Brand Management and Marketing 3. 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.

FTM 310 Entrepreneurship & New Product Development in Textiles 3. Offered in Fall and Spring. 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 to develop innovative textile products. Write a business plan to take the textile product to market. Multidisciplinary and experiential learning environment is cultivated through in-class activities and online collaboration.

FTM 315 Fashion Product Design 3. Prerequisite: FTM 217 and FTM 219. 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.

FTM 317 Computer-Aided Design for Apparel 3. Prerequisite: FTD 215 or Corequisite: FTM 315. Introduction to the operation of industry design software for apparel & other sewn products. Euphoria and/or Artwork 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.

FTM 318 Fashion Development Processes 3. Prerequisite: FTM 317. 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; and quality evaluations.

FTM 320 Retail Merchandising in Fashion and Textiles 3. Offered in Fall Only. Prerequisite: FTM 220. 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.

FTM 352 Dress, Style, Change 3. Interdisciplinary course focusing on historical and cultural principles of style as related to dress and fashion. Examination of fashion and stylistic trends in cycles of dress.

FTM 380 Management and Control of Textile and Apparel Systems 3. Prerequisite: TT 252. Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.

FTM 382 Intermediate Textile Brand Management and Marketing 3. Prerequisite: FTM 282 and (EC 201 or ARE 201). 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 of major strategic tools used for brand management and marketing activities by firms across the integrated textile complex. Students will be assigned practical application projects that require utilization of academic knowledge with industry application.

FTM 384 Visual Merchandising Principles and Management 3. Prerequisite: Junior standing or higher, FTM 217. Corequisite: FTM 382. 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.

FTM 385 Fashion and the Consumer 3. Prerequisite: FTM 217, FTM 282. 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.

FTM 387 Textile Brand Communications & Promotions 3. Offered in Fall and Spring. Prerequisite: FTM 382. Examines the utilization of textile brand communications 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.

FTM 400 Major Fashion Designers 3. 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 major historical and current fashion designers that have had an international influence on US fashion merchandise. An additional focus of the course will be on the career path of major fashion designers. A study of haute couture and pret-a-porter will be conducted to provide insight into special management issues.


FTM 415 Fashion Product Development 3. Prerequisite: FTM 318. 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.

FTM 416 The Fashion Industry 3. 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.

FTM 420 Retail Buying in Fashion and Textiles 3. Offered in Spring Only. Prerequisite: FTM 320. 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.

FTM 431 Quality Management and Control In Textile Manufacturing 3. Prerequisite: TT 221, TT 252, TT 331, and ST 361 or BUS 350. Principles of quality and process management and control in textile/apparel manufacturing with emphasis on quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.

FTM 460 Textile Market Research 3. Offered in Fall and Spring. Prerequisite: FTM 382 and ST 361. 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).

FTM 480 Operations Management Decisions for Textiles 3. Prerequisite: FTM 380, ACC 210, ST 361, (MA 131 and 132 or MA 141). Quantitative techniques for decision making and management in the textile complex. Applications include vendor selection, plant location, retail inventory management, forecasting demand, project management, and logistics planning. Techniques covered include simulation, PERT/CPM, mathematical modeling.

FTM 481 Product Costing in the Textile and Apparel Industry 3. 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.

FTM 482 Advanced Textile Brand Management and Marketing 3. Prerequisite: FTM 382. 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.

FTM 483 Global Trade & Sourcing 3. Prerequisite: FTM 282 and EC 201 or ARE 201 or EC 205. 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.

FTM 484 Management Decision Making for the Textile Firm 3. Prerequisite: FTM 380 and EC 201 or ARE 201 or EC 205. Economic, institutional and environmental settings within which management decisions are made, including in-depth analyses of specific issues and problem areas affecting the textile industry. Special emphasis on strategic management and topics of current interest and significance.

FTM 485 Textile Computer Integrated Enterprise 3. Prerequisite: FTM 380. 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.

FTM 486 Supply Chain Management in the Textile Industry 3. Prerequisite: FTM 380. 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 TAM 486 and MT 386.


FTM 490 Development Projects in Textile and Apparel Management 1-3. 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.

FTM 491 Special Topics in Textile and Apparel Management 1-4. Special topics related to textile and apparel management.

FTM 494 International Industrial Internship in Textile Management 3. 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.

FTM 497 Senior Fashion Collection Studio 6. Offered in Spring Only. Prerequisite: FTM 318. 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.

FTM 499 Textile Senior Project 4. 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 be presented formally at the end of the semester. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses.
FW 221 Conservation of Natural Resources 3. Offered in Full Spring Summer. 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.

FW 311 Piedmont Wildlife Ecology and Management 3. Offered in Summer. This 3-week course will involve relationships of wildlife and habitat, the use of GIS and GPS, use of new technology (PTT 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 camps 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.

FW 312 Fisheries Techniques and Management 1. Offered in Summer. Corequisite: FW 311 and FW 313. 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.

FW 313 Mountain Wildlife Ecology and Management 1. Offered in Summer. Corequisite: FW 311 and FW 312. 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.

FW 314 Coastal Ecology and Management 1. Offered in Summer. Prerequisite: BIO 181. 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.

FW 353 Wildlife Management 3. Offered in Fall Only. Prerequisite: BIO 181 or ZO 150. 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.

FW 403 Urban Wildlife Management 3. Offered in Fall Only. 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.

FW 404 Forest Wildlife Management 3. Offered in Fall Only. Prerequisite: 9 hrs. Biological Sciences. 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.

FW 411 Human Dimensions of Wildlife and Fisheries 3. Offered in Spring Only. 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.

FW 420 Introduction to Fisheries Science 3. Offered in Spring Only. Prerequisite: BIO 181 or ZO 150, BIO 260 or PB 360. Role of fish in aquatic ecosystems, fish biology, fish ecology, fisheries management and conservation. Emphasis on aquatic ecosystems and food webs, life history and ecology of important sport and commercial fishes, population and community dynamics, and theory and practice of fisheries management and conservation. Case studies from freshwater, estuarine and marine systems.

FW 430 Fisheries and Wildlife Administration 3. Offered in Spring Only. Prerequisite: PS 201, PS 202, FW/BIO 420, FW/BIO 353. Describes and compares the administrative structures and programs of federal and state fish and wildlife agencies and develops an understanding of the basis on which these agencies function. Evaluates the interrelationships that fisheries-wildlife professionals, special interest groups, public agencies and legislative bodies play in resource management programs.


FW 465 African Ecology and Conservation 4. Offered in Summer. Prerequisite: One 200-level or higher course in ES, ET FOR, FW, NR, PB, PRT, or ZO. 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.
FW 485 Natural Resources Advocacy 3. Offered in Fall and Spring. Prerequisite: ENG 333. Junior standing or Senior standing with at least 10 hours of biology. Analysis of natural resources problems as they affect management agencies and user groups. Emphasis on professional attitudes, policies, and communication skills needed for management of sensitive natural resource issues. Guest professionals sharing their perspectives on dealing effectively with natural resource clientele groups. Student discussions, team projects, technical presentations citing popular articles on natural resources subjects.

FW 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

FW 493 Special Problems in Fisheries and Wildlife Sciences 1-6. Offered in Fall and Spring. 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.

FW 495 Special Topics in Fisheries and Wildlife Science 1-3. Offered in Fall and Spring. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

GRAPHIC COMMUNICATIONS

GC 101 Engineering Graphics I 2. Offered in Fall and Spring. Graphical representation and solution of 2D and 3D spatial problems. Emphasis on development of logical and analytical approaches to problem solution. Conventional methods of graphically describing size and shape to represent basic mechanical elements. Includes practical engineering drawing applications.

GC 120 Foundations of Graphics 3. Offered in Fall Spring Summer. 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.

GC 210 Introductory Engineering Graphics for Industrial Engineering 3. Offered in Fall and Spring. Prerequisite: E 115. Introduction to the graphical representation and solution of 2D and 3D spatial problems. Conventional methods using computer-based tools to graphically describe 2D and 3D objects relevant to the field of IE. Overview of the fundamentals and applications of computer graphics and computer-aided design. Includes practical IE drawing applications.

GC 211 Introductory Engineering Graphics for Mechanical and Aerospace Engineers 3. Offered in Fall and Spring. Prerequisite: E 115. Graphical representation and solution of 2D and 3D spatial problems relevant to the field of mechanical and aerospace engineering using sketching and computer-based tools. Computer-aided design in the engineering design and manufacturing process. Practical mechanical and aerospace engineering drawing applications. Credit can be given for only one of the following: GC 101, GC 120, or GC 211.

GC 250 Architectural Graphic Communications 3. Offered in Fall and Spring. Prerequisite: GC 120 or GC 210 or GC 211. 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.

GC 320 3D Spatial Relations 3. Offered in Fall and Spring. Prerequisite: GC 101 or GC 120 or GC/IE 210. 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.

GC 330 Basic Technical Animation 3. Offered in Fall Only. Prerequisite: GC 120 or GC 210 or GC 211. 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, photo-realism, and raytracing.

GC 340 Concepts of Website Development 3. Offered in Spring Only. 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.

GC 350 Applied CAD/D and Geometric Controls 3. Offered in Fall Spring Summer. Prerequisite: GC 120 or GC/IE 210 or GC 211. 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-AidedDesign/Computer-Aided Manufacture) processes. Conventions and standards for technical drawing documentation.


GC 420 Visual Thinking 3. Offered in Fall and Spring. 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.

GC 450 Advanced Graphics Usage with CAD 3. Offered in Fall and Spring. Prerequisite: GC 350. 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. Emphasis on application of 3-D modeling technology.

**GC 496 Special Topics in Graphic Communications I-4. Offered in Fall Spring Summer.** Topical study in areas of current interest and need to students and/or needs of curricula served by Graphic Communications.

**GC 498 Independent Study in Graphic Communications I-4. Offered in Fall Spring Summer. Prerequisite: GC 120 or GC 210 or GC 211.** Independent study in areas of current interests and needs of students in the field of Graphic Communications and the visual sciences.

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**GRAPHIC DESIGN**

**GD 200 Graphic Design Theory and Practice 3. Offered in Spring Only.** 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.

**GD 201 Graphic Design Studio I 6. Offered in Fall Only. Prerequisite: D 104, D 105; Corequisite: GD 210, GD 217.** Principles and language of graphic design. Analysis, organization, invention of two-dimensional form for the purpose of communicating information, concepts, emotions. Varied means of graphic representation are explored. Graphic Design Majors, Department approved Minor, and Department approved Elective (“swing”) Studio for all other College of Design Majors.

**GD 202 Graphic Design Studio II 6. Offered in Spring Only. Prerequisite: GD 201, GD 210, GD 217; Corequisite: GD 310, GD 317.** Methods and processes of graphic design problem solving. Student exercises define communication problems; evaluate analytical, synthetic, and intuitive approaches to problem solving; develop critical thinking, oral presentation, and writing skills. Emphasis on the appropriateness of form to a given context.

**GD 210 Imaging for Graphic Design I 3. Offered in Fall Only. Prerequisite: D 104, D 105.** Introduction to the technical and formal issues of photography and photomechanical processes as they relate to visual communication; terminology; photographic history within the context of graphic design. Graphic Design Majors, Department approved Minor, and Department approved Elective for all other College of Design Majors.

**GD 217 Typography I 3. Prerequisite: D 104, D 105.** Typography as a medium of visual communication. Student exercises focus on type as image and the relationship between visual and verbal language; the expressive characteristics of letter forms and text explored. Terminology, typographic history, technical issues related to typography. Graphic Design Majors, Department approved Minor, and Department approved Elective for all other College of Design Majors.

**GD 292 Special Topics in Graphic Design I-3. Offered in Fall Spring Summer.** Topics of current interest in Graphic Design. Normally used to develop new courses.

**GD 301 Graphic Design Studio III 6. Offered in Fall Only. Prerequisite: GD 202, GD 317; Corequisite: GD 410, GD 417.** Students apply theoretical information related to semiotics and communication theory through demonstration projects. Projects center on tailoring communication to audiences and acknowledging the role of context in the interpretation of form.

**GD 310 Imaging for Graphic Design II 3. Offered in Spring Only. Prerequisite: GD 210.** Intermediate photography and introduction to digital imaging as they relate to visual communication design; simple serial imaging; using movement and point of view; discussion of examples from photography and graphic design history.

**GD 317 Typography II 3. Offered in Spring Only. Prerequisite: GD 217.** Exploration of design using text type and typographic technology. Student exercises explore congruency between visual and verbal hierarchies, expressive use of typographic form, format/informational organization problems, and technical details of typographic specification and computer layout.

**GD 342 History of Graphic Design 3. Offered in Fall Only.** 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.

**GD 400 Advanced Graphic Design Studio 6. Offered in Fall Spring Summer. Prerequisite: GD 304, GD 400, GD 417, GD 442.** Advanced visual communication problems integrating typographic, photographic, and historical concepts in graphic design studio projects. Projects reflect applications with specific audiences, contexts, and production criteria. Graphic Design Majors, and Department approved elective (“swing”) Studio for all other College of Design Majors with Senior or Graduate Standing in Major.

**GD 410 Imaging for Graphic Design III 3. Offered in Fall Only. Prerequisite: GD 310.** Advanced photography and digital imaging; introduction to multi-media and narrative as they relate to visual communication design; discussion of authorship and images in culture and the communication environment.

**GD 417 Typography III 3. Offered in Fall Only. Prerequisite: GD 317.** Systematic approaches to structuring typographic form according to information hierarchies, user needs, and visual expression. Application to the organization of tables, charts, books, magazines, and corporate identities.

**GD 490 Graphic Design International Studio 6. Offered in Summer.** 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.

**GD 492 Special Topics in Graphic Design I-3. Offered in Fall Spring Summer.** Topics of current interest in Graphic Design. Normally used to develop new courses.

**GD 494 Internship in Graphic Design 3. Offered in Fall Spring Summer.** Supervised field experience in graphic design offices and organizations.

**GD 495 Independent Study in Graphic Design I-3. Offered in Fall Spring Summer.** Special projects in graphic design developed under the direction of a faculty member on a tutorial basis.
GENEALOGY

GEO 200 Principles of Geography 3. Offered in Spring Only. 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.

GEO 220 Cultural Geography 3. Offered in Fall and Spring. 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.

GEOGRAPHIC INFORMATION SYSTEMS

GIS 410 Introduction to Geographic Information Systems 3. Offered in Fall and Spring. Overview of the operations and functions of computerized spatial display and map analysis processes (Geographic Information Systems), production of effective computer-generated maps and spatial displays, concepts for spatial modeling. Extensive independent learning and computer experiences including on-line virtual laboratory sessions. Credit will not be given for both GIS 410 and GIS 510.

GENETICS

GN 301 Genetics in Human Affairs 3. Offered in Fall Spring Summer. Appreciation and understanding of genetics in everyday life. Genetic perspective on normal human development, birth defects, birth control, cancer, organ transplants, intelligence, mental illness, and radiation and chemical exposure and issues raised by applications of recently developed genetic techniques such as in vitro fertilization, genetic engineering and prenatal monitoring.

GN 311 Principles of Genetics 4. Prerequisite: BIO 183 or ZO 160. 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.

GN 312 Elementary Genetics Laboratory 1. Offered in Fall and Spring. Corequisite: GN 311. 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.


GN 414 Genes and Development 3. Offered in Spring Only. Prerequisite: GN 311. Genes and genetic pathways that control development in animals; overview of early, pivotal experiments in embryology and genetics; use of molecular biology, genomics and bioinformatics to study genes and development; concentration on four model systems; presentation and discussion of major issues in developmental biology.

GN 415 Genome Science 3. Prerequisite: GN 311. Complementation of modern genomics approaches with classical and molecular genetics; goals of major genome projects in animals, plants, humans, and microorganisms; genomic science opportunities at NCSU and in the Research Triangle; presentation and discussion of current literature; and preparation for careers in genomics-related fields.

GN 421 Molecular Genetics 3. Offered in Fall and Spring. Prerequisites: GN 311 and (MA 131 or MA 141). 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.

GN 425 Advanced Genetics Laboratory 2. Offered in Spring Only. Prerequisite: GN 412; Corequisite: GN 413 or GN 421. 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.

GN 434 Genes and Development 3. Offered in Spring Only. Prerequisite: C- or better in GN 421. Genes and genetic pathways that control development in animals; overview of early, pivotal experiments in embryology and genetics; use of molecular biology, genomics and bioinformatics to study genes and development; concentration on four model systems; presentation and discussion of major issues in developmental biology.

GN 441 Human and Biomedical Genetics 3. Offered in Fall Only. Prerequisite: C- or better in GN 421. 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.

GN 451 Genome Science 3. Prerequisite: C- or better in GN 423. Complementation of modern genomics approaches with classical and molecular genetics; goals of major genome projects in animals, plants,
humans, and microorganisms; genomic science opportunities at NCSU and in the Research Triangle; presentation and discussion of current literature; and preparation for careers in genomics-related fields.

GN 490 Genetics Colloquium 1. Offered in Spring Only. Prerequisite: GN 421. 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.

GN 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

GN 493 Special Problems in Genetics 1-6. Offered in Fall and Spring. A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Arrangements must be initiated by student and approved by a faculty adviser and the departmental teaching coordinator.

GN 495 Special Topics in Genetics 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

GLOBAL PUBLIC HEALTH

GPH 201 Fundamentals of Global Public Health 3. Offered in Fall Only. 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.

GLOBAL TRAINING INITIATIVE

GTI 401 US Culture and Education Colloquium 3. 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 on topics, 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.

HISTORY OF ART

HA 201 History of Art From Ancient Greece Through the Renaissance 3. Offered in Fall Only. Major art forms of ancient Greece and Rome through Italian Renaissance. Major art forms of painting, sculpture, and architecture.

HA 202 History of Art From the Renaissance Through the 20th Century 3. Offered in Spring Only. Major art forms of painting, sculpture, and architecture recent mixed media techniques such as collage, and tattlage.

HA 240 Introduction to Visual Culture 3. Offered in Fall Only. 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.

HA 298 Special Topics in Art History 3. Offered in Fall Spring Summer. 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.

HA 310 History of Art and Photography 3. History of the interaction between art and photography from the invention of photography to the present.

HA 320 American Decorative Arts 3. History of American Art (painting, sculpture, and architecture) from Colonial Period through 20th century.

HA 395 History of Art: Study Abroad 3. Offered in Fall Spring Summer. 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).

HA 401 19th Century European Art 3. Offered in Fall Only. Prerequisite: HA 201 or HA 202. Major stylistic movements of 19th century European art and the theoretical basis for their development. Covers Neo Classicism, Romanticism, Realism and Impressionism, and Post Impressionism.

HA 404 Italian Renaissance Masters 3. Prerequisite: 3 hrs. of HA. Selected problems in the development of Italian Renaissance art including painting sculpture and architecture, 1300-1550: including the pioneers Giotto and Duccio; founders of the early Renaissance: Masaccio, Donatello, and Brunelleschi; great masters of the High Renaissance: Michelangelo, Raphael and Leonardo da Vinci. Works of art analyzed in terms of style, subject matter and historical context.

HA 498 Independent Study in History of Art 1-6. Offered in Fall and Spring. Prerequisite: 3 hours History of Art. Directed independent study of topics in the History of Art.

HISTORY

HI 205 Western Civilization Since 1400 3. Offered in Fall and Spring. A survey of Western Civilization from the Renaissance to the present.

HI 207 Ancient World to 180 A.D 3. Offered in Fall and Spring. The ancient cultures of the Middle East, Greece and Rome, including Mesopotamian, Egyptian, Hebrew, Phoenician, Greek and Roman societies and cultures.

HI 208 The Middle Ages 3. Offered in Fall and Spring. 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.

HI 209 Europe, Renaissance to Waterloo, 1300-1815 3. Offered in Fall and Spring. Transition from the medieval to modern Europe; decline of medieval institutions, Renaissance, Reformation and Counter-Reformation, rise of Absolutism, English 17th-century revolution, French Revolution and Napoleonic era.

HI 210 Modern Europe 1815-Present 3. Offered in Fall and Spring. Survey of the history of European societies and political systems from 1815 to the present.

HI 215 Latin America to 1826 3. Offered in Fall and Spring. The origins and development of social, political, economic and religious institutions from pre-conquest times to the achievement of independence. The ancient American cultures; Spain and Portugal before 1492; conquest and settlement, Spanish rule in theory and practice, economic life, the Church, land and labor; the African contribution; the Portuguese in Brazil; the independence movements.

HI 216 Latin America Since 1826 3. Offered in Fall and Spring. Social, political, economic, and intellectual life in the 19th and 20th centuries in Central and South America. The social structure of the new nations; 19th century liberalism; the force of tradition; relations with Europe and the United States; economic change; caudillo rule; 20th century upheavals; revolutions; political conflict.

HI 221 British History to 1688 3. 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.

HI 222 History of British Cultures and Societies From 1688 3. British people from Glorious Revolution to the present. Social, political, cultural, and economic development; history and literature; growth and decline of British empire; spread of British culture.

HI 232 The World Since 1750 3. Offered in Fall and Spring. Introductory survey of three major civilizations before 1750, associated with Islam, with Christianity, and with China. The course examines the ways that people structure community identities, from the local to the civilization; the importance of interregional connections, established particularly through trade; and the ongoing impact of these connections on community identities.

HI 233 The World Since 1750 3. Offered in Fall Spring Summer. This course surveys the making of the world from 1750 to the present. Topics include: the Industrial Revolution, the development of the Nation-States, the rise of European, American and Japanese Empires, WWI, inter-war reconfigurations of colonial empires, anti-colonial nationalist movements, the Great Depression, the Cold War, struggles for political and economic independence among newly independent nations, the US-dominated neo-liberal order from the 1980s to the present, and contemporary global conflicts over ethnicity, religion, resources, disease, and the environment.

HI 240 Introduction to Visual Culture 3. Offered in Fall Only. 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.
HI 251 Early American History 3. Offered in Fall and Spring. Themes in early American history: colonial clash and mix of culture; generation of an American consciousness; federalism and democracy in national politics; expansion and immigration; racial and sectional division.

HI 252 Modern American History 3. Offered in Fall and Spring. Themes in modern 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 pluralistic society.

HI 263 Asian Civilizations to 1800 3. Offered in Fall Only. Introductory survey of the great civilizations of Asia, particular attention to India, China and Japan. Emphasis on comparative study of Asian religions, political systems, art, and literature.

HI 264 Modern Asia: 1800 to Present 3. Offered in Spring Only. 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.

HI 270 Modern Middle East 3. Offered in Fall Only. 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.

HI 275 Introduction to History of South and East Africa 3. Offered in Fall Spring Summer. 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.

HI 276 Introduction to History of West Africa 3. Offered in Fall and Spring. 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.

HI 295 First-Year Seminar in History 3. Topical introductory history course in the CHASS First-Year Seminar offerings. (Current listings available in the CHASS Dean's office and in the History Department).

HI 298 Special Topics in History 3. Offered in Fall Spring Summer. 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.

HI 300 Sophomore Seminar in History 3. Offered in Fall and Spring. 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.

HI 320 Religion in American History 3. Prerequisite: 3 hours of History or Sophomore standing. Representative people, movements and thought in the major religions within the context of American society and culture.

HI 321 Ancient and Medieval Science 3. Prerequisite: 3 hours of History or Sophomore standing. Selected topics in the history of pre-modern science are studied for both their intrinsic interest and to gain perspective on the nature of modern science. Examples are taken from pre-history, Mesopotamia, Egypt, Greece, Rome, Islam, and the medieval Christian West, with the possibility of comparisons to other cultures.


HI 335 The World at War 3. Offered in Spring Only. Prerequisite: 3 hours of History. 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.

HI 341 Technology in History 3. Offered in Spring Only. Prerequisite: 3 hours of History or Sophomore standing. 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.

HI 350 American Military History 3. Offered in Fall and Spring. Prerequisite: 3 hours of History or Sophomore standing. 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.

HI 351 U.S. Naval History 3. Offered in Spring Only. Prerequisite: 3 hours of History or Sophomore standing. 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.

HI 354 History of North Carolina 3. Prerequisite: 3 hours of History or Sophomore standing. 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.

HI 365 The American West 3. Prerequisite: 3 hours of History or Sophomore standing. A history of the American Frontier 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.

HI 366 Native American History 3. 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.

HI 370 Modern Egypt 3. Offered in Spring and Summer. Prerequisite: 3 hours of History or Sophomore standing. Political
HI 371 Modern Japan, 1850 to Present 3. Prerequisite: 3 hours of History or Sophomore standing. 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.

HI 372 African-American History Through the Civil War, 1619-1865 3. Prerequisite: 3 hours of History or Sophomore standing. African background and continuity of the particular role, experience and influence of African Americans in the United States through the Civil War.

HI 373 African-American History Since 1865 3. Prerequisite: 3 hours of History or Sophomore standing. The history of African-Americans from the Reconstruction era through the Civil Rights movement of the 1950s and 1960s to the present.

HI 374 Visual Culture of Modern South Asia 3. Offered in Spring Only. Prerequisite: 3 hours of History or Art Studies or Sophomore Standing. 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 patronage and popular values through common themes and stories. Changing state formations and power relationships--from the Mughal empire and its successor states through British imperial control and after independence--are studied as contexts for the visual culture that emerges and changes across these time periods. Knowledge gained from HI 263 [Asian Civilizations to 1800] or HI 264 [Modern Asia] is helpful but not required.

HI 380 History of Nonprofits, Philanthropy, and Social Change 3. Offered in Fall Only. Prerequisite: 3 hours of History or Sophomore standing. Historical development of nonprofits and philanthropy in the United States from the colonial period to the present--including origins of charity and philanthropy as concepts for social change and social justice, rise of benevolent societies, creation of philanthropic foundations and advocacy organizations, and relationships between modern nonprofits, the state, and the private sector.

HI 395 History: Study Abroad 1-3. Prerequisite: 3 hours of History or Sophomore standing. Topical History courses taught in NCSU Study Abroad programs. (Current listings available in Study Abroad Office, CHASS Dean's Office and History Department).

HI 400 Civilization of the Ancient Near East 3. Prerequisite: 3 hours of History. 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.

HI 402 Early Christianity to the Time of Eusebius 3. Prerequisite: One of: REL 312, REL 317, or HI 207. 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 Christian movements; anti-heretical writings; orthodox institutions of authority.

HI 403 Ancient Greek Civilization 3. Prerequisite: 3 hours of History. The history of the Hellenes from the Minoan civilization through Alexander's legacy, with readings in Herodotus and Thucydides.

HI 404 Rome to 337 A.D. 3. Prerequisite: 3 hrs. of History. 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.

HI 405 History and Archaeology of the Roman Empire 3. Prerequisite: 3 hrs. of History. 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.

HI 406 From Roman Empire to Middle Ages 3. Prerequisite: 3 hrs. of History. 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.

HI 407 Islamic History to 1798 3. Prerequisite: 3 hrs. of History. Credit will not be given for both HI 407 and HI 507. 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.

HI 408 Islam in the Modern World 3. Prerequisite: 3 hours of History or Religious Studies. 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.

HI 409 The High Middle Ages 3. Prerequisite: 3 hrs. of History. 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.

HI 410 Italian Renaissance 3. Prerequisite: 3 hrs. of History. Renaissance humanism, an educational ideal and an awareness of man as the sole creator in the historical world, is examined in its relationship to the Italian republics and princedoms of the 14th through the 16th century. Credit will not be given for both HI 410 and HI 510.

HI 411 The Protestant and Catholic Reformation of the 16th Century 3. Prerequisite: 3 hrs. of History. The conditions and criticisms which led to reform and the nature of the institutional and theological changes affected by the various churches and sects. Special attention to Luther and Calvin. Credit will not be given for both HI 411 and HI 511.

HI 412 The Sexes and Society in Early-Modern Europe 3. Prerequisite: 3 hrs. of History. 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.

HI 414 France in the Old Regime 3. . Prerequisite: 3 hrs. of History. France from the sixteenth century to the Revolution, development of renaissance and absolutist state, social and economic change, religious reform and Enlightenment, origins and beginnings of the revolution. Credit will not be given for both HI 414 and HI 514.

HI 415 The French Revolution 3. . Prerequisite: 3 hrs. of History. 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.

HI 418 Fascist Italy and Nazi Germany 3. Offered in Fall Only. Prerequisite: 3 hrs. of History. 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.

HI 419 Modern European Imperialism 3. . Prerequisite: 3 hrs. of History. 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.

HI 420 European Diplomatic History 3. Offered in Spring and Summer. Prerequisite: 3 hours of History. Survey of major events in European international relations, including the Congress of Vienna in 1815, the unification of Germany, World War I and II, the origins of the Cold War, European unification, and the crisis of the Soviet bloc. Credit will not be given both for HI 420 and HI 520.

HI 421 European Intellectual History: The Eighteenth Century 3. . Prerequisite: 3 hrs. of History. 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.

HI 422 European Intellectual History: The 19th Century 3. . Prerequisite: 3 hrs. of History. 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.

HI 423 Women in European Enlightenment 3. Offered in Spring Only. Prerequisite: 3 hrs. of History. Historical examination of construction of female 'nature' resources available to women writers and intellectuals, and constraints on women's education, writing and publication during the Enlightenment period. Credit will not be given for both HI 423 and HI 523.

HI 425 Tudor and Stuart England 3. . Prerequisite: 3 hrs. of History. 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.

HI 429 20th Century Britain 3. . Prerequisite: 3 hours of History. 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.

HI 430 Modern France 3. . Prerequisite: 3 hrs. of History. 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.

HI 431 Germany: Luther to Bismarck 1500-1871 3. . Prerequisite: 3 hrs. of History. Germany from the Reformation to the completion of national unification in 1871. Emphasizes the impact of socioeconomic changes on politics and culture. Credit will not be given for both HI 431 and HI 531.

HI 432 History of Germany Since 1871 3. . Prerequisite: 3 hours of History. German history from the unification of 1871 to the present, concentrating on problems of nationalism and political and social reform. Credit will not be given for both HI 432 and HI 532.

HI 435 Europe Since 1945 3. Offered in Fall Only. Prerequisite: 3 hrs. of History. Survey of European politics, society, and culture from 1945 to the present day focusing equally on Eastern and Western Europe. Begins with the Cold War division of the continent and gives special attention to the years immediately following the end of the Second World War, to the revolts of 1968, to the fall of Communism in 1989-1991, and to the Wars of Yugoslav Succession, 1991-1999..

HI 438 The Russian Empire to 1917 3. . Prerequisite: 3 hours of History. Russian Empire to the Revolution of 1917. Kiev Rus and the Mongol conquest, serfdom, territorial expansion, cultural insularity of the Great Russian state in Moscow, Westernization, reform, and great power status in 18th and 19th centuries, peoples of the multi-national empire, cultural, educated society, and revolutionary opposition, industrialization, rapid urbanization, war, and revolution. Credit will not be given for both HI 438 and HI 538.

HI 439 History of the Soviet Union And After 3. . Prerequisite: 3 hrs. of History. Soviet state and society from the 1917 Revolution, including the 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 the failed attempt at Party renewal after 1985. Credit will not be given both for HI 439 and HI 539.

HI 440 American Environmental History 3. Offered in Fall Only. Prerequisite: 3 hours of History. 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.

HI 441 Colonial and Revolutionary U.S 3. . Prerequisite: 3 hrs. of History. 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.

HI 442 Creating the Constitution: Origins and Development 3. Offered in Spring Only. Prerequisite: 3 hours of History. Analysis of state and federal constitutions developed in the United States after 1776. Theories behind a federal constitution; the Philadelphia Convention of 1787; the ratification debate; and the bill of rights. Credit will not be given for both HI 442 and HI 542.
HI 443 U.S. Constitutional History to 1883 3. Prerequisite: 3 hrs. of History. 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.

HI 444 U.S. Constitutional History Since 1870 3. Offered in Spring Only. Prerequisite: 3 hrs. of History. 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.

HI 445 Early American Frontier 3. Prerequisite: 3 hrs. of History. 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.

HI 446 Civil War and Reconstruction 3. Prerequisite: 3 hrs. of History. Examination of sectional polarization of the 1850's, impact of the war on both northern and southern societies, and trauma of reconstructing the Union. Credit will not be given for both HI 446 and HI 546.

HI 447 History of American Women to 1900 3. Prerequisite: 3 hours of History. The historical experience of women in America from the colonial period to 1890. Changes in women's work, education, legal and political status, religious experience, 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) 447 and HI (WGS) 547.

HI 448 American Women in the Twentieth Century 3. Prerequisite: 3 hrs. of History. 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.

HI 449 U.S. Labor to 1900 3. Prerequisite: 3 hrs. of History. History of work, workers, and working-class organizations and politics in colonial and nineteenth-century America. Credit will not be given for both HI 449 and HI 549.

HI 450 U.S. Labor Since 1900 3. Prerequisite: 3 hrs. of History. History of work, workers, and working-class organizations and politics in twentieth-century America. Credit will not be given for both HI 450 and HI 550.

HI 451 The Vietnam War 3. Offered in Spring Only. Prerequisite: 3 hours of History. Analysis of U.S. involvement in Vietnam, including an introduction to Vietnamese history, why the United States intervened in Vietnam, the various forms U.S. intervention took, which Americans went to Vietnam and what they expected there, the consequences of U.S. involvement for Americans and Vietnamese, the effort to end American participation in the war, and the war's legacy. Credit for both HI 451 and HI 551 is not allowed.

HI 452 Recent America 3. Prerequisite: 3 hrs. of History. 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.

HI 453 United States-Latin American Relations Since 1823 3. Prerequisite: 3 hrs. of History. Analysis of periods, issues, and events in U.S.-Latin American relations since 1823: Monroe Doctrine, Manifest Destiny, Mexican and Spanish-American Wars, Dollar Diplomacy, Good Neighbor Policy, anti-Communist crusade since 1945, Alliance for Progress, U.S. responses to revolution. Historical perspective on contemporary inter-American problems on drugs, environment, debt crisis, and human rights abuses. Credit will not be given both for HI 453 and HI 553.

HI 454 History of U.S. Foreign Relations, 1900-Present 3. Prerequisite: 3 hrs. of History. 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 American relations with other nations. Credit for both HI 454 and HI 554 will not be allowed.

HI 455 History of the Civil Rights Movement 3. Prerequisite: 3 hrs. of History. 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 HI (AFS) 455 and HI 555.

HI 456 Early American Thought 3. Prerequisite: 3 hours of History. American intellectual history to 1865. Influence of reformation, enlightenment, scientific revolution, capitalism and romanticism on social and political order. Credit will not be given for both HI 456 and HI 556.

HI 457 Twentieth-Century U.S. Intellectual History 3. Prerequisite: 3 hrs. of History. American intellectuals and their views on 20th-century topics such as politics, culture, race and gender in historical context. Credit for both HI 457 and HI 557 is not allowed.

HI 458 Modern American Historical Biography 3. Prerequisite: 3 hrs. of History. Credit will not be given for both HI 458 and HI 558. American history in the 20th century through the medium of historical biography. Credit will not be given for both HI 458 and HI 558.

HI 459 The Early American Republic 3. Prerequisite: 3 hrs. of History. 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.
HI 461 Civilization of the Old South 3. Prerequisite: 3 hrs. of History. 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.

HI 462 Social History of the New South 3. Offered in Full Only. Prerequisite: 3 hours of History. Analysis of the change and continuity in the American South from the end of the Civil War through the present. Credit will not be awarded both for HI 462 and HI 562.

HI 465 Oil and Crisis in the Gulf 3. Prerequisite: 3 hrs. of History. 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.

HI 466 History of the Palestinian-Israeli Conflict 3. Prerequisite: 3 hrs. of History. 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.

HI 467 Modern Mexico 3. Prerequisite: 3 hours of History. 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 Porfirio Diaz. The 1910 Revolution and the resulting transformation of Mexico's political, social and economic institutions. Reading knowledge of Spanish helpful but not required.

HI 469 Latin American Revolutions in the Twentieth Century 3. Prerequisite: 3 hrs. of History. 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.

HI 470 Seminar: Teaching World History 3. Offered in Spring Only. Prerequisite: 3 hours of History. Introduction to historiography and themes of world history; designed for, but not restricted to, LTH students planning to teach world history.

HI 471 Revolutionary China 3. Prerequisite: 3 hrs. of History. 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.

HI 473 Japan's Empire in Asia, 1868-1945 3. Offered in Fall Only. Prerequisite: 3 hrs. of History. 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.

HI 474 Modern India 3. Offered in Fall Only. Prerequisite: 3 hours of History. 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.

HI 475 History of the Republic of South Africa 3. Offered in Fall and Spring. Prerequisite: 3 hours of History. 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.

HI 476 Leadership in Modern Africa 3. Prerequisite: 3 hours of History. 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.

HI 477 Women in the Middle East 3. Offered in Spring Only. Prerequisite: 3 hours of History. The varied forces influencing lives of women in Middle East from beginning of Islam to present.

HI 478 Islam and Christianity in Sub-Saharan Africa 3. Offered in Spring Only. Prerequisite: 3 hours of History. 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.

HI 479 Africa (sub-Saharan) in the Twentieth Century 3. Offered in Spring Only. Prerequisite: 3 hours of History. 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.

HI 480 Scientific Revolution: 1300-1700 3. Prerequisite: 3 hrs. of History. Factors behind dramatic scientific changes of the seventeenth century. Role of mathematics and experiment. Interaction of the new science with trends in philosophy, religion, alchemy, magic, medicine, and with institutional, educational, political, economic and technological factors. Credit will not be given for both HI 480 and HI 580.

HI 481 History of the Life Sciences 3. Prerequisite: 3 hrs. of History. The major ideas, methods, institutions, and individuals that have contributed to the biological sciences from Renaissance to modern times. The connections between the life sciences and other aspects of culture, including the physical sciences, religious belief, medical practice, and agriculture. Credit will not be given for both HI 481 and HI 581.

HI 482 Darwinism in Science and Society 3. Offered in Spring Only. Prerequisite: 3 hrs. of History. 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.

HI 483 Science and Religion in European History 3. Offered in Spring Only. Prerequisite: 3 hrs. of History. The historical conflict between science and religion; crisis of religion; science as a new cultural authority; political and institutional landscape of science and religion in Europe. Credit will not be given for both HI 483 and HI 583.
HI 484 Science in European Culture 3. Offered in Fall Only. Prerequisite: 3 hrs. of History. Relationship between science and culture in European history; evaluation of 'two cultures' thesis; scientific instruments, universal expos, science and literature. Credit will not be given for both HI 484 and HI 384.

HI 485 History of American Technology 3. Offered in Spring Only. Prerequisite: 3 hours of History. 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.

HI 491 Seminar in History 3. Offered in Fall and Spring. Prerequisite: 3 hours of History, Junior standing. Detailed investigation of selected topics in history. Consult Department of History for specific topics.

HI 495 Honors Research in History I 2. Offered in Fall and Spring. Preparation of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 496 Honors Research in History II 4. Offered in Fall and Spring. Prerequisite: HI 495, Senior in History Honors Program. Completion of the honors thesis. Topics and procedures to be determined by the student and the supervising faculty member.

HI 498 Independent Study in History 1-6. Prerequisite: 3 hours of History. Extensive readings on predetermined topics focused around a central theme. Permission of the department is required.

HON 101 Honors Colloquium I 1. Offered in Fall Only. Introduction to Honors at NC State University for University Honors Program students. Development of Honors Plan of Study and discussion of issues of concern in higher education and relationship between education, personal development, and community involvement. Require permission of the University Honors Program.

HON 102 Honors Colloquium II 1. Offered in Spring Only. Prerequisite: HON 101, UHP student. Introduction to Honors at NC State University for University Honors Program students. Development of plan for honors research project and proposal for study abroad experience. Further reflection on purpose of higher education in addressing the issues and opportunities of our time. Require permission of the University Honors Program.

HON 201 Inquiry, Discovery, and the Arts 3. Offered in Fall and Spring. A study of works of art that treat the theme of inquiry and discovery—its risks, its creativity, its ambiguities and complexities, and its moral dilemmas. Selected works from several media-theatre, 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.

HON 202 Inquiry, Discovery, and Literature 3. Offered in Fall and Spring. 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.

HON 290 Honors Special Topics - History 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in History, interdisciplinary in character and often team-taught.

HON 291 Honors Special Topics-Mathematics 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in mathematics, interdisciplinary in character and often team-taught.

HON 292 Honors Special Topics-Natural Sciences 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the natural sciences, interdisciplinary in character and often team-taught.

HON 293 Honors Special Topics-Literature 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in history or literature, interdisciplinary in character, and often team-taught.

HON 294 Honors Special Topics-Philosophy or Religion 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in philosophy, religion, or arts, interdisciplinary in character, and often team-taught.

HON 295 Honors Special Topics-Social Science 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in the social sciences, interdisciplinary in character, and often team-taught.

HON 296 Honors Special Topics-Science, Technology, Society-H&SS Perspective 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Science, Technology and Society (humanistic perspective) interdisciplinary in character and often team-taught.

HON 297 Honors Special Topics-Science, Technology, Society-Natural Sciences 3. Offered in Fall and Spring. Seminar for University Honors Program students, repeatable if content varies, meeting GER requirements in Science, Technology and Society (natural science perspective) interdisciplinary in character and often team-taught.

HON 298 Honors Research/Independent Study 1-3. Offered in Fall Spring Summer. 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 registration. Permission of the University Honors Program required.

HON 299 Honors Special Topics - Visual and Performing Arts 3. Offered in Fall and Spring. 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.

HON 310 The Creative Process in Science: Realities, Comparisons, and Culture Perceptions 3. Offered in Fall and Spring. 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 to 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.

HON 321 Music and the Science of Sound 3. Offered in Fall Only. This course investigates music using the science of sound, from the earliest experiments on vibrating strings to digital recording and MP3s, and the parallel development of music and scientific thought in western cultures. Concepts will be explained in simple mathematical and non-mathematical terms and developed in an historical perspective. Students will build instruments based upon what they have learned in the course. This course is suitable for both science and non-science students. University Honors Program student or permission of the UHP.

HON 341 Time Travel 3. Offered in Spring Only. 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.

HON 342 Issues in Contemporary Religion 3. Offered in Spring Only. An examination of major issues in contemporary religious thought, with particular attention to how theologians have reshaped traditional theological concepts in response to 20th-21st century challenges. After considering the academic study of religion and addressing the methodological issues of the nature of religious language and the task of theology, the course will examine the impact of recent historical and cultural developments on the formulation of theological proposals and the role religion plays in shaping societal attitudes and mores.

HON 343 Philosophical Ethics 3. Offered in Fall Only. An introduction to some of the main concepts and theories in the field of ethics. This course explores answers to the most basic questions of ethics: How can we tell right from wrong and good from bad? What is it to be a good person? What does "making the world a better place" amount to? The course will examine how philosophers have answered these questions in the past and consider how their answers might be relevant to contemporary ethical dilemmas. University Honor Program Students or permission of UHP.

HON 344 Kantian Ethics 3. Offered in Fall and Spring. In this course students will be introduced to foundational ideas of a moral system 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 morality. Students will be introduced to some of the enduring moral questions, such as What is the good life? What is justice? What is freedom? What are the universal moral principles and whether we ought to follow them? They will learn a variety of approaches to ethical issues and their reflection in social and political reality.

HON 345 On the Human 3. Offered in Fall and Spring. 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.

HON 346 Ethics and Gender 3. Offered in Fall and Spring. This course is concerned with contemporary work in ethics and gender that speaks both to the status of women and issues surrounding sexual orientation. The core readings will be Martha Nussbaum's Sex and Social Justice, Sam Harris' The Moral Landscape: How Science Can Determine Human Values, and an essay by Cheshire Calhoun from her book, Feminism, the Family and the Politics of the Closet. All of the major Western, secular, philosophical ethical theories and perspectives will be considered. The course will begin with some background in older ethical theories and traditions in order to better understand the contemporary literature. This class is restricted to students in the University Honors Program. Other students may enroll with permission of the UHP.

HON 351 American Ideals in Global Perspective 3. Offered in Fall Only. This course will examine core American ideals, how they evolved, what differentiates them from competing ideologies, and the extent to which they are transferable to countries with very different cultures, histories, and levels of economic development. It will also critically enquire about the extent to which the United States has been achieving its ideals and how successful it has been in promoting these values globally.

HON 361 Eco-Realism: Human Nature, Politics, and Ecological Constraints 3. Global Environmental issues reveal the reciprocal relationship between human activity and the environment. The course approaches environmental issues from a "realist" perspective, focusing on the function of the earth as humans' life support system and the impact of political and economic organization as well as technology on this system. The examination of basic ecological principles and a discussion of the understanding of "human nature" in classic, modern and contemporary science prepare students for conducting their own case studies. University Honors Program student or permission of the UHP.

HON 362 Information Technology, Society, and Academic Research 3. Developments in information technology have a dramatic impact on how we conduct research and on society itself, affecting economics, politics, and the lives of individuals and communities. This course explores the relationship between information technology and society, probing complex issues such as information overload, the digital divide, information ethics, indeterminate authority, and the open access movement. As we explore specific information technologies, students will also have the opportunity to develop greater expertise in locating, evaluating and using information. University Honors Program student or permission of the UHP.

HON 371 Environmental Science and Technology 3. Offered in Spring Only. This seminar explores deeply advanced topics in contemporary environmental science and considers and evaluates the potential solutions to the challenges they pose. The seminar is based on readings from multiple perspectives of these real-world challenges with an emphasis on those occurring in North Carolina. The seminar is interdisciplinary, so political, economic, and ethical aspects are addressed. University Honors Program student or permission of UHP.

HON 391 Music and Social Life 3. Offered in Spring Only. At NC State and in the Triangle people are actively engaged in music-making, dancing, devotional practices, and a multitude of other kinds of artful performance. Students in this class think about the relationship between music and other aspects of social life by doing field research to answer questions about creativity, listening, performance, and the ways music and dance shape social life, values, and ideas about difference. Students consider modes of research about music and learn techniques
HORTICULTURAL SCIENCE

HS 100 Home Horticulture 3. Offered in Fall and Spring. 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.

HS 101 Home Horticulture 3. 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.

HS 201 Principles of Horticulture 3. Offered in Fall and Spring. 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.

HS 203 Home Plant Propagation 3. Offered in Spring Only. 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.

HS 211 Ornamental Plants I 3. Offered in Fall Only. Prerequisite: BIO 181. Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes bedding plants, trees, and gymnosperms.

HS 212 Ornamental Plants II 3. Offered in Spring Only. Prerequisite: BIO 181. Identification, distribution, growth, characteristics, adaptation, and usage of ornamental plants. Emphasizes shrubs, ground covers, vines, bulbs, and interior landscape plants.

HS 215 Basic Agricultural Genetics 3. Offered in Fall Only. Prerequisite: ZO 160 or BIO 181. Basic principles of inheritance in plants and animals of agricultural significance. Transmission genetics and its effects on the usefulness of plants and animals. Basic principles of plant and animal improvement.

HS 250 Home Landscape Design 3. Offered in Summer. 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.

HS 252 Landscape Graphic Communication 3. Offered in Spring Only. Visualization of the entire design process, from conception to presentation drawings. A complete graphic vocabulary (concepts, techniques, and drawing styles) will be covered, providing the designer with an effective means of communicating design ideas, to her/himself, other professionals, clients, and the public.

HS 290 Perspectives in Horticultural Science 1. Offered in Fall Only. 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.

HS 301 Plant Propagation 4. Offered in Fall Only. Prerequisite: BIO 181 or BO 200. 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.

HS 302 Gardening with Herbaceous Perennials 3. Offered in Spring Only. Prerequisite: BIO 183 or BO 200. 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.

HS 342 Landscape Horticulture 3. Offered in Fall and Spring. Introduction to comprehensive process for small scale landscape projects. Includes garden history, social and environmental analysis, creative problem solving process and the practice of oral, written and graphic communication.

HS 357 Site Design and Construction Materials 4. Offered in Fall and Spring. Prerequisite: Landscape Horticulture (11HORTTHL) students, HS 252 and HS 342. Site design of small scale landscape design projects including: understanding two-dimensional and three-dimensional representation of landform, landform manipulation, surveying and measuring, base map development, site analysis, grading and drainage plans, small circulation systems (pedestrian and vehicular), pavement, functional role of plants, designing site structures (steps, ramps, walls, and fences), documenting and analyzing user information, and special population site requirements. Exploration of appropriate construction materials and their properties occurs concurrently with the above topics. Field trips will be required.

HS 371 Interior Plantscapes 3. Offered in Spring Only. Prerequisite: BIO 181 or BO 200, second semester Sophomore standing. Identification, selection, installation, utilization, and maintenance of plants commonly used in commercial interior settings.

HS 400 Residential Landscaping 6. Offered in Fall and Spring. Prerequisite: HS 211, 212, 342, LAR 430, Corequisite: LAR 457. 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.

HS 401 Landscape Construction Studio 6. Offered in Spring Only. Prerequisite: THL Major, HS 357, 400. Small scale landscape design with a concentrated focus on detail design and construction documentation. Development of skills in designing, drawing, and building landscape features. Opportunities for hands-on experiences.

HS 411 Nursery Management 3. Offered in Fall Only. Prerequisite: BIO 181, SSC 200, Junior standing. 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.

HS 416 Principles of Ornamental Planting Design 4. Offered in Fall and Spring. Prerequisite: Landscape Horticulture (11HORTTHL) concentration, HS 400. 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.

HS 421 Physiology and Culture of Temperate-Zone Tree Fruits 3. Offered in Fall Only. Prerequisite: BIO 181 or BO 200. 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 to North Carolina.

HS 422 Small Fruit Production 3. Prerequisite: BIO 181, SSC 200, HS 201. 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.

HS 423 General Viticulture 3. Offered in Spring Only. 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 making, and safety. 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.

HS 431 Vegetable Production 4. Offered in Fall Only. Prerequisite: BIO 181, SSC 200. 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.

HS 432 Introduction to Permaculture 3. Offered in Fall and Spring. Permaculture means "permanent culture," (or "permanent agriculture") and "...is the conscious design and maintenance of cultivated ecosystems that have the diversity, stability, and resilience of a natural ecosystem." (Bill Mollison) Course will explore, through lectures, discussions, field trips, and required projects, a design/thinking methodology that seeks to provide for our physical needs, food, water, shelter, energy, etc., while doing so in an environmentally friendly, sustainable manner. The Saturday field trips and the weekend mountain trip are all optional.

HS 440 Greenhouse Management 3. Offered in Fall Only. Prerequisite: SSC 200 and HS 201. 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.

HS 442 Production of Floricultural Crops 3. Offered in Spring Only. Prerequisite: SSC 200, HS 201. 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.

HS 451 Plant Nutrition 3. Offered in Spring Only. Prerequisite: SSC 200. 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.
HS 462 Postharvest Physiology 3. Offered in Spring Only. Prerequisite: PB 421. 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.


HS 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

HS 493 Special Problems in Horticultural Science 1-6. Offered in Fall and Spring. 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.

HS 495 Special Topics in Horticultural Science 1-6. Offered in Fall Spring Summer. Independent study under faculty supervision of horticultural topics in the student's area of interest not available in regular course offerings. Offering of new courses on a trial basis.

HUMANITIES & SOCIAL SCIENCES

HSS 100 CHASS Computer Literacy 0. Offered in Fall and Spring. Computer Literacy Certification for majors in College of Humanities and Social Sciences.

HSS 110 Humanities and Social Sciences Scholars Forum 0. Offered in Fall and Spring. 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.

HSS 111 Humanities and Social Sciences Scholars Forum 0. Offered in Fall and Spring. 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.

HSS 294 Social Sciences Studied in an Overseas Context 3. Social Sciences courses taught in NC State Study Abroad programs. (Current listings available in Study Abroad office and CHASS Dean's Office.)

HSS 298 Study Abroad Topics in Humanities and Social Sciences 1-6. Offered in Fall and Spring. Study Abroad Programs: selected topics in the humanities and social sciences.


INDUSTRIAL DESIGN

ID 201 Basic Industrial Design Studio I 6. Offered in Fall Only. Prerequisite: D104 and D105; Corequisite: ID 215, ID 255, and ID 318. 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, department approved minor, and department approved elective ("swing") studio for all other College of Design majors.

ID 202 Basic Industrial Design Studio II 6. Offered in Spring Only. Prerequisite: ID 201, ID 215, ID 255, ID 318; Corequisite: ID 315, ID 418. 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.

ID 215 Introduction to digital Techniques 3. Offered in Fall Only. Prerequisite: D 104, D 105. 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; desktop publishing applications for design and production of presentation documentation; and visual editors for creating and managing web sites. Industrial design majors, department approved minor, and department approved elective for all other college of design majors.

ID 255 Contemporary Manufacturing Processes I 3. Offered in Fall Only. Prerequisite: D 104, D 105. Introduction to mass production processes and their influences on design. 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.

ID 256 Contemporary Manufacturing Processes II 3. Offered in Spring Only. Prerequisite: ID 255. 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.

ID 262 Professional Practice in Industrial Design 3. Offered in Spring Only. Issues and situations encountered in a design practice. Topics include patents, trademarks, contracts, basic marketing skills within corporations and in free-lance design.

ID 292 Special Topics in Industrial Design 1-3. Offered in Fall Spring Summer. Topics of current interest in Industrial Design. Normally used to develop new courses.

ID 300 Intermediate Industrial Design Digital Studio Series 6. Offered in Fall and Spring. Prerequisite: ID 202, ID 255, ID 315, ID 418; Corequisite: ID 415 (Fall), ID 445 (Spring). Individual and team-
oriented design experiences that expand upon and combine intellectual and manual skills required for the practice of industrial design. Emphasis on identifying and solving design problems through manipulation of design theory, application of human factors, product safety awareness, universal design principles, ecological/environmental concerns, appropriate combination of materials and manufacturing techniques, and presentation of concepts. Extensive integration of computertechnology, including 3-D digital modeling, rapid prototyping, interactive virtual product visualization, and world wide web-based presentation.

ID 315 Digital Product Modeling 3, Offered in Spring Only. Prerequisite: ID 215. Progression of digital experiences that expand upon and combine the intellectual and conceptual skills required for 3-dimensional design visualization. Emphasis on solving design problems through manipulation of 3-dimensional form within the virtual environment.

ID 318 Ideation I 3, Offered in Fall Only. Prerequisite: D 104, D 105. The ideation process of conceiving, developing and recording ideas two-dimensionally. These techniques defined and practiced as an extension of understanding the human idea motor process.

ID 400 Advanced Industrial Design Studio Series 6, Offered in Fall Spring Summer. Prerequisite: Industrial Design Majors, ID 300. A series of advanced studio experiences that expands upon and combines intellectual and manual skills required for the practice of industrial design. 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.

ID 415 Advanced Digital Product Modeling 3, Offered in Fall Only. Prerequisite: ID 315. Advanced concepts for planning and executing efficient workflow practices for manufacturable product surfaces. Emphasis on theory and application of three-dimensional surface modeling tools, accurate development of wire frame geometry, rapid prototyping and animation techniques. Introduction of animations to aid with dynamic visual analysis of digital product design concepts.

ID 418 Ideation II 3, Offered in Spring Only. Prerequisite: ID 318. This is an advanced course which expands the ideation process with greater emphasis directed toward the creative development and recording of conceptual design phase.

ID 445 Human-Centered Design 3, Offered in Spring Only. 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 Junior or Graduate standing in Major.

ID 490 Industrial Design International Studio 6, Offered in Fall Spring Summer. 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.

ID 492 Special Topics in Industrial Design 7-3, Offered in Fall Spring Summer. 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 or Graduate standing in Major.

ID 494 Internship in Industrial Design 1-6, Offered in Fall Spring Summer. Supervised field experience in product design offices, galleries, museums and other related organizations. Maximum of 6 credit hours.

ID 495 Independent Study in Industrial Design 1-3, Offered in Fall Spring Summer. Special projects in industrial design developed under the direction of a faculty member on a tutorial basis. Maximum 6 credit hours - May be repeated.

INTERDISCIPLINARY STUDIES

IDS 105 A Systems Approach to the Universe 3, Offered in Fall Summer. Systems approaches to problems in physical, social, and behavioral sciences and technology. Concepts of general systems (interactions between systems functioning). Emphasis in interdisciplinary problem-solving methods and critical questioning.

IDS 201 Environmental Ethics 3, Offered in Fall and Spring. 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.

IDS 211 Eating through American History 3, Offered in Fall. 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.

IDS 230 Coastal and Ocean Frontiers 3, Offered in Fall Only. Interdisciplinary approach to current issues, theories, management strategies and future trends concerning the coasts and the oceans. Required weekend field trip.

IDS 260 Changing Paradigms of Leadership, Learning, and Service 4, Offered in Fall and Spring. Interdisciplinary examination of leadership, learning, and service-and their inter-relatedness-in light of the evolving scientific worldview of western civilization. Service-learning enhanced seminar supports students in connecting course material and community-based experiences to their personal lives and their roles as citizens. Peer-led reflection sessions, seminars with guests, field-trips, and other enhancement opportunities during required weekly two-hour learning lab; service hours scheduled by students. Serves as training course for students interested in leadership roles in service-learning and civic engagement at NCSU.

IDS 295 Special Topics in Interdisciplinary Studies 1-99, Offered in Fall Spring Summer. Detailed investigation of an interdisciplinary topic. Topic and mode of study to be determined by faculty member and/or teach team.

IDS 303 Humans and the Environment 3, Offered in Fall Spring Summer. 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.
IDS 305 Peace in the Global Village 3. Offered in Fall Only. Examination of peace in multidisciplinary terms—anthropological, psychological, political, philosophical, environmental and religious; consideration of human propensity for cooperation as well as aggressiveness; dialogue-lectures, case studies, workshops and round table presentations on past and present human groupings that succeeded in attaining peace; possibilities for peace in the future.

IDS 401 The Contemporary City: Problems and Prospects 3. Offered in Spring Only. Interdisciplinary examination of the social and physical characteristics of the contemporary city and problems which cities face. Topics include urban design, social relationships, education, transportation, crime and violence, and urban psychology. Alternative solutions to various urban problems examined.


IDS 415 Peruvian Amazon Ecology and Ethnology 2. Offered in Summer. A field/lecture course, located on the Amazon, near Iquitos, Peru, is presented by a team of scientists and specialists in ornithology, ecology, entomology, and anthropology. Coursework is divided into pre-trip readings, onsite field experiences and lectures; and post-trip reflection and application. This course is designed for, but not restricted to precollege teachers and informal educator, e.g., in museums and parks, as a general introduction to tropical systems. Additional travel and trip costs are required beyond registration fees as well as appropriate immunization.

IDS 490 Interdisciplinary Methods and Issues 3. Offered in Fall and Spring. Capstone seminar for students in the IDS self-design major. Intensive study of student's area of concentration, leading to a major research paper.

IDS 495 Special Topics in Interdisciplinary Studies 1-99. Offered in Fall and Spring. Examination of selected topics of an interdisciplinary nature.

IDS 496 Topics in Film and Interdisciplinary Studies 3. Detailed examination of film within interdisciplinary contexts. Specific topics will vary from semester to semester.

IDS 498 Independent Study in Interdisciplinary Studies 1-99. Offered in Fall and Spring. Independent investigation and discussion of a selected topic of an interdisciplinary nature.

INTERDISCIPLINARY PERSPECTIVES

IP 295 Interdisciplinary Perspectives Special Topics 2-3. Offered in Fall Spring Summer. Special Topics course offered on a trial basis for the General Education Interdisciplinary perspectives category. Offered for a letter grade.

IS 200 Introduction to International Studies 3. Offered in Fall and Spring. 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.

IS 393 International Affairs Seminar 3. Offered in Fall Only. An interdisciplinary study of various aspects of globalization, with an emphasis on the interaction between local communities and global forces and how the two shape each other at the level of human rights, ethnic relations, states, human migrations, the environment, cultures and languages, and health.

IS 491 Senior Seminar in International Studies 3. Offered in Fall and Spring. Prerequisite: IS 393. An intensive study of selected international issues, global dimensions and implications, leading to a major research paper.

INDUSTRIAL & SYSTEMS ENGINEERING

ISE 110 Computer-Based Modeling for Engineers 3. Offered in Fall and Spring. Prerequisite: E 115, Corequisite: MA 141. 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.

ISE 210 Introductory Engineering Graphics for Industrial Engineering 3. Offered in Fall and Spring. Prerequisite: E 115. Introduction to the graphical representation and solution of 2D and 3D spatial problems. Conventional methods using computer-based tools to graphically describe 2D and 3D objects relevant to the field of IE. Overview of the fundamentals and applications of computer graphics and computer-aided design. Includes practical IE drawing applications.

ISE 216 Manufacturing Engineering Practicum 3. Offered in Fall and Spring. Prerequisite: GC 120. Hands-on experimentation for students to learn the capabilities and limitations of basic manufacturing processes. Relationships between product design, quality, manufacturing planning, computer simulation, material handling systems, time and motion studies, and ergonomics.


ISE 316 Manufacturing Engineering I - Processes 3. Offered in Fall and Spring. Prerequisite: MSE 200; ISE 216; ISE/GC 210. Analytical study and design of manufacturing engineering with emphasis on mfg. and processes. Address the interaction of design, materials, and processing. Laboratory instruction and hands-on experience in metrology, machining, process planning, economic justification, and current mfg. methodologies.
ISE 330 Furniture Product Engineering 3. Prerequisite: GC 120. Introduction to the use and properties of materials and construction methods used in mass production of furniture. Examines techniques of product engineering and its role in determining product quality and manufacturability. Emphasis on principles of computer-based product development, specification, and performance evaluation.

ISE 331 Furniture Manufacturing Processes I 3. Prerequisite: ISE 330. Furniture manufacturing technology emphasizing mass production equipment capabilities and capacities. Relationship of product characteristics to machine selection and process planning activities. Introduction to computer-controlled machining and integrated manufacturing systems.

ISE 351 Manufacturing Engineering 3. Prerequisite: GC 120. Analytical study and design of manufacturing engineering and processes. Emphasis on the interaction of design, materials, and processing, on the techniques of metrology, machining, process planning, computer-aided process control, economic justification, and state-of-the-art manufacturing technologies.

ISE 352 Work Analysis and Design 3. Offered in Fall and Spring. Prerequisite: C- or better in ST 371; C- or better in ISE 310. Work methods and production processes to improve operator effectiveness and reduce production costs. Techniques studied include operation analysis, motion study, value engineering, predetermined time systems, time study and line balancing.

ISE 361 Deterministic Models in Industrial Engineering 3. Offered in Fall and Spring. Prerequisite: (MA 303 or MA 341 or MA 405) and C- or better in ISE 110. 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.

ISE 401 Stochastic Models in Industrial Engineering 3. Offered in Fall and Spring. Prerequisite: (MA 303 or MA 341 or MA 405) and C- or better in ST 371 and C- or better in ISE 110. 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.

ISE 408 Control of Production and Service Systems 3. Offered in Fall and Spring. Prerequisite: ISE 361; C- or better in ST 371. Planning and control of production and service systems. Production organization flow and inventory control methods: Systems approach.

ISE 416 Manufacturing Engineering II - Automation 3. Offered in Fall and Spring. Prerequisite: ISE 316. 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.

ISE 417 Database Applications in Industrial & Systems Engineering 3. Offered in Fall and Spring. Prerequisite: ISE 316 or ISE 331; C- or better in ISE 110. Principles, economic justification, implementation, and performance evaluation of Computer Integrated Mfg. (CIM) systems. Fundamentals of group technology and cellular mfg. systems. Automation of information flow supporting the manufacturing operations using transaction processing via database technology. Real-time control of CIM systems including data acquisition, process control, and programmable logic controllers.

ISE 430 Furniture Manufacturing Processes II 3. Prerequisite: ISE 331; C- or better in ISE 110. Corequisite: ISE 352. A survey of furniture manufacturing technology. Emphasis is on operations, production rates, and the integration of many types of equipment into a manufacturing system.

ISE 431 Furniture Manufacturing Facilities Design 3. Prerequisite: ISE 430. A survey of furniture manufacturing technology. Emphasis is on operations, production rates, and the integration of many types of equipment into a manufacturing system.

ISE 441 Introduction to Simulation 3. Offered in Fall and Spring. Prerequisite: MA 342, ST 372; C- or better in ISE 110. 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.


ISE 452 Ergonomics 3. Offered in Fall and Spring. Prerequisite: CE 214; Corequisite: ISE 352. Worker - machine environment systems, design and evaluation; applications to consumer products tools, equipment and the workplace. Consideration of anatomical, physiological and psychological capabilities and limitations as related to systems design and human performance. Use of anthropometric data in design of display and control systems. Effects of environmental stress upon work performance, safety, and health.

ISE 453 Design of Production, Logistics, and Service Systems 3. Offered in Fall and Spring. Prerequisite: ISE 401. Principles and practice in design of facilities and logistics networks. Integration of supply chain design, capacity planning, facility layout, material handling, and storage and warehousing issues into overall production system design. Emphasis on economic justification of alternative designs and use of computer software to aid design process. Group projects.

ISE 495 Project Work in Industrial Engineering 1-6. Offered in Fall and Spring. 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.

ISE 498 Senior Design Project 3. Offered in Fall and Spring. Prerequisite: ISE 311, ISE 408, ISE 441, ISE 453. 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.

LANDSCAPE ARCHITECTURE

LAR 200 Landscape Architecture Introductory Studio 6. Offered in Fall Only. Prerequisite: Design Majors, LAR 102. 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.

LAR 210 Digital Drawing for Landscape Architecture 3. Offered in Spring and Summer. Digital modeling and computer aided design in landscape architecture. Integration of digital data in visualization of past, existing and future designs.

LAR 211 Digital Design Media for Landscape Architecture 3. Offered in Fall and Summer. 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.

LAR 221 Introduction to Environment and Behavior for Designers 3. Offered in Spring Only. Integration of behavioral and environmental systems related to design. Exploration of humane, ecologically sound design alternatives.

LAR 222 Perception and Behavior for Designers 3. Offered in Spring Only. Perceptual systems, linkages among them, and linkages between them and language and culture as these affect the design process.

LAR 292 Special Topics in Landscape Architecture 1-3. Offered in Fall Spring Summer. Topics of current interest in Landscape Architecture. Normally used to develop new courses.

LAR 400 Landscape Architecture Studio 6. Offered in Spring Only. Prerequisite: D 105, LAR 200; or Departmental Head Approval. Projects cover small scale design, urban landscapes, community design, and environmental management. Design process stressed, including attention to project organization, design synthesis and realization.

LAR 421 Environmental Cognition for Designers 3. Basic cognitive theory as a framework for exploration of cognitive imagery; images of self; and developmental images of home, school, neighborhood, and city.

LAR 423 Concepts of Space 3. The role of space and its representation in design is considered against an overview of concepts of space drawn from psychology, anthropology, mathematics, art history, and philosophy.

LAR 430 Site Planning 3. Offered in Spring Only. Prerequisite: LAR 400 or LAR 501. Technical operations and environmental landscape controls for site development. Site analysis, grading and drainage, earthwork, horizontal and vertical control for road alignment. Graphic exercises.

LAR 433 Native Plants in Environmental Design 3. Analysis of natural processes relating to plant materials native to this region. Planting design theory. Planting design methods. Applications in a laboratory setting.

LAR 443 Landscape History 3. Human impact on the land over the past 20,000 years: development of agriculture, commerce and industry and their role in changing the face of the earth.

LAR 444 History of Landscape Architecture 3. Offered in Fall Only. The history of designed landscapes. Environmental, social and cultural factors which influence human made landscapes presented with history and art of landscape architecture.

LAR 445 American Parks, Parkways and Estates 3. Design and planning traditions of parks and parkways. Philosophical and social motivation for establishment of national parks. Field trip to Biltmore Estate and Blue Ridge Parkway.

LAR 457 Landscape Construction Materials, Methods and Documentation 3. Offered in Fall Only. Prerequisite: LAR 400 or LAR 502. Materials, standards, and construction methods used to implement landscape architectural designs. Development of construction documents.

LAR 465 Landscape Architecture International Studio 6. Offered in Fall and Spring. 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.

LAR 492 Special Topics in Landscape Architecture 1-3. Offered in Fall Spring Summer. Topics of current interest in Landscape Architecture. Normally used to develop new courses.

LAR 494 Internship in Landscape Architecture 1-3. Offered in Fall Spring Summer. Supervised field experience in landscape architecture office, related design office, or governmental agency. Students work in an office or agency for up to 12 hours per week. A daily work journal and a final paper summarizing the work experience are required.

LAR 495 Independent Study in Landscape Architecture 1-3. Offered in Fall Spring Summer. Individual projects in landscape architecture developed under the direction of a faculty member on a tutorial basis.

FOREIGN LANGUAGES - LATIN

LAT 101 Elementary Latin 1.3. Offered in Fall Only. Beginning course in Classical Latin, emphasizing elementary grammatical form and basic syntax. Readings based on brief selections from Roman authors, including Cicero and Catullus.

LAT 102 Elementary Latin II 3. Offered in Spring Only. Continuation of Latin 101. Completion of the study of elementary grammar. Readings from a variety of Latin authors, including texts on mythological themes.

LAT 201 Intermediate Latin I 3. Offered in Fall Only. Prerequisite: LAT 102. 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.


LAT 310 Classical Mythology 3. Offered in Fall Only. 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 of the most important theories of interpretation and classification. All readings and discussion in English.

LOGIC


LOG 335 Symbolic Logic 3. Prerequisite: LOG 201 or MA 225. Introduction to modern symbolic logic; the concept of proof, mathematical induction, recursion and the relationship between formal and informal theories (examples: group theory, Peano arithmetic). The Gödel Theorems and the mathematical study of logic.

LOG 435 Advanced Logic & Metamathematics 3. Prerequisite: LOG 335. Advanced topics in logic and metamathematics: proof procedures, first-order theories, soundness and completeness theorems, recursive functions, the formalization of arithmetic, the Gödel Incompleteness Theorems. Emphasis on mathematical study of logic and mathematics. Students cannot receive credit for both LOG 435 and LOG 535.

LOG 437 Model Theoretic Semantics 3. One of the following courses: MALOG 335, LOG 435, MA 403, MA 407, MA 408, MA 410, MA/CSC 416, MA 421, MA 425, MA 426, CSC 333, CSC 411, CSC 417. This course is an introduction to the fundamental concepts and methods of model-theoretic semantics and its applications in logic, foundations of mathematics, philosophy, and computer science. Credit will not be given for both LOG 437 and LOG 537.

LOG 498 Special Topics in Logic 1-6. Offered in Fall and Spring. Prerequisite: One of the following: (MALOG 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). 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.

LEADERSHIP IN THE PUBLIC SECTOR

LPS 200 Introduction to Public Leadership 3. Offered in Fall Only. This introductory course is designed for students who are interested in exploring public sector leadership. It starts with acquiring 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.

LPS 201 The Humanitarian Response to Conflict 3. Offered in Fall Only. 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.

LPS 202 Essentials of Fundraising for Leaders in Public and Non-Profit Institutions 3. Offered in Fall Only. 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.


LPS 400 Advanced Military Leadership Theory 3. Offered in Fall Only. 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.

LPS 425 Leadership in the Public & Nonprofit Sectors Capstone 3. Offered in Spring Only. Prerequisite: LPS Majors need to have passed LPS 200. 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.

LPS 490 Undergraduate Internship in Leadership in the Public Sector 1-3. Offered in Fall Spring Summer. Prerequisite: LPS 200. 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 internship proposal. Students must provide own transportation for internship. Intern liability insurance is required.

MANAGEMENT

M 100 Professionalism, Diversity, and Academic Success in Management 1. Offered in Fall and Spring. Introduction to expectations and opportunities in the College of Management. Overview of curricula, academic requirements, and career opportunities in business administration, accounting, and economics. Discussion of expectations for academics and career success including professionalism, diversity, and inclusiveness. Overview resources and support services.
Mathematics

MA 100 Precalculus by Self Study 3. Directed self study of precalculus topics to prepare students for a Mathematics Level II achievement test. Spring or Summer.

MA 101 Intermediate Algebra 4. Offered in Fall and Spring Summer. 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.

MA 103 Topics in Contemporary Mathematics 3. Offered in Spring Only. Prerequisite: MA 101 or equivalent completed in high school. 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.

MA 105 Mathematics of Finance 3. Offered in Fall Spring Summer. Prerequisite: MA 101 or equivalent completed in high school. 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.

MA 107 Precalculus I 3. Offered in Fall Spring Summer. 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. Algebra and basic trigonometry; polynomial, rational, exponential, logarithmic and trigonometric functions and their graphs. Credit for MA 107 does not count toward graduation for students in Engineering, PAMS, Design, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, College of Management, and B.S. degrees in CHASS. Credit is not allowed for both MA 107 and MA 111.

MA 108 Precalculus II 3. Offered in Fall Spring Summer. Prerequisite: C or better in MA 107. Algebra, analytic geometry and trigonometry; inequalities, conic sections, complex numbers, sequences and series, solving algebraic operations, factoring, linear equations. Credit for MA 108 does not count toward graduation for students in Engineering, PAMS, Design, Bio and Ag Engineering (Science Program), Bio Sci (all options), Math Edu, Sci Edu, Textiles, College of Management, and B.S. degrees in CHASS. Credit is not allowed for both MA 108 and MA 111. Also, MA 108 should not be counted toward the GER mathematical sciences.

MA 111 Precalculus Algebra and Trigonometry 3. Prerequisite: C or better in MA 101, or 480 or better on the SAT Subject Test in Mathematics Level 2 or the NCSU Math Skills Test. 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., Physical & Math. Sci., 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.

MA 114 Introduction to Finite Mathematics with Applications 3. Offered in Fall Spring Summer. Prerequisite: MA 101 or equivalent completed in high school. 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.

MA 116 Introduction to Scientific Programming (Math) 3. Offered in Fall and Spring. Prerequisite: MA 141, and either PMS 100 or E 115; Corequisite: MA 241. 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. Prerequisites: MA 141 and either PMS 100 or E115. Corequisite: MA 241.

MA 121 Elements of Calculus 3. Offered in Fall Spring Summer. 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. For students who require only a single semester of calculus. Emphasis on concepts and applications of calculus, along with basic skills. Algebra review, functions, graph, 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.

MA 131 Calculus for Life and Management Sciences A 3. Offered in Fall Spring Summer. 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. 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 not allowed for more than one of MA 121, 131, and 141.

MA 132 Computational Mathematics for Life and Management Sciences 1. Offered in Spring Only. Prerequisite: C or better in MA 121 or MA 131. 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.

MA 141 Calculus I 4. Offered in Fall Spring Summer. 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. 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.

MA 205 Elements of Matrix Computations 3. Prerequisite: C in MA 121, 131, or 141. 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.

MA 225 Foundations of Advanced Mathematics 3. Offered in Fall and Spring. Prerequisite: MA 241. 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.

MA 231 Calculus for Life and Management Sciences B 3. Offered in Fall Spring Summer. Prerequisite: MA 131. Differential equations - population growth, flow processes, finance and investment models, systems; functions of several variables - partial derivatives, optimization, least squares, multiple integrals; Lagrange multiplier method - chain rule, gradient; Taylor polynomials and series; numerical methods. MA 121 is not an accepted prerequisite for MA 231.

MA 241 Calculus II 4. Offered in Fall Spring Summer. Prerequisite: MA 141 with grade of C- or better or AP Calculus credit. 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.

MA 242 Calculus III 4. Offered in Fall Spring Summer. Prerequisite: MA 241 with grade of C- or better or AP Calculus credit, or Higher Level IB credit. Third of three semesters in a calculus sequence for science and engineering majors. Vectors, vector algebra, and vector functions. Functions of several variables, partial derivatives, gradients, directional derivatives, maxima and minima. Multiple integration. Line and surface integrals, Green's Theorem, Divergence Theorems, Stokes' Theorem, and applications. Use of computational tools.

MA 293 Special Topics in Mathematics 1-6. Offered in Fall Spring Summer. Freshman-sophomore level experimental course offerings or directed individual study.


MA 303 Linear Analysis 3. Offered in Fall and Spring. Prerequisite: MA 241. 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.

MA 305 Introductory Linear Algebra and Matrices 3. Offered in Fall Spring Summer. Prerequisite: MA 241 or MA 231 with MA 132. The course is an elementary introduction to matrix theory and linear algebra. Emphasis is given 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.


MA 315 Mathematics Methods in Atmospheric Sciences 4. Offered in Fall Only. Prerequisite: MA 116, MA 141, MA 241. Corequisite: MA 242. 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 MRR majors only.

MA 325 Introduction to Applied Mathematics 3. Offered in Spring Only. Prerequisite: MA 231 or MA 242 and MA 116 or three-credit programming course. 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 areheat and mass transfer, biology and population, probability and finance, acoustic models, cryptography as well as others.

MA 335 Symbolic Logic 3. . Introduction to modern symbolic logic; the concept of proof, mathematical induction, recursion and the relationship between formal and informal theories (examples: group theory, Peano arithmetic). The Gödel Theorems and the mathematical study of logic.


MA 351 Introduction to Discrete Mathematical Models 3. Offered in Fall and Spring. Prerequisite: MA 224, 225, 231 or 241. 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.

MA 401 Applied Differential Equations II 3. Offered in Fall Spring Summer. Prerequisite: MA 341. 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.

MA 402 Computational Mathematics: Models, Methods and Analysis 3. Offered in Fall Only. Prerequisite: Programming proficiency (Matlab, C++, Java, Fortran, or other language) and PY 182. Corequisite: MA 341. Introduction to high performance computing and numerical modeling. Matrix models and boundary value problems with an emphasis on heat and mass transfer. Assessments of all approximations in the computational engineering and science process.

MA 403 Introduction to Modern Algebra 3. Offered in Fall Spring Summer. Prerequisite: MA 225. 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.

**MA 405 Introduction to Linear Algebra** 3. Offered in Fall Spring Summer. Prerequisite: MA 241 (MA 225 recommended); Corequisite: MA 341 is recommended. 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.

**MA 407 Introduction to Modern Algebra for Mathematics Majors** 3. Prerequisite: MA 225 and MA 405. 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.

**MA 408 Foundations of Euclidean Geometry** 3. Offered in Fall and Spring. Prerequisite: MA 225. An examination of Euclidean geometry from a modern perspective. The axiomatic approach with alternative possibilities explored using models.

**MA 410 Theory of Numbers** 3. Offered in Spring Only. 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.

**MA 412 Long-Term Actuarial Models** 3. Offered in Fall Only. 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. 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.

**MA 413 Short-Term Actuarial Models** 3. Offered in Spring Only. Prerequisite: MA 241 or MA 231, and one of MA 421, ST 301, ST 305, ST 370, ST 371, ST 380, ST 421. 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.

**MA 416 Introduction to Combinatorics** 3. Offered in Spring Only. Prerequisite: MA 225 or CSC 226. 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.

**MA 421 Introduction to Probability** 3. Offered in Fall Spring Summer. Prerequisite: MA 242. 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.

**MA 425 Mathematical Analysis I** 3. Offered in Fall and Spring. Prerequisite: MA 225 (MA 407 desirable). 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.

**MA 426 Mathematical Analysis II** 3. Offered in Spring Only. Prerequisite: MA 425 and 405. 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.

**MA 427 Introduction to Numerical Analysis I** 3. Offered in Fall Only. Prerequisite: MA 341 or 301 and programming language efficiency. 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.

**MA 428 Introduction to Numerical Analysis II** 3. Offered in Fall and Spring. Prerequisite: MA 405 or MA 407 and programming language proficiency. 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.

**MA 430 Mathematical Models in the Physical Sciences** 3. Offered in Fall Only. Prerequisite: MA 341 and MA 405. 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.

**MA 432 Mathematical Models in Life and Social Sciences** 3. Offered in Spring Only. Prerequisite: MA 341. 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).

**MA 433 History of Mathematics** 3. Offered in Fall and Spring. Development of mathematical thought and evolution of mathematical ideas examined in a historical setting. Biographical and historical content supplemented and reinforced by study of techniques and procedures used in earlier eras.

**MA 437 Applications of Algebra** 3. Offered in Spring Only. Prerequisite: MA 403 or 407, MA 405. Error correcting codes, cryptography, crystallography, enumeration techniques, exact solutions of linear equations, and block designs.

**MA 440 Game Theory** 3. Offered in Fall Only. Prerequisite: MA 231 or MA 242. 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.

**MA 444 Problem Solving Strategies for Competitions** 1. Offered in Fall Only. 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.
MA 491 Reading in Honors Mathematics 1-6. Offered in Fall and Spring. A reading (independent study) course available as an elective for students participating in the mathematics honors program.

MA 493 Special Topics in Mathematics 1-6. Offered in Fall and Spring. Directed individual study or experimental course offerings.

MA 494 Major Paper in Math 1. Offered in Fall and Spring. Corequisite: MA class at the 400-level or above. 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 adopt 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.

MA 499 Independent Research in Mathematics 1-6. Offered in Fall Spring Summer. 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 towards an undergraduate degree.

MAE 206 Engineering Statics 3. Offered in Fall Spring Summer. Prerequisite: Cumulative GPA 2.5 or higher and a grade of C- or better in both MA 241 and PY 205. Basic concepts of forces in equilibrium. Distributed forces, frictional forces. Inertial properties. Application to machines, structures, and systems.

MAE 208 Engineering Dynamics 3. Offered in Fall Spring Summer. Prerequisite: 2.5 GPA or higher, MA 242, C- or better in MAE 206 or CE 214. 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.

MAE 261 Aerospace Vehicle Performance 3. Prerequisite: Cumulative GPA 2.5 or higher and a grade of C- or better in both MA 241 and PY 205. 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.

MAE 301 Engineering Thermodynamics I 3. Offered in Fall Spring Summer. Prerequisite: MA 242, PY 208 or 202. 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 analysis of basic power cycles is introduced.

MAE 302 Engineering Thermodynamics II 3. Offered in Fall Spring Summer. Prerequisite: CSC 112 or CSC 114, C- or better in MAE 301. 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 flows.

MAE 304 Manufacturing Laboratory 1. Offered in Fall and Spring. Prerequisite: Sophomore standing in ME. C- or better in MAE 206, GC 211. This laboratory course teaches several modern-manufacturing processes. Interaction between manufacturing and design is emphasized. Students learn techniques in operating manual and numerically controlled manufacturing machines. Students learn about other metallic and nonmetallic manufacturing processes. Safe operation of equipment is taught and students are expected to perform the labs in a safe manner. Students will not become certified machinists or CNC operators.

MAE 306 Mechanical Engineering Laboratory I 1. Offered in Fall and Summer. Prerequisite: C- or better in MAE 208 or CE 215. 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).

MAE 308 Fluid Mechanics 3. Offered in Fall Spring Summer. Prerequisite: MA 242, C- or better in MAE 208 or CE 215. Corequisite: (MA 341 or MA 301) and (MAE 301 or MSE 301). 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.

MAE 310 Heat Transfer Fundamentals 3. Offered in Fall Spring Summer. Prerequisite: (MA 341 or MA 301), C- or better in MAE 301. Corequisite: MAE 308. 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 convective heat transfer relations relevant to mechanical engineers. Heat transfer by the mechanism of radiation heat transfer.

MAE 314 Solid Mechanics 3. Prerequisite: MA 242, C- or better in (MA 206 or CE 214). Corequisite: (MSE 200 or MSE 201, or BME 203, or BAE 315). Concepts and theories of internal force, stress, strain, and strength of structural element under static loading conditions. Constitutive behavior for linear elastic structures. Deflection and stress analysis procedures for bars, beams, and shafts. Introduction to matrix analysis of structures.

MAE 315 Dynamics of Machines 3. Offered in Fall Spring Summer. Prerequisite: MA 341, C- or better in MAE 208 or CE 215. 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.

MAE 316 Strength of Mechanical Components 3. Offered in Fall Spring Summer. Prerequisite: ME, AE, or NE Majors, C- or better in MAE 314 or CE 313. 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.

MAE 355 Aerodynamics I 3. Offered in Fall Only. Prerequisite: MAE 261 and (MA 341 or MA 301). Fundamentals of perfect fluid theory with applications to incompressible flows over airfoils, wings, and flight vehicle configurations.

MAE 356 Aerodynamics II 3. Offered in Spring Only. Prerequisite: MAE 355, C- or better in MAE 301. 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.

MAE 357 Experimental Aerodynamics I 1. Offered in Fall Only. Prerequisite: (MA 341 or MA 301) and C- or better in MAE 261; Corequisite: MAE 355. 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.

MAE 358 Experimental Aerodynamics II 1. Offered in Spring Only. Prerequisite: MAE 357, Corequisite: MAE 356. Advanced stability and control experiments in the subsonic wind tunnel and external compressible flow experiments in the supersonic wind tunnel.

MAE 371 Aerospace Structures I 3. Offered in Fall Only. Prerequisite: C- or better in MAE 261 and (MA 314 or CE 313). 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.


MAE 406 Energy Conservation in Industry 3. Offered in Fall Only. Prerequisite: MAE 302, MAE 310. 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.

MAE 407 Steam and Gas Turbines 3. Offered in Spring Only. Prerequisite: MAE 302, MAE 308 or MAE 355. Fundamental analysis of the theory and design of turbomachinery flow passages; control and performance of turbomachinery; gas-turbine engine processes.


MAE 412 Design of Thermal System 3. Offered in Fall and Spring. Prerequisite: MAE 302, MAE 308, MAE 310. 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.

MAE 415 Analysis for Mechanical Engineering Design 3. Offered in Fall and Spring. Prerequisite: MAE 315 and (MAE 316 or MAE 371). Integration of the physical sciences, mathematics, and engineering to solve real-world design problems. 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. Formal written communication of results.

MAE 416 Mechanical Engineering Design 4. Offered in Fall and Spring. Prerequisite: MAE 415. 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.


MAE 435 Principles of Automatic Control 3. Offered in Fall Spring. Prerequisite: MAE 341 or MA 301) and MAE 315. Study of linear feedback control systems using transfer functions. Transient and steady state responses. Stability and dynamic analyses using time response and frequency response techniques. Compensation methods. Classical control theory techniques for determination and modification of the dynamic response of a system. Synthesis and design applications to typical mechanical engineering control systems. Introduction to modern control theory.

MAE 442 Automotive Engineering 3. Prerequisite: MAE 302, MAE 308, MAE 315, MAE 316. Fundamental aspects of automotive engineering. Examines various automotive systems (engine, brakes, etc.) as well as their interactions in such areas as safety and performance. Current practices and development for the future.


MAE 453 Introduction to Space Flight 3. Offered in Spring Only. Prerequisite: (MA 341 or MA 301), CSC 112, C- or better in PY 205. 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.
MAE 455 Boundary Layer Theory 3, Offered in Fall Only.  
Prerequisite: MAE 356. 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.

MAE 456 Computational Methods in Aerodynamics 3, Offered in Fall Only.  
Prerequisite: MAE 356, Corequisite: MAE 455. 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.

MAE 461 Dynamics & Controls 3, Offered in Full Only.  
Prerequisite: (MA 324 or MA 381), and C- or better in (MAE 208 or CE 215). 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.

MAE 462 Flight Vehicle Stability and Control 3, Offered in Spring Only.  
Prerequisite: (MAE 461 or MA 455) and C- or better in MAE 261. 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.

MAE 466 Experimental Aerodynamics III 1, Offered in Fall Only.  
Prerequisite: MAE 358, Corequisite: MAE 455, MAE 475. Laboratory experiments in internal compressible flow and boundary layers in conjunction with MAE 455 and MAE 475. Topics include nozzle flows, constant area duct flows, component/overall performance of a gas turbine, and boundary layer analysis.

MAE 469 Controls Laboratory 1, Offered in Fall Only.  
Prerequisite: (MAE 300 or C- or better in MAE 261); Corequisite: (MAE 461 or MA 455). Laboratory experiments demonstrate the essential features of classical and modern control theory for single-input and single-output systems.

MAE 472 Aerospace Structures II 3, Offered in Spring Only.  
Prerequisite: MAE 371. 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.

MAE 473 Aerospace Vehicle Structures II Lab 1, Offered in Spring Only. Prerequisite: MAE 371, Corequisite: MAE 472. 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.

MAE 475 Propulsion 3, Offered in Fall Only. Prerequisite: MAE 356, C- or better in MAE 301. 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.

MAE 476 Rocket Propulsion 3, Offered in Fall Only. Prerequisite: MAE 356 or MAE 302. Study of chemical rockets. This includes nozzle theory, flight performance, thermochemical calculations, and component and system analysis and design.

MAE 478 Aerospace Vehicle Design I 3, Offered in Fall Only.  
Prerequisite: Senior standing, Aerospace Engineering Majors, MAE 356, 472, 462. A synthesis of previously acquired theoretical and empirical knowledge and application to the design of practical aerospace vehicle systems.

MAE 479 Aerospace Vehicle Design II 4, Offered in Spring Only.  
Prerequisite: MAE 478. Designs are refined and the vehicles constructed and instrumented by the students. A flight test program is designed and carried out in cooperation with MAE 525 students. A continuation of MAE 478.

MAE 495 Special Topics in Mechanical and Aerospace Engineering 1-3. Offered as needed to present new or special MAE subject matter.

MAE 496 Undergraduate project Work in Mechanical and Aerospace Engineering 1-6. Offered in Fall Spring Summer.  
Prerequisite: Completion of all required MAE-300 level courses. Corequisite: MAE 415 or MAE 478. 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.

MB 101 Introduction to Microbiology and Biochemistry Laboratory Practices 3, Offered in Spring Only. 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.

MB 103 Introductory Topics in Microbiology 1. Offered in Fall Only. Introduction to scope and objectives of university education. Emphasis on microbiology. Career opportunities, computers, university resources.

MB 180 Introduction to Applied Bioprocessing 3, Offered in Summer. 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 culture 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.

**MB 200 Microbiology and World Affairs 3.** An integrated and comprehensive study of the microbial world and its influence on global events and human affairs.

**MB 210 Phage Hunters 3. Offered in Fall Only.** 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.

**MB 211 Phage Genomics 2. Offered in Spring Only. Prerequisite: BIT(MB) 210.** This course offers first-year students an opportunity for mentored research. Student 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.

**MB 320 Fundamentals of Microbial Cell Culture 2. Offered in Fall Spring Summer. Prerequisite: BIO 183.** This is a half-semester course. This introductory module addresses fundamental cell biology concepts and enables students to gain an understanding of the basic principles of microbiology, culture preparation, physiology and genetics of microbial cell cultures. The lab portion of the course provides students with practical experience in basic laboratory and culture techniques. Students who have completed either MB 352 or MB 354 may not take this course for credit.

**MB 325 Fundamentals of Microbial Cell Biotransformations 2.. Prerequisite: BEC(MB) 320 or MB 352.** 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 culture. The biological understanding, mathematical models, and engineering controls that enable a 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 BIT(CHE) 463 may not take this course for credit.

**MB 351 General Microbiology 3. Offered in Fall Spring Summer. Prerequisite: One Biology course (BIO 181, BIO 183, ZO 150 or ZO 160) and one Organic Chemistry course (CH 221 or CH 220).** 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.

**MB 352 General Microbiology Laboratory 1. Offered in Fall Spring Summer. Corequisite: MB 351.** 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.

**MB 354 Inquiry-Guided Microbiology Lab 1. Offered in Fall and Spring. Corequisite: MB 351.** 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.

**MB 405 Food Microbiology 3. Offered in Fall Only. Prerequisite: MB 351.** 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.

**MB 406 Food Microbiology Lab 1. Offered in Fall Only. Prerequisite: MB 351 and Corequisite: FS 405 or FS 505.** 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.

**MB 411 Medical Microbiology 3. Offered in Fall Only. Prerequisite: MB 351.** Comprehensive study of microbial pathogenesis and mammalian host resistance. Diagnosis, prevention, and therapy of common human diseases of microbial origin.

**MB 412 Medical Microbiology Laboratory 1. Offered in Fall Only. Prerequisite: MB 352 or MB 354 and Corequisite: MB 411.** 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.

**MB 414 Microbial Metabolic Regulation 3. Offered in Fall Only. Prerequisite: MB 351, BCH 451.** An integrative perspective on bacterial physiology and metabolism through an analysis of metabolic regulatory functions.

**MB 420 Fundamentals of Microbial Cell Biotransformations 2. Offered in Fall and Spring. Prerequisite: MB 352 OR Corequisite of BEC(MB) 320.** 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 culture. The biological understanding, mathematical models, and engineering controls that enable a 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.

**MB 441 Immunology 3. Offered in Fall Only. Prerequisite: MB 351.** Introduction to principles of molecular immunity. Overview of immune system development and function, and discussions of ongoing scientific research regarding immune regulation.

**MB 451 Microbial Diversity 3. Offered in Spring Only. Prerequisite: MB 411 and (GN 311 or BCH 451).** 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.
MB 452 Microbial Diversity Lab 2. Offered in Spring Only. Prerequisite: MB 412; Corequisite: MB 451. 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.

MB 455 Microbial Biotechnology 3. Prerequisite: MB 351 and GN 311. 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.

MB 461 Molecular Virology 3. Offered in Spring Only. Prerequisite: MB 351, MB 411. 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; picomaviruses, togaviruses, orthomyxoviruses, retroviruses, polyomaviruses, and herpesviruses.

MB 480 Current Issues in Microbiology 1. Offered in Fall and Spring. Prerequisite: SBM majors or minors, Senior standing, and MB 351. Library research on current topics in all areas of microbiology. Presentation of research results orally and in the form of a major term paper.

MB 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

MB 493 Special Problems in Microbiology 1-6. Offered in Fall and Spring. 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.

MB 495 Special Topics in Microbiology 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.


MEA 101 Geology I: Physical 3. Offered in Fall Spring Summer. 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.

MEA 110 Geology I Laboratory 1. Offered in Fall Spring Summer. Corequisite: MEA 101 or Prerequisite: MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200. Scientific methodology applied to the study of common rock-forming minerals, common rocks, topographic maps, geologic structures and geological maps. Field trips.

MEA 120 The Dinosaurian World 3. Evolution and ecology of dinosaurs related to broader features of Earth history, including plate tectonics, paleoclimatology, mass extinction and the long-term effects of natural selection.

MEA 121 The Dinosaurian World Lab 1. Offered in Fall Only. Corequisite: MEA 120. Companion to lecture course on "The Dinosaurian World." Adaptive significance of osteological characteristics, ecological correlates of body weight and physical environmental variables, and concepts relating to natural selection, fitness, biodiversity and changes in the planetary environment on various time scales. Discussion, specimen demonstrations and problem solving.

MEA 130 Introduction to Weather and Climate 3. Offered in Fall and Spring. 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.

MEA 135 Introduction to Weather and Climate Laboratory 1. Offered in Fall and Spring. Corequisite: MEA 130. 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 instruments and observations; weather map analysis; forecasting principles.

MEA 140 Natural Hazards and Global Change 3. Offered in Fall Only. The science of natural hazards and global change: the impact on human civilization of events in the lithosphere, atmosphere, biosphere, and hydrosphere (e.g., earthquakes, hurricanes, red tides, and floods), and the impact of humans on the global environment (e.g., global warming).

MEA 150 Environmental Issues in Water Resources 4. Offered in Fall Only. 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.

MEA 200 Introduction to Oceanography 3. Offered in Fall and Spring. Corequisite: Recommended that MEA 210 be taken concurrently. 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.

MEA 202 Geology II: Historical 3. Offered in Spring Only. Prerequisite: (MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200 and MEA 110; Corequisite: Recommended that MEA 211 be taken concurrently. 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..

**MEA 210 Oceanography Lab 1. Offered in Fall and Spring.** Corequisite: MEA 200. 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..

**MEA 211 Geology II Laboratory 1. Corequisite: MEA 202.** 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..

**MEA 213 Fundamentals of Meteorology 2. Offered in Fall Only.** Corequisite: MA 141. Introduction to the discipline of and opportunities in meteorology, atmospheric vertical structure, motion, and pressure systems, jet streams; global circulation; air masses and fronts; mid-latitude cyclone structure and evolution..

**MEA 214 Fundamentals of Meteorology II 2. Offered in Spring Only.** Prerequisite: MEA 213. Introduction to moisture variables, adiabatic processes, thermodynamic diagrams, stability, clouds and precipitation, thunderstorms, tornadoes, and hurricanes, air pollution, global climate change, ozone hole..

**MEA 220 Marine Biology 3. Offered in Spring Only.** Prerequisite: MEA 200 or BIO 181. 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..

**MEA 250 Introduction to Coastal Environments 3.** Prerequisite: MEA 200/210 or MEA 101/110. A global survey of coastal habitats, the processes that shape these dynamic environments, and the physicochemical controls that regulate their indigenous biological communities..

**MEA 251 Introduction to Coastal Environments Laboratory 1. Corequisite: MEA 250.** 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..

**MEA 268 Marine Paleontology 4. Offered in Fall Only.** Prerequisite: BIO 181, MEA 102. Evolution of marine life traced through geologic time, accenting the functional significance of adaptations and the history of marine ecosystems. Required field trips..

**MEA 300 Environmental Geology 4.** Prerequisite: MEA 101 or MEA 150 or MEA 140 or SSC 200. 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..

**MEA 311 The Global Atmosphere 3. Offered in Fall Only.** Physical basis for weather and climate. Regional and global climate change; earth-sun relationships; solar energy incident to and modified by the atmosphere; terrestrial radiation; transports of heat and water vapor; surface and global energy balance; general circulation of the atmosphere; climate classification..

**MEA 312 Atmospheric Thermodynamics 3. Offered in Spring Only.** Atmospheric thermodynamics: 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 of water vapor. Atmospheric statics: static stability of moist air; vertical acceleration..

**MEA 313 Weather Measurements and Analysis I 1. Offered in Fall Only.** A laboratory course supplementing material in MEA 311. Solar and terrestrial radiation; atmospheric attenuation; surface energy balance; general circulation and transport of heat and water vapor; climate classification..

**MEA 314 Weather Measurements and Analysis II 1. Offered in Spring Only.** A laboratory course supplementing material in MEA 312. Meteorological data fields and their mathematical expression; objective analysis; measurement and calculation of moisture variables: moist and dry adiabatic processes; static stability; effects of radiation and vertical motion; vertical cross sections..

**MEA 315 Mathematics Methods in Atmospheric Sciences 4. Offered in Fall Only.** Prerequisite: MA 116, MA 141, MA 241; Corequisite: MA 242. 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..

**MEA 320 Fundamentals of Air Pollution 3. Offered in Spring Only.** Prerequisite: MA 121 or MA 131 or MA 141, CH 201, PY 131 or PY 201 or PY 205 or PY 211. 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..

**MEA 321 Fundamentals of Air Quality and Climate Change 3. Offered in Fall Only.** Prerequisite: CH 201, CH 201, MA 141, MA 241; Corequisite: PY 205. 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.

**MEA 322 Earth System Chemistry 3. Offered in Spring Only.** Prerequisite: CH 201 and (CE 373 or any MEA course). Chemistry of the earth with an emphasis on the interactions of the biosphere, geosphere and atmosphere. The origin and chemical evolution of the solar system, chemical cycles in the environment, and the impact of man on biogeochemical processes..

**MEA 369 Terrestrial Paleontology 4. Offered in Spring Only.** Prerequisite: BIO 181 or MEA 202 or MEA 120. Evolution of terrestrial life traced through geologic time, accenting the functional significance of adaptations and the history of terrestrial ecosystems. Required field trips..

**MEA 384 Paleocology 3. Offered in Fall Only.** Prerequisite: MEA 268 and MEA 369. Methodologies in paleocology. Effects of
preservational bias, interpretations of the dynamics of ancient communities, and comparisons with living communities. Required field trips.

**MEA 410 Introduction to Mineralogy and Petrology I.** Offered in Fall Only. Prerequisite: MA 100, MA 101, MA 102, MA 125, MA 140 or MA 200, and MA 110 and CH 101/102. 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.

**MEA 411 Marine Sediment Transport.** Offered in Fall Only. Prerequisite: MA 100, MA 200, MA 241, PY 201 or PY 205. 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 to the deep sea and interpretation of sediment transport processes from sedimentary structures. Credit not allowed for both MEA 411 and MEA 562.

**MEA 412 Atmospheric Physics.** Offered in Spring Only. Prerequisite: MA 242, PY 208. Physical and analytical descriptions of atmospheric aerosols, clouds/foams, 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.

**MEA 421 Atmospheric Dynamics I.** Offered in Fall Only. Prerequisite: MA 321, MA 312. 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 and spherical coordinates. Scale analysis and simplifications. Cases of horizontal flow: geostrophic and gradient wind, ageostrophy and acceleration; thermal wind and vorticity.

**MEA 422 Atmospheric Dynamics II.** Offered in Spring Only. Prerequisite: MA 421. 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.

**MEA 425 Introduction to Atmospheric Chemistry.** Offered in Fall Spring. Prerequisite: MA 141, CH 201, (PY 205, PY 211 or MEA 320). 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.

**MEA 433 Forensic Geology.** Offered in Spring Only. Prerequisite: MEA 101. Application of geology to crime investigation, ranging from violent crime to fraud and liability in property management. Role of a geologist as expert witness. Application of analytical techniques, e.g., petrographic microscopy, trace-element analysis, remote sensing, digital mapping, and image analysis. Tour of the SBI lab and a certified gemology lab. Identification of art fraud by pigment analysis and a corresponding tour of the NC Museum of Art.

**MEA 435 Engineering Geology.** Offered in Spring Only. Prerequisite: MEA 101 and Junior standing in Colleges of Agriculture and Life Sciences, Engineering, Natural Resources, Physical and Mathematical Sciences or Textiles. Application of both geology and geotechnical engineering to engineering projects. Illustrations of relevant materials properties and techniques utilized in describing subsurface conditions.

**MEA 440 Igneous and Metamorphic Petrology I.** Offered in Spring Only. Prerequisite: MA 410. 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.

**MEA 443 Weather Analysis and Forecasting I.** Offered in Fall Only. Prerequisite: MA 421. 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.

**MEA 444 Weather Analysis and Forecasting II.** Offered in Spring Only. Prerequisite: MA 443. 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.

**MEA 449 Principles of Biological Oceanography.** Offered in Fall Only. Biological productivity and trophic relationships in plankton, nekton and benthos; community ecology of selected habitats (estuaries, intertidal zones, coral reefs, deep sea); and adaptation of organisms to the marine environment. Credit is not allowed for both MEA/BIO 449 and MEA/BIO 549.

**MEA 450 Introductory Sedimentary Petrology/Stratigraphy.** Offered in Spring Only. Prerequisite: MA 410. Properties, classification, geologic occurrences, and origin of minerals and rocks formed by physical, chemical, and biologic processes at and near the earth's surface. Principles of division of stratified terrains into natural units, correlation of strata, interpretation of depositional environments and facies. Required field trips.

**MEA 451 Structural Geology.** Offered in Fall Only. Prerequisite: MA 410. 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.

**MEA 454 Marine Physical-Biological Interactions.** Offered in Spring Only. Prerequisite: MA 400 and MEA/ZO 449. 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.
MEA 455 Micrometeorology 3. Offered in Fall Only. Prerequisite: MEA 422 or MAE 308. 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.

MEA 459 Field Investigation of Coastal Processes 5. Prerequisite: MEA 250 and MEA 251. Coastal zone processes and dynamics with emphasis on the forcing factors that regulate changing coastal landforms, the ecology and physicochemical 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.

MEA 460 Principles of Physical Oceanography 3. Offered in Fall Only. Prerequisite: MA 242, Corequisite: PY 203 or PY 208. 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 equation; air-sea interaction; global fluxes and general description of major ocean currents. Credit is not allowed for both MEA 460 and MEA 540.

MEA 461 Undergraduate Cruise Experience 1. Offered in Fall and Spring. Corequisite: MEA 200 or MEA 220. Broad exposure to planning and execution of oceanographic research operations, including demonstration of techniques and equipment regularly used aboard ships and familiarization with acquisition and processing of oceanographic data via preparation for and participation in a demonstration cruise under the guidance of NCSU oceanography faculty members.

MEA 462 Observational Methods and Data Analysis in Marine Physics 3. Prerequisite: MEA 460. 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.

MEA 463 Fluid Physics 3. Offered in Fall Only. Prerequisite: MA 341 and PY 208. 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.

MEA 464 Ocean Circulation Systems 3. Offered in Spring Only. Prerequisite: PY(MEA) 463. 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.

MEA 465 Geologic Field Camp 4. Offered in Summer. Prerequisite: MEA 440, MEA 450, MEA 451. 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.

MEA 467 Marine Meteorology 3. Offered in Spring Only. Prerequisite: MEA 422 or MEA 460. 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.

MEA 468 Invertebrate Paleontology and Biostratigraphy 4. Offered in Fall Only. Prerequisite: MEA 102 and MEA 111, or ZO 402. Study of fossil invertebrates and their applications to problems and concepts of paleoecology, correlation of strata, evolution and broader concepts of earth history. Required field trips.

MEA 469 Ecology of coastal Resources 3. Offered in Spring Only. Prerequisite: MEA 250, MEA 220. 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.

MEA 470 Introduction to Geophysics 3. Prerequisite: PY 208 or 212. 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.

MEA 471 Exploration and Engineering Geophysics 3. Prerequisite: PY 208 or PY 211. Geophysical methods applied to exploring the earth's shallow sub-surface. Principles of gravity, magnetic, electrical, and seismic exploration surveys. Planning, conducting, and interpreting geophysical surveys.

MEA 473 Principles of Chemical Oceanography 3. Offered in Fall Only. Prerequisite: CH 204. 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. Credits not allowed for both MEA 473 and MEA 573.

MEA 479 Air Quality 3. Offered in Spring Only. Prerequisite: CE 373, CE 382; or CHE 311 (CHE Majors); or MEA 421 (MEA Majors), Corequisite: ST 370; ST 380 (MEA Majors). 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.

MEA 481 Principles of Geomorphology 3. Prerequisite: (MEA 100, MEA 101, MEA 120, MEA 140 or MEA 200) and MEA 110. 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.

MEA 485 Introduction to Hydrogeology 3. Prerequisite: (MEA 101 or MEA 202; (MA 131 or MA 141), CH 201, and (PY 201, PY 205, or PY 211). Basic science of groundwater flow in geological media. Saturated and unsaturated flow, Darcy's equation, heterogeneity and anisotropy, flownets, 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.
ME 491 Seminar on Selected Geologic Topics 2. Offered in Fall Only. Study and discussion of selected topics from the geological literature. Preparation of a major library research paper.

ME 492 Senior Seminar in the Atmospheric Sciences 1. Offered in Fall Only. Emphasis on student professional development. Discussions of professional opportunities, resources and ethics. Atmospheric scientists from the public and private sectors introduce students to career options. Strategies for finding jobs and graduate programs are presented. Students reflect on future career goals and plans. For seniors in the Atmospheric Sciences.

ME 493 Special Topics in MEAS 1-6. Offered in Fall and Spring. Directed individual study or experimental course offering.

ME 495 Senior Seminar in the Marine Sciences 1. Offered in Fall Only. Discussions of selected topics from the marine literature. Marine scientists from the public and private sectors introduce students to career options. Strategies for finding jobs and graduate programs are presented.

ME 498 Internship in MEAS 1-6. Offered in Fall Spring Summer. 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.

ME 300 Systems Engineering 4. Offered in Fall Only. Prerequisite: C- or better in MAE 206; Corequisite: ST 370. 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.

ME 305 Mechanical Engineering Systems Lab I 1. Offered in Summer. Prerequisite: GC 120, MSE 201, MAE 206. 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.

MES 401 MES Capstone Design I 3. Offered in Fall Only. Prerequisite: MAE 316, MAE 310, MES 300; Corequisite: MAE 415. 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. MES students only.

MES 402 MES Capstone Design II 4. Offered in Spring Only. Prerequisite: MES 401. This course is the second of the two semester senior engineering design and manufacturing experience. In MES 402, students manage their design project through the completion of a critical design review, a production readiness review, manufacturing and fabrication, a test readiness review and a final verification review. Students develop written and verbal communication skills through reports and presentations and gain insight into engineering design practices through guest lectures from local engineers. Students must provide any transportation needed for this course. MES majors only.

MES 405 Mechanical Engineering Systems Lab II 2. Offered in Summer. Prerequisite: MES 305, MAE 314, MAE 308; Corequisite: MAE 435, MAE 310. 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.

MANAGEMENT, INNOVATION, & ENTREPRENEURSHIP

MIE 201 Introduction to Business Processes 3. Offered in Fall and Spring. 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.

MIE 235 Topics in Leadership Seminar 3. Offered in Spring Only. Introduction to leadership, self-awareness, interpersonal needs, attitudes, cognitive style, values, ethics and values. Listening, communicating, interviewing, self-efficacy, empowerment, time and stress management, solving problems creatively, motivation, giving feedback and developing others. Team building and group dynamics. A history of leadership research, leadership concepts, characteristics, and principles.

MIE 300 Business Career Planning 1. Offered in Fall Only. Development of proactive plans and skills to enhance marketability for placement into professional career paths in business. Minimal fee assessed to cover cost of career tests administered during course.

MIE 305 Legal and Regulatory Environment 3. Introduction to contract, tort and agency law, the judicial system, common law, statutory law, and constitutional law. Review and discussion of the major legal and regulatory issues affecting business including ethics, fiduciary duty, white collar crime, dispute resolution, intellectual property, international, and product safety laws.

MIE 306 Managing Ethics in Organizations 3. Offered in Fall and Spring. Prerequisite: MIE 201 or BUS 201. 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.

MIE 310 Introduction to Entrepreneurship 3. Offered in Fall and Spring. Prerequisite: MIE 201 or BUS 201. 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.

MIE 330 Human Resource Management 3. Prerequisite: MIE 201. Sophomore standing; College of Management Majors must have passed Software Applications Proficiency Requirement. 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.

MIE 335 Organizational Behavior 3. Offered in Fall and Spring. 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.

MIE 410 Business Opportunity Analysis 3. Prerequisite: MIE 310. 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.

MIE 411 Managing the Growth Venture 3. Prerequisite: MIE 310. 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 projects with a local venture. Students need to provide their own transportation to off-campus sites.

MIE 412 Finance and Accounting for Entrepreneurs 3. Offered in Spring Only. Prerequisite: MIE 310. 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.

MIE 413 New Venture Planning 3. Offered in Spring Only. Prerequisite: MIE 410. 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, entrepreneurship, 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.

MIE 416 The Legal Dynamics of Entrepreneurship 3. Prerequisite: MIE 310. 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.

MIE 418 Social Entrepreneurship Practicum 3. Corequisite: MIE 411. Application of entrepreneurship 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 an evaluation of the venture and a formal presentation including a summary of work completed and the implications of the work for each student's project. Students need to provide their own transportation to off-campus sites.

MIE 419 Entrepreneurship Practicum 3. Offered in Fall and Spring. Corequisite: MIE 413. Application of entrepreneurship 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 formal presentation that includes a summary of the work completed and the implications of that work completed by each student's project. Some individual off-campus travel is required.


MIE 432 Industrial Relations 3. Offered in Fall and Spring. Prerequisite: EC 201; MIE 330. The role of collective bargaining in the labor market. Determinants of the pattern of union membership today and its growth rate. The objectives and tactics of both labor and management within public policy guidelines. Analysis of the impact of unions on job security, productivity, and compensation.


MIE 434 Compensation Systems 3. Offered in Fall and Spring. Prerequisite: MIE 330. 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.

MIE 435 Leadership and Management 3. Offered in Fall and Spring. Prerequisite: MIE 330. 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.

MIE 436 Training, Development and Performance Management 3. Offered in Fall and Spring. Prerequisite: MIE 330. Training, development and performance management functions in organizations. Needs assessment, legal issues, training program design, learning, training methods, transfer of training, effectiveness and utility of training programs, executive development, criteria development for
performance appraisal, validation, instrumentation, sources, accuracy, and feedback.

MIE 438 Staffing 3. Offered in Fall and Spring. Prerequisite: MIE 330. 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 recruitment, assessment and selection, decision making, employment, and termination. Considerable emphasis on employment and labor legislation.

MIE 480 Business Policy and Strategy 3. Offered in Fall and Spring. Prerequisite: BUS/MIE 305, BUS 320, (BUS/CSC 340 or ACC 340), BUS 360, BUS 370, MIE 330, and (BUS/ST 350 or ST 302 or ST 361 or ST 370 or ST 372). 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.

MIE 495 Special Topics in MIE 1-6. . . 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. . . 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.

**MILITARY SCIENCE**

MS 101 Introduction to Leadership and Values I 3. Offered in Fall Only. . . 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.

MS 102 Basic Military Leadership 1. Offered in Fall and Spring. . . 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.

MS 106 Map Reading 1. Offered in Spring Only. . . Basic map reading techniques: determination of present location through the use of intersection and resection procedures; information for outdoor activities, ranging from competitive orienteering to occasional backpacking.

MS 201 Intermediate Leadership Theory I 2. Offered in Fall Only. . . 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.

MS 202 Intermediate Leadership Theory II 2. Offered in Spring Only. Prerequisite: MS 101. 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.

MS 295 Special Topics in Military Leadership 3 . . . Intensive supervised study in applied military leadership and management in an organization or historically applied scenario. Departmental approval required.

MS 301 Military Leadership and Training Management 3. Offered in Fall Only. . . Organizational leadership and processes in the Army; leadership activities and key management functions. Management and conduct of group training activities.

MS 302 Intermediate Small Unit Tactics 3. Offered in Spring Only. . . Planning, organizing and executing military operations at the squad and platoon level. Focus on the leader's actions, map reading, and navigation.

MS 401 Advanced Military Science - Leadership and Systems Management 3. Offered in Fall Only. Prerequisite: MS 301, MS 302. A course designed to familiarize the student with the fundamentals of staff operations and procedures, military correspondence, and the U.S. Army training management system. Also included are the Officer Personnel Management and Officer Evaluation Report systems (OPMS/OER), the Army logistics system, mobilization and deployment, and intelligence/electronic warfare.

MS 402 Advanced Military Science - Military Justice, Ethics and Professionalism 3. Offered in Spring Only. Prerequisite: MS 401. The role of military justice, the Uniform Code of Military Justice (UCMJ) and the procedures for accomplishing certain legal actions. Ethics and professionalism of the officer corps. Also included are counseling techniques and continued preparation for the transition from cadet to commissioned officer. Emphasis on student interaction and small group exercise practical application.

MS 495 Special Topics in Military Science 3 . . . Individualized readings/research of Company Command level issues and implementation of the Uniform Code of Military Justice, DOD Policies, and additional duties required of company grade officers. Departmental approval required-advanced course students only.

**MATERIALS SCIENCE & ENGINEERING**

MSE 200 Mechanical Properties of Structural Materials 3. Offered in Fall Spring Summer. Prerequisite: CH 101. An introduction to the atomic and grain structure of 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.

MSE 201 Structure and Properties of Engineering Materials 3. Offered in Fall Spring Summer. Prerequisite: CH 101. 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.
MSE 203 Introduction to the Materials Science of Biomaterials 3. Offered in Fall Only. Prerequisite: C- or better in CH 101, CH 102 and PY 205. 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.

MSE 230 The Impact of Materials on Civilization 3. Offered in Spring Only. Exploration of the role of materials in the development of modern industrial civilizations by putting technology into a historical context and examining the advances made possible by innovations with materials starting with the Stone age. Basic concepts in materials science and engineering which focus on the relationship between processing, structure, properties and performance. Material classes covered include metals, ceramics, polymers, composites and semiconductors.


MSE 260 Mathematical Methods for Materials Engineers 3. Offered in Spring Only. Prerequisite: E 115, MA 141. Use of Excel spreadsheets to illustrate principles and application of mathematical and simulation methods that are central to materials science and engineering. Data plotting, curve fitting, Taylor series, Fourier transforms, numerical integration and differentiation, finite element analysis, numerical solution of differential equations, atomistic and molecular modeling using Monte Carlo and other methods.

MSE 270 Materials Science and Engineering Seminar 1. Offered in Spring Only. Corequisite: MSE 201. 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.

MSE 300 Structure of Materials at the Nanoscale 3. Offered in Fall Only. Prerequisite: C- or better in MSE 201. 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.

MSE 301 Introduction to Thermodynamics of Materials 3. Offered in Fall Only. Prerequisite: MSE 201 or MSE 203; MSE majors must have a C- or better in MSE 201. Review of classical thermodynamics and thermodynamic relationships. Use of statistical methods of describe entropy and other thermodynamic properties. Description controlled by microstructure and defects, dislocation theory, mechanical properties, radiation damage, hardening and embrittlement due to radiation exposure and problems concerned with fission and fusion materials.

MSE 320 Introduction to Defects in Solids 3. Offered in Fall Only. Prerequisite: C- or better in MSE 201. 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.

MSE 335 Experimental Methods for Analysis of Material Properties 2. Offered in Fall Only. Prerequisite: C- or better in MSE 201. 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.

MSE 350 Mechanics of Materials 3. Prerequisite: MA 341. Covers fundamental topics in stress analysis and mechanics of materials including statics and structures, elasticity, plasticity, fracture, fatigue, testing methods, and engineering applications.

MSE 355 Electrical, Magnetic and Optical Properties of Materials 3. Offered in Spring Only. Prerequisite: PY 208 and MA 341. Fundamental treatment of the electronic properties of materials, including the electrical, magnetic and optical characteristics. The role of electrons, band structure, and Brilliouin 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.

MSE 360 Kinetic Processes in Materials 3. Offered in Spring Only. Prerequisite: MA 341 and MSE 301. 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.

MSE 370 Microstructure of Inorganic Materials 3. Offered in Spring Only. Prerequisites: MSE 300, MSE 301 and MSE 220. 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.

MSE 380 Microstructure of Organic Materials 3. Offered in Spring Only. Prerequisite: CH 220 and MSE 300. 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.

MSE 409 Nuclear Materials 3. Offered in Spring Only. Introduces students to properties and selection of materials for nuclear steam supply systems and 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.
MSE 409 Nuclear Materials 3. Offered in Spring Only. 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.

MSE 420 Mechanical Properties of Materials 3. Offered in Fall Only. Prerequisite: MSE 370 and MSE 380. 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 420

MSE 423 Introduction to Materials Engineering Design 3. Offered in Fall Only. 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 is 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.

MSE 440 Processing of Metallic Materials 3. Offered in Fall Only. Prerequisite: MSE 360 and MSE 370. Corequisite: MSE 420. 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.

MSE 445 Ceramic Processing 3. Offered in Fall Only. Prerequisite: MSE 370. 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.

MSE 455 Polymer Technology and Engineering 3. Offered in Spring Only. Prerequisite: MSE 380. 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.

MSE 456 Composite Materials 3. Offered in Spring Only. Prerequisite: MSE 420. 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. Processing 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.

MSE 460 Microelectronic Materials 3. Offered in Fall Only. Prerequisite: MSE 355. 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.

MSE 470 Materials Science and Engineering Senior Design Project 3. Offered in Spring Only. Prerequisite: MSE 423. 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 advisor on problems submitted by local industrial sponsors or emerging research issues that represent the major speciality areas including ceramics, metals, polymers, or electronic materials.

MSE 480 Materials Forensics 3. Offered in Spring Only. Prerequisite: MSE 370 and MSE 380. 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.

MSE 490 Special Topics in Materials Engineering 1-4. 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. Offered in Fall and Spring. 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.

MEDICAL TEXTILES

MT 105 Introduction to Medical Textiles 3. Offered in Fall Only. 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.

MT 323 Introduction to Theory and Practice of Medical Fiber and Yarn Formation 3. Offered in Full Only. Prerequisite: PY 211 or PY 205, PCC 203 or CH 221. 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 biopolymeric fibers used in medical textiles. The common methods of yarn manufacture are introduced.

MT 366 Biotextile Product Development 3. Offered in Fall Only. Prerequisite: MT105 or PCC105, MT323, PCC203 or CH221, ZO160, PY205 or PY211. Biotextile product development of surgical implants designed for the repair and replacement of tissue in cardiovascular, wound healing, orthopedic, dental and tissue engineering applications. Mechanical, physical, chemical, surface and biological properties
including cell/biotelstic interactions of fibers and fibrous structures will be reviewed. Biodegradable polymers, drug delivery systems, fiber reinforced composites, and strategies for surface modification and biorecognition will be reviewed in the light of material selection and structural design. Credit for TE 366 and TE 466 is not allowed.

MT 381 Medical Textile and the Regulatory Environment 3. Offered in Spring Only. 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.

MT 386 Medical Textiles Supply Network 3. Offered in Fall Only. Prerequisite: MT 105, TMS 210 or (TT 221 and TT 252), TAM 380, ZO 160. Study of the supply system for medical textiles and healthcare products among organizations and firms, including information requirements that are exchanged between producers, manufacturers, distributors, retailers, clinicians, institutional and individual users. Consideration of the market system, product pricing, channels to market, product lead times and the role of product managers. Modeling and simulation of supply networks will also be studied. Credit cannot be given for both MT 386 and TAM 486.

MT 432 Biotextiles Evaluation 3. Offered in Spring Only. Prerequisite: MT 323, ZO 160, Corequisite: MT 366 or TE 466. 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.

MT 435 Evaluation of Medical and Protective Textiles 3. Offered in Spring Only. Prerequisite: Senior standing, TMS 211, PY 211 or PY 205. Scientific principles and practices involved in the testing and qualification of the protection and comfort performance of medical and protective clothing.

MT 452 Formation, Structure and Assembly of Medical Textile Products 3. Offered in Fall Only. Prerequisite: MT 323, TMS 210 or (TT 221 and TT 252), PY 208 or PY 212. Braiding, weaving, knitting and nonwoven technologies in the design, patterning, formation and assembly of medical textiles and healthcare products. Specialized laminating, finishing joining, cleaning and sterilizing techniques for conversion of textile structures into medical products. Structure/property relationships in terms of physical, chemical and biological performance of medical textiles and healthcare products.

MT 471 The Chemistry of Synthetic and Natural Bipolymers 3. Offered in Fall Only. Prerequisite: CH 220 or CH 221. 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, polyelectrolytes, polyurethanes, polyhydroxides and polyethers.

MT 482 Healthcare Product Management 3. Offered in Spring Only. Prerequisite: MA 231 or MA 241, ST 311 or ST 361, MT 386 or TAM 380. Overview and analysis of the entire health care complex, the markets, the needs, and especially the use of medical and biotextile products to meet these needs. Study of the product design, production, and distribution systems for medical textiles and biotextiles and other healthcare products. Covers roles of all organizations including designers, inventors, producers, buyers, consumers and users. Study of differences in regulatory systems, product testing, manufacturing quality control systems, and distribution and tracking systems.

MUS 100 Instrumental Music 1. Offered in Fall and Spring. The study and performance of instrumental music. Repertoire dependent upon instrument and level of interest and accomplishment.

MUS 103 Music Theory I 3. Offered in Fall and Spring. Prerequisite: MUS 120 or Rudiments Placement Test. Co-requisite: MUS 104. Through the examination of musical styles, as exemplified by various composers of the western music common practice period, the student will explore the fundamentals of music theory. Composition, analysis, and other practical skills will be used to enhance the study of traditional musical elements.

MUS 104 Aural Skills I 1. Offered in Fall and Spring. Prerequisite: MUS 120 or aural skills placement test; Co-requisite: MUS 103. This is the first course in a two-semester sequence which will lead to proficiency in sight singing, rhythmic skills, and conducting. Aural dictation of melodies, rhythms, and harmonies will be enhanced through computer-based software.

MUS 107 Class Piano 1. Offered in Fall and Spring. Development of technical and musical foundation for playing the piano. Exploration of repertoire in various keys, scale structures, harmonization of melodies using chord progressions, use of pedal. Materials supported with theory and aural examples. Section 001 for Music Minors and Honors students only. Section 002 for General Students and Honors students.

MUS 110 Choral Music 1. Offered in Fall and Spring. Study and performance of choral music by participation in Varsity Men's Glee Club (male chorus), Women's Choir, New Horizons Choir (mixed chorus), or Chamber Singers.

MUS 111 University Singers 1. Offered in Fall and Spring. Rehearsal and performance of choral literature. 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.

MUS 112 Men's Choir 1. Offered in Fall and Spring. 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.

MUS 113 Women's Choir 1. Offered in Fall and Spring. 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.
MUS 114 Chamber Singers 1. Offered in Fall and Spring. 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.

MUS 115 State Chorale 1. Offered in Fall and Spring. 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.

MUS 120 Rudiments of Music 3. Offered in Fall Spring Summer. Rudiments of music 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, and triads.

MUS 121 Raleigh Civic Symphony 1. Offered in Fall and Spring. Rehearsal and performance of significant repertoire for symphony 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. Audition required. May be repeated for up to 10 semesters.

MUS 122 Chamber Orchestra 1. Offered in Fall and Spring. 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 for up to 10 semesters.

MUS 131 Marching Band 1. Offered in Fall Only. 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.

MUS 132 Varsity Band 1. Offered in Fall and Spring. 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.

MUS 133 British Brass Band 1. Offered in Spring Only. Rehearsal and performance of significant repertoire for British brass band, 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.

MUS 134 Wind Ensemble 1. Offered in Fall and Spring. Rehearsal and performance of significant repertoire for wind ensemble, 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.

MUS 140 Jazz Improvisation 1. Offered in Fall and Spring. 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.

MUS 141 Jazz Combo 1. Offered in Fall and Spring. 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.

MUS 142 Jazz Ensemble 2 1. Offered in Fall and Spring. 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.

MUS 143 Jazz Combo 2 1. Offered in Fall and Spring. 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.

MUS 144 Jazz Ensemble 1 1. Offered in Fall and Spring. 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.

MUS 150 Vocal Techniques 1. Offered in Fall and Spring. Development and practice of vocal techniques suitable for solo and ensemble singing in a variety of musical styles, both historical and contemporary.

MUS 152 Tubes and Drums 1. Offered in Fall and Spring. Rehearsal and performance of music for bagpipes and drums, including individual practice techniques, traditional performance practices, 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.

MUS 180 Introduction to Musical Experiences 3. Offered in Fall and Spring. 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.

MUS 181 Exploring Music Theory 3. Offered in Fall and Spring. 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.

**MUS 200 Understanding Music: Global Perspectives 3.** Offered in Fall and Spring. Music as universal human phenomenon. Global approach to music's elements and concepts like melody, rhythm, and timbre; and how it functions in relationship to religious belief, observation, and experience; its role in the formation, expression, and contestation of social identity; and its expressive power in the exposition of narrative and drama.

**MUS 201 Introduction to Music Literature I 3.** Offered in Fall Only. Survey of Western art music from antiquity to end of eighteenth century. Includes examination of the art of music through discourses of philosophy (aesthetics) and anthropology (ethnomusicology). Core requirement for music minor. Requires the ability to read music notation.

**MUS 202 Introduction to Music Literature II 3.** Offered in Spring Only. Survey of Western art music from end of eighteenth century through end of twentieth century. Includes examination of contemporary popular genres and impact of media and technology on music production and consumption. Core requirement for music minor. Requires the ability to read music notation.

**MUS 203 Music Theory 2 3.** Offered in Spring Only. Prerequisite: MUS 103 or Music Theory 1 Placement Test. Second course in Music Theory. Musical analysis of representative works. Further study of chordal functions and orchestration techniques through written exercises. Compositions, written by students.

**MUS 204 Aural Skills 1 1.** Offered in Spring Only. Prerequisite: MUS 104 or Aural Skills 1 Placement Test.

**MUS 205 Introduction to Music in Western Society 3.** Offered in Spring and Summer. 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.

**MUS 206 America's Music 3.** Offered in Spring Only. 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.

**MUS 207 Class Piano 2 1.** Offered in Fall and Spring. Prerequisite: MUS 107. Continuation of materials and skills introduced in MUS 107. Development of technical and musical areas through study of solo and ensemble repertoire; practical, theoretical and aural study of keys, scales and chord structures, harmonization and transposition of melodies. Section 001 for Music Minors and Hons. students only. Corequisite of MUS 203 and MUS 204 for students in the Music Minor, Performance Concentration. Section 002 for General Students and Hons. students.

**MUS 230 Introduction to African-American Music 3.** Offered in Fall Only. Comprehensive survey of African-American music in the United States from Colonial times to the, with emphasis on its unique features and contributions to American culture.

**MUS 260 History of Jazz 3.** 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.

**MUS 300 Chamber Music Performance 1.** Offered in Fall and Spring. 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.

**MUS 305 Music Composition 3.** Prerequisite: MUS 105 or MUS 203. Study and creation of musical works. Emphasis on writing original music and works imitative of conventional and contemporary musical styles.

**MUS 306 Music Composition with Computers 3.** Offered in Fall Spring Summer. 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).

**MUS 310 Music of the 17th and 18th Centuries 3.** Offered in Spring Only. 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.

**MUS 315 Music of 19th Century Europe 3.** 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.

**MUS 320 Music of the Twentieth Century 3.** Offered in Fall Only. Prerequisite: One 3-hour MUS class. Study of Western Art Music from 1900 to present, emphasizing significant composers, repertoire, and compositional procedures and trends, including traditional, atonal, serial, aleatoric, electronic and computer music.

**MUS 330 Music Drama 3.** Offered in Fall Only. Survey of staged musical works spanning four centuries. Emphasis on large-scale dramatic works in the genres of opera, opera seria, and musical theater. Designed for students with musical and/or theatrical experience.

**MUS 335 Choral Literature 3.** Offered in Fall Only. Survey of choral literature spanning five centuries. Emphasis on large-scale choral/orchestral masterworks in the genres of oratorio, passion, cantata, mass and requiem.

**MUS 350 World Music I: Music of Asia 3.** Offered in Fall Only. Examination of music from a variety of Asian traditions including India and Pakistan, Japan and Korea, Thailand and Indonesia. Emphasis placed 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 required.

**MUS 360 Women In Music 3.** Offered in Spring Only. 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.

**MUS 390 Applied Music 1.** Offered in Fall and Spring. Individual instruction in voice or instrumental performance. Includes development of technique basic to voice or instrument, as well as advancement of artistry, musicianship, and repertoire.
MUS 493 Recital 2. Offered in Fall and Spring. Prerequisite: 4 Semesters of MUS 390 for Performance Concentration. MUS 493: Recital is the capstone for a student in the Music Minor performance concentration. Students receive weekly 45-minute individual instruction culminating in a public recital. Students also receive instruction in organizing the recital.

MUS 495 Special Topics in Music 3. Offered in Fall and Spring. Examination of selected topics in music.

MUS 498 Independent Study in Music 1-3. 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.

NUCLEAR ENGINEERING

NE 201 Introduction to Nuclear Engineering 2. Offered in Fall Only. Prerequisite: MA 241, PY 205. 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.

NE 202 Radiation Sources, Interaction and Detection 4. Offered in Spring Only. Prerequisite: PY 208 and CSC 112. 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.

NE 235 Nuclear Reactor Operations Training 2. Offered in Fall Only. 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.

NE 301 Fundamentals of Nuclear Engineering 4. Offered in Fall Only. Prerequisite: MA 341, CSC 112, C- or better in NE 202. 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. Laboratory sessions include neutron detection and measurement, reactor instrumentation, and reactivity measurements.

NE 400 Nuclear Reactor Energy Conversion 4. Offered in Spring Only. Prerequisite: MAE 301 and a C- or better in NE 301. 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.

NE 401 Reactor Analysis and Design 4. Offered in Spring Only. Prerequisite: C- or better in NE 301, Corequisite: MA 401. 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 and thermalization models and transient isotopics. Laboratory observations and correlation of reactor measurements with theory.

NE 402 Reactor Engineering 4. Offered in Fall Only. Prerequisite: MAE 305 and either NE 400 or MAE 310. 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.

NE 404 Radiation Safety and Shielding 3. Offered in Fall Only. Prerequisite: NE 401 with a grade of C- or better or NE 419. 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.

NE 405 Reactor Systems 3. Offered in Fall Only. Prerequisite: NE 401, NE 402. 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.

NE 406 Nuclear Engineering Senior Design Preparation 1. Offered in Fall Only. Prerequisite: NE 401, Corequisite: NE 402. 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.

NE 408 Nuclear Engineering Design Project 3. Offered in Spring Only. Prerequisite: NE 406. 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.

NE 409 Nuclear Materials 3. Offered in Spring Only. Prerequisite: MSE 201. 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.

NE 409 Nuclear Materials 3. Offered in Spring Only. Introduces students to properties and selection of materials for nuclear steam supply systems and 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.
NE 442 Nuclear Fuel Cycles 3. Offered in Spring Only. Prerequisite: NE 401. 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, decision-making methodologies. Nuclear power plant and fuel cycle economics.

NE 418 Nuclear Power Plant Instrumentation 3. Offered in Fall Only. Prerequisite: ECE 221 or ECE 331. 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.

NE 419 Introduction to Nuclear Energy 3. Offered in Spring Only. Prerequisite: PY 202 or PY 208. 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.

NE 491 Special Topics in Nuclear Engineering 1-4 . . Detailed coverage of special topics.

NONPROFIT STUDIES

NPS 340 Fundamentals of Grant Development for Nonprofits 3. Offered in Spring Only. 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 successful grant proposals.

NPS 395 Special Topics in Nonprofit Studies 1-6 . . Offered as needed to present material not normally available in regular departmental course offerings or for offering of new courses on a trial basis.

NPS 490 Internship in Nonprofit Studies 4. Offered in Spring and Summer. Prerequisite: PS 203, COM 466. The 150-hour internship provides students with the opportunity to apply the knowledge, skills, and abilities gained through their coursework in the minor in Nonprofit Studies to a nonprofit organizational work setting. The course will include a bi-weekly, two-hour seminar that focuses on careers in the nonprofit sector and nonprofit employment strategies. Students will discuss and reflect upon the service-learning themes of the minor in Nonprofit Studies as they relate to their ongoing internship experiences. Departmental approval required.

NPS 498 Capstone Seminar in Nonprofit Studies 1. Offered in Fall and Spring. Prerequisite: PS 203, COM 466, Corequisite: NPS 490. 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.

NATURAL RESOURCES

NR 100 Introduction to Natural Resources 2. Offered in Fall Only. Orientation to natural resource management. Case study of a current natural resource management issue including biophysical, economic, social and political dimensions. Field experience with local natural resources issues. Career orientation and counseling. Open to Natural Resources, Forest Management and University Undesignated students only.

NR 300 Natural Resource Measurements 4. Offered in Spring Only. Prerequisite: (PB 360/365 or SSC 200) and (MA 231 or ST 311). 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.

NR 301 Practicum for Professional Development I 1. Offered in Fall Only. Prerequisite: Junior standing, NR Majors, NR 100. 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 coduments from NR 501 students; preparation for summer work experience.

NR 303 Humans and the Environment 3 . . 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.

NR 350 International Sustainable Resource Use 4. Offered in Summer. 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 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.

NR 360 Internship Experience 3. Offered in Fall Spring Summer. Prerequisite: NR 301. Internship experience with a natural resource agency or company. Most internships require working and living off campus.


NR 401 Practicum for Professional Development II 1. Offered in Fall Only. Prerequisite: NR majors, NR 360. Preparation and presentation of journal on summer work experience, final report and oral presentation of summer work activities; instruction in presentation techniques; review and critique of seminars and documents; mentoring NR 301 students.

NR 406 Conservation of Biological Diversity 3. Offered in Fall Only. 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.

NR 420 Watershed and Wetlands Hydrology 4. Offered in Fall Only. Prerequisite: SSC 200, BO 360. 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.

NR 421 Wetland Assessment, Delineation and Regulation 3. Offered in Spring Only. Prerequisite: SSC 200, BO 360, FOR 212 or BO 405 and FOR 420. 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; application of federal and state regulatory programs. Five Saturday field trips are required. Credit will not be given for both NR 421 and NR 521.

NR 460 Renewable Natural Resource Management and Policy 3. Offered in Fall Only. 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.

NR 484 Environmental Impact Assessment 4. Offered in Fall Only. Prerequisite: FOR 273 or NR 300 or ET 310. 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.

NR 491 Special Topics in Forestry and Related Natural Resources 1-4. Offered in Fall and Spring. 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.

NAVAL SCIENCE

NS 100 Naval Science Lab 0. Offered in Fall and Spring. 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.

NS 110 Introduction to Naval Science 2. Offered in Fall Only. 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.

NS 210 Leadership and Management 3. Offered in Fall Only. 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.

NS 225 Navigation 4. Offered in Spring Only. 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.

NS 315 Naval Engineering 3. Offered in Fall Only. 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.

NS 325 Naval Weapons Systems 3. Offered in Spring Only. 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.

NS 330 Evolution of Warfare 3. Offered in Spring Only. 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.

NS 415 Naval Operations 4. Offered in Fall Only. Prerequisite: NS 225 Navigation. 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.

NS 420 Naval Leadership and Ethics 3. Offered in Spring Only. 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.

NS 430 Amphibious Warfare 3. Offered in Spring Only. 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.

NUTRITION

NTR 301 Introduction to Human Nutrition 3. Offered in Fall Spring Summer. Functions, dietary sources and deficiencies of essential nutrients in humans; a balanced diet; role of nutrients in heart disease, cancer, hypertension, osteoporosis; weight control and eating disorders; vegetarianism; food safety; dietary supplements; government regulation of food supply; food quackery. Food science majors may use as a free elective only.
NTR 390 Nutrition Seminar 1. Offered in Spring Only. Location of recent literature in the library and discussion of current topics in nutrition. Guest lectures on career opportunities and jobs available in the fields of human and animal nutrition. Use of computer databases to conduct a literature search on the chosen topic. Preparation and presentation of a final oral report, including an abstract and effective visual aids.

NTR 401 Advanced Nutrition and Metabolism 3. Offered in Fall Only. Prerequisite: (NTR 301 or NTR 415 or NTR 500) and (CH 221 or CH 220). 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 mechanisms of nutrient transport in the gut, in bone muscle, blood, growth and development and communication. Credit will not be awarded for both NTR (FS) 401 and NTR (FS) 501.

NTR 415 Comparative Nutrition 3. Offered in Fall Only. Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223. Principles of nutrition, including the classification of nutrients and the nutrient requirements of metabolism by different species for health, growth, maintenance and productive functions.

NTR 419 Human Nutrition and Chronic Disease 3. Offered in Spring Only. Prerequisite: Junior standing, ANS 230, or ANS/FS/NTR 301 or FS/NTR 400 or ANS/NTR/PO 415. 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.

NTR 420 Community Nutrition 4. Offered in Fall Only. Prerequisite: NTR 301 and junior standing required. This course exposes students to nutrition-related community programs, agencies, and activities. Through service-learning experiences, students will apply course material to teach nutrition in the community. Course topics will also cover behavior change models, educational pedagogies, and nutrition among diverse populations. Students are expected to provide their own transportation for the community service in the greater Raleigh area. Instructor consent required; Credit will not be given for both NTR 420 and NTR 520.

NTR 421 Life Cycle Nutrition 3. Offered in Spring Only. Prerequisite: NTR 301 and junior standing required. This course focuses on the physiologic changes and nutritional needs throughout the life cycle. Additionally, students will explore psychosocial and environmental influences 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 group service-learning projects. Credit will not be given for both NTR 421 and NTR 521.

NTR 490 Experience in Teaching, Research, or Service in Nutrition 3. Offered in Fall and Spring. This capstone course provides students with a supervised professional experience that involves both 90 hours of responsible participation in a teaching, research, or service setting and reflection on that experience through writing. Students must complete a plan-of-study contract to be signed by the course instructor and the student-identified preceptor prior to registration.

NTR 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

NTR 493 Special Problems in Nutrition 1-6. Offered in Fall and Spring. 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.

NTR 495 Special Topics in Nutrition 1-3. Offered in Fall Spring. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PUBLIC ADMINISTRATION

PA 311 Public Policy Analysis and Evaluation 3. Offered in Fall Only. 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.

PA 332 Human Resource Management in Public Sector 3. Offered in Spring Only. PA 332 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.

PA 410 Public Administration for Police Supervisors 3... 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.

PA 411 Managing Police Organizational Behavior 3... 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 g tools and assessments utilized by police agencies to facilitate organizational change are also considered. Available only to distance education students enrolled in the AOMP.

PA 412 Management Skills & Practices for Police Supervision 3... 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.

PA 420 State and Local Economic Development Policy. Offered in Spring Only.. 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).

PLANT BIOLOGY

PB 101 Perspectives on Botany 1. Offered in Fall Only.. 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.

PB 200 Plant Life 4. Offered in Fall Spring Summer.. 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. Credit cannot be given for both BO 200 and BO 250.

PB 208 Agricultural Biotechnology: Issues and Implications 3. Offered in Spring and Summer.. 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.

PB 213 Plants and Civilization 3.. Prerequisite: BIO 125, BIO 105 or PB 200. Economic social, political, religious, and medical roles of plants and plant products in human civilization. Foods, beverages, drugs, fibers, oils, latexes, religious symbols and elements.

PB 215 Medicinal Plants 3. Offered in Fall Only. Prerequisite: CH 101 and any one of the following courses: BIO 125, BIO 181, PB 200, ZO 150, ZO 160. Plants and their derived pharmaceuticals in Western medicine and in herbal medicine.

PB 219 Plants in Folklore, Myth, and Religion 3. Offered in Fall Only.. 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.

PB 220 Local Flora 3.. Prerequisite: BIO 125 or PB 200. Structural terminology of vascular plants, field identification of plant species using popularized field guides, description of plant community types and their soil and topographic features.

PB 250 Plant Biology 4. Offered in Fall Only.. An introduction for Life Science majors to the ecology, structure, function, processes, reproduction and evolution of higher plants. BIO 181 and BIO 183 or BIO 125. Students may not receive credit for both BO 200 and BO 250.

PB 277 Space Biology 3. Offered in Fall Only. Prerequisite: BIO 105 or BIO 140 or BIO 181 or BIO 183 or PB 200. Overview of the biology of plants, animals and humans in the space environment, including gravitational biology, aerospace medicine, search for extraterrestrial life, terraforming and life support.

PB 295 Special Topics in Botany 1-4. Offered in Fall Spring Summer.. Trial offerings of new or experimental courses in Botany at the early undergraduate level.

PB 321 Introduction to Whole Plant Physiology 3. Offered in Spring Only. Prerequisite: BIO 183 or PB 200 or PB 250; CH 101/102 and CH 220 or CH 221. 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.

PB 330 Evolutionary Biology 3. Offered in Spring Only. Prerequisite: BIO 181, BIO 183. 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.

PB 360 Ecology 4. Offered in Fall Spring Summer. Prerequisite: BIO 181. 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.

PB 400 Plant Structure and Diversity 4. Offered in Spring Only. Prerequisite: BIO 181 or PB 200 or PB 250. Survey of the structure and diversity of plants. Emphasis on anatomy, including cells, tissue systems, and organs, morphology, evolutionary trends, adaptive strategies, and bases for assumed phylogenetic relationships of fossil as well as living forms. Two one-day weekend field trips.

PB 403 Systematic Botany 4. Offered in Fall Only. Prerequisite: PB 200, PB 250, BIO 183. Junior standing. 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.

PB 405 Wetland Flora 3. Offered in Fall Only. Prerequisite: PB 200 or PB 250 or PB 403 or FOR 212. Plant morphological terminology and identifications of wetland plants; discussion of wetland flora, plant communities, functions and values of North Carolina wetland types; several one-day weekend field trips required.

PB 413 Plant Anatomy 2. Offered in Spring Only. Prerequisite: PB 200 or PB 250 or PB 321 or PB 421. Organelles, cells, tissues and
PB 414 Cell Biology 3. Offered in Spring Only. Prerequisite: (BIO 183 or ZO 160) and CH 221. The chemical and physical bases of cellular structure and function with emphasis on methods and interpretations.

PB 421 Plant Physiology 3. Offered in Fall Only. Prerequisite: BIO 183 or ZO 160, or PB 200 and CH 220 or CH 221. Physiology of higher plants with emphasis on biochemical, cellular 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.

PB 422 Plant Physiology Laboratory 1. Offered in Spring Only. Prerequisite: PB 421. Laboratory to accompany BO 421. Exercises are designed to study plant processes such as respiration, photosynthesis, tropisms, and secondary metabolite accumulation. Basic laboratory procedures in separation and analytical techniques including electrophoresis, chromatography and spectroscopy and at least one library research project will be included. The course is intended for students interested in postgraduate studies in plant biology and in technical positions in plant biology research laboratories.

PB 445 Paleobotany 4. Prerequisite: BIO 181 or MEA 102. 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.

PB 464 Rare Plants of North Carolina 3. Offered in Fall Only. Prerequisite: One of the following: (PB 200, PB 220, PB 403, or PB 405). 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.

PB 476 Applied Bioinformatics 2. Offered in Fall Only. Prerequisite: BIT 410 or BHC 454 or GN 311. 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.

PB 480 Introduction to Plant Biotechnology 3. Offered in Fall and Spring. Prerequisite: BIT 410 or CS 211 or GN 311 or PB 421. Introduction to molecular techniques in the plant sciences, gene identification and isolation, plant tissue culture and transformation, and methods for working with single and multiple locus traits. Discussions of the role and potential of plant genetic engineering to solve problems facing agriculture.

PB 481 Plant Tissue Culture and Transformation 2. Offered in Spring Only. Prerequisite: BIT 360 or MB 409 or BCH 454 or ZO 480. 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.

PB 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

PB 493 SP Problems in BO 1-6. 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.

PB 495 Special Topics in Botany 1-6. Offered in Fall Spring Summer. Prerequisite: 8 hrs. of Botany courses. Individualized study, under faculty supervision, of botanical topics in the student's area of interest and not covered in existing courses. Development of a new course on a trial basis.

PCC 101 Introduction to Polymer and Color Chemistry 2. Offered in Fall Only. Corequisite: PCC 104. 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.

PCC 104 Introduction to Polymer and Color Chemistry Lab 1. Offered in Fall Only. Prerequisite: PCC 101. An introduction to hands-on laboratory work for the study of basic polymer principles, dye synthesis, forensic analysis and coloration of fibers.

PCC 106 Polymer Chemistry and Environmental Sustainability 3. Offered in Fall Only. Prerequisite: CH 101; Corequisite: CH 221. 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.

PCC 203 Introduction to Polymer Chemistry 3. Offered in Fall Spring Summer. Prerequisite: CH 101, TC 105 or TT 105. Organic reaction principles necessary to understand the preparation, properties and chemistry of polymers. Synthesis, applications and behavior of common classes of polymers with emphasis on those materials used in the textile industry. The chemistry and structure of natural and man-made fibers.

PCC 274 Introduction to Forensic Science 3. Offered in Spring Only. 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.

PCC 301 Technology of Dyeing and Finishing 3. Offered in Fall and Spring. Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 304. 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.

PCC 302 Technology of Textile Wet Processing 4. Offered in Fall Spring Summer. Prerequisite: TT 105 or PCC 105, TMS 211, CH 101, PY 211 or PY 205. 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.

PCC 304 Technology of Dyeing & Finishing Laboratory 1. Offered in Fall and Spring. Prerequisite: PCC 106 or PCC 203 or TE 200 and Corequisite: PCC 301. Laboratory experience involving the preparation, dyeing, printing, and finishing of natural and man-made fibers.

PCC 350 Introduction to Color Science and Its Applications 2. Offered in Spring Only. Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 354. Basic principles and applications of color science. Physical, physiological and psychophysical aspects of color, color perception, color specification, color measurement and color control.

PCC 354 Intro to Color Science Laboratory 1. Offered in Spring Only. Prerequisite: PCC 301 and either PY 208 or PY 212; Corequisite: PCC 350. An introduction to hands-on laboratory work for the color measurement and perception of colored materials.

PCC 401 Manufacturing and its Impact on Safety, the Environment, and Society 3. Offered in Fall Only. 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.

PCC 402 Introduction to the Theory and Practice of Fiber Formation 3. Prerequisite: PCC 203, PY 208 or PY 212, MA 242, CH 201. 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 cellulosic fibers.

PCC 403 Carpet Industry 3. Offered in Fall Only. Prerequisite: Senior standing PCC 301 or 302, TT 221, 241 and 251 or TMS 210 or TE 301 and 302. An overview of all aspects of carpet production and marketing including fiber properties and selection, yarn formation, carpet formation, dyeing and finishing, design, quality assurance and testing, marketing, and environmental issues. Instruction provided by industry professionals. May include a field trip.

PCC 407 Wet Processing Operations and Quality Control 3. Offered in Spring Only. Prerequisite: PCC 310, PCC 320, TMS 210, and CH 431 or TC 441. Pilot-scale batch and continuous wet processing. Selection and use of processes and quality control tests.


PCC 412 Textile Chemical Analysis 2. Offered in Spring Only. Prerequisite: PCC 301 and TE 303 or CH 331 or CH 431; Corequisite: PCC 414. 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 and solving problems of analysis for quantitate and characterization purposes.

PCC 414 Textile Chemistry Analysis Lab 1. Offered in Spring Only. Prerequisite: PCC 301 and TE 303 or CH 331 or CH 431 and Corequisite: PCC 412. 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 quantitative and characterization purposes.

PCC 420 Textile Dyeing and Printing 3. Offered in Spring Only. Prerequisite: PCC 301. Topics in coloration of textile fibers; chemical and physical mechanisms in textile dyeing and printing.


PCC 461 Chemistry of Polymeric Materials 3. Offered in Fall Only. Prerequisite: TE 200 and CH 220 or CH 223 and Corequisite: PCC 464. 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.

PCC 462 Characterization and Physical Properties of Polymers 3. Offered in Fall Only. Prerequisite: PCC 461. Properties unique to polymers are related to their high molecular weight, long and flexible chains, or polymers physics. The detailed molecular structures of polymer, or 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, near-shapes and conformational entropies, to both their environments and the stresses placed upon them.

PCC 464 Chemistry of Polymeric Materials Laboratory 1. Offered in Fall Only. Prerequisite: TE 200 and CH 220 or CH 223 and
Corequisite: PCC 461. 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 using step-growth and chain-growth polymerization techniques. The properties of the resultant polymers are studied.

PCC 466 Polymer Chemistry Laboratory 3. Prerequisite: TC 441 or CH 431; Senior standing. 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.

PCC 471 The Chemistry of Synthetic and Natural Bipolymers 3. Offered in Fall Only. Prerequisite: CH 220 or CH 221. 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, polystyres, polyurethanes, polyanhydrides and polyethers.

PCC 474 Forensic Chemistry Laboratory 3. Offered in Fall Only. Prerequisite: CH 220 or CH 223 and TMS 211. 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.

PCC 490 Undergraduate Research in Polymer and Color Chemistry 1-6. Offered in Fall Spring Summer. Prerequisite: PCC 301; PCC 461/CH 461; and TE 303, CH 331 or CH 431. 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.

PCC 491 Seminar in Polymer and Color Chemistry 1. Offered in Fall Spring Summer. 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.

PCC 492 Special Topics in Polymer and Color Chemistry 3. Offered in Fall Spring Summer. 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.

**PHYSICAL EDUCATION**

PE 101 Fitness and Wellness 1. Offered in Fall Spring Summer. 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.

PE 102 Fitness Walking 1. Offered in Fall Spring Summer. 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.

PE 103 Water Aerobics 1. Offered in Fall Spring Summer. 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.

PE 104 Swim Conditioning 1. Offered in Fall Spring Summer. 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.

PE 105 Aerobics and Body Conditioning 1. Offered in Fall Spring Summer. 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.

PE 106 Triathlon 1. Offered in Fall Spring Summer. 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.

PE 107 Run Conditioning 1. Offered in Fall Spring Summer. 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 could take place in or out of the water.

PE 108 Water Step Aerobics 1. Offered in Fall Spring Summer. 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.

PE 109 Step Aerobics 1. Offered in Fall Spring Summer. 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
paced step aerobics classes. Muscular strength activities could take place in or out of the aerobics room.

PE 110 Adapted Physical Education 1. Offered in Fall Spring Summer. This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardiorespiratory 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.

PE 111 Indoor Group Cycling 1. Offered in Fall Spring Summer. This course is designed to teach and apply the principles of lifetime physical fitness, utilizing the five major components of cardiorespiratory 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 indoor group cycling classes. Muscular strength activities could take place in or out of the main classroom.

PE 214 Beginning Swimming 1. Offered in Fall Spring Summer. Swimming strokes and deep water skills for the non-swimmer to survive in the water.

PE 215 Advanced Beginning Swimming 1. Offered in Fall Spring Summer. Prerequisite: PE 214 or equivalent skill. Continuation of Basic Strokes acquired in Beginning Swimming, additional new strokes, and survival skills.

PE 216 Soccer 1. Offered in Fall Spring Summer. Soccer with emphasis on skills development, playing strategies, and rules of the game.

PE 217 Survival Swimming 1. Offered in Fall Only. Prerequisite: PE 214 or equivalent skill. 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.


PE 221 Intermediate Swimming 1. Offered in Fall Spring Summer. Prerequisite: PE 214 or equivalent skill. 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.

PE 223 Lifeguard Training 1. Offered in Fall and Spring. 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.

PE 224 Water Safety Instructor 1. Offered in Spring Only. Designed to provide students with the skills and knowledge necessary to qualify for an American Red Cross Water Safety Instructor's certification. Optional fee assessed for certification.

PE 225 Scuba Leadership 2. Offered in Fall Only. Prerequisite: PE 227 or equivalent skill. 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).

PE 226 Skin and Scuba Diving I 2. Offered in Fall Spring Summer. 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, gas mix, 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).

PE 227 Skin & Scuba Diving II 2. Offered in Fall and Spring. Prerequisite: PE 226 or equivalent skills. This course will build on the knowledge and skills learned in Skin & Scuba Diving I with emphasis on diver 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).

PE 228 Springboard Diving 1. Offered in Fall Spring Summer. Prerequisite: PE 215 or equivalent skills. Development of fundamental one-meter springboard diving.

PE 230 Pilates/Core Training 1. Offered in Fall Spring Summer. 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.

PE 231 Scientific Diving 3. Offered in Spring Only. Prerequisite: PE 227 or equivalent skill. 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 mixes, 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).

PE 232 Track & Field 1. Offered in Fall Only. Develops knowledge, skill and interest in track and field events.
PE 233 Clogging 1. Offered in Fall and Spring. An entry level dance course stressing the fundamentals of traditional and precision clogging. Emphasis on basic foot movements, combinations and individual freestyle.

PE 234 Country Dance 1. Offered in Fall and Spring. American Heritage dances, Texas two-step, and Western Square Dance.

PE 235 Beginning Karate 1. Offered in Fall and Spring. Introduction to traditional Japanese karate: kihon (basic punching, striking, blocking, and kicking techniques); kata (formal drills); yokusoku kumite (pre-arranged sparring); and demonstration of ji-yu-kumite (controlled free sparring). Karate uniform required.


PE 237 Weight Training 1. Offered in Fall Spring Summer. Provides essential knowledge of the Principles of Muscular Strength development and an opportunity to acquire skill in a variety of progressive resistance exercises.

PE 238 Wrestling 1. Offered in Fall and Spring. Wrestling skills, safety considerations, and conditioning factors necessary for moderate competition in a combative sport-beginning skills through more advanced techniques.

PE 239 Self Defense 1. Offered in Fall and Spring. 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.

PE 240 Social Dance 1. Offered in Fall Spring Summer. Basic steps and fundamentals of leading and following in the Fox Trot, Waltz, Cha-Cha, Shag, and one other current popular dance form.

PE 241 Social Dance II 1. Offered in Fall and Spring. Prerequisite: PE 240 or equivalent skills. 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 currently offered in the beginning level class. Dances taught will differ from semester to semester.

PE 242 Badminton 1. Offered in Fall Spring Summer. Skills development, strategies and rules of singles and doubles play.

PE 243 Bowling 1. Offered in Fall Spring Summer. Instruction in ball selection, grip, stance, approach, delivery, bowling etiquette, safety precautions, rules, scoring, terminology, and general theory of spare coverage. Additional fee assessed.

PE 244 Fencing 1. Offered in Fall and Spring. This course will provide students with the fundamentals of modern foil fencing. Emphasis will be placed on safety, footwork, blade work, etiquette, refereeing, scoring, rules, and techniques and strategy. Offensive and defensive techniques will be practiced in partner drills and during an in-class tournament. Basic rules in and techniques of epee and saber will be presented.

PE 245 Golf 1. Offered in Fall Spring Summer. 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 and appreciation for the game of golf through practice, play, and time of the golf course. There is a required fee for class meetings at the Lonnie Poole Golf Course Range. Check the online scheduling for current charge. The student must provide their own transportation to the golf course.

PE 246 Handball 1. Offered in Fall and Spring. This course will provide handball instruction at the beginning level in which students will develop the basic skills necessary to play the game of handball. Technical skills include serves, overhead, sidewall, and underwater strokes, ceiling shot, lob, three-wall shot, kill shots and passing shots. Instruction will include an emphasis on the fundamental strategies and rules used in singles, doubles, and cutthroat play. Basic fitness and training principles will be discussed as applicable to the game of handball. Students are required to purchase handball gloves and protective eyewear.

PE 247 Squash 1. Offered in Fall and Spring. Skill development and strategies of play. Equipment selection, safety, history, and rules.

PE 248 Social Dance 1. Offered in Fall and Spring. Emphasis on instruction in advanced striking, blocking, and kicking techniques. Three additional Pinan Katas. Introduction to multiple-step pre-arranged Kumite.

PE 249 Tennis I 1. Offered in Fall Spring Summer. Basic tennis skills on grips, footwork, ground strokes, service. Rules and basic strategy for singles play. Introduction to volleys, lobs, overheads, and doubles.

PE 250 Tennis II 1. Offered in Fall Spring Summer. Prerequisite: PE 249. Review basic tennis skills on grips, footwork, ground strokes, and service. Stroke production involved in more aggressive/offensive style of play: approach and volley, spin serve and kick serve. Emphasis on half-volleys, lobs, overheads, and supplemental shots. Active drills and point play situations for aggressive singles and doubles play.

PE 251 Target Archery 1. Offered in Fall Spring Summer. Shooting fundamentals, safety, selection, and care of equipment.

PE 252 Skiiing/Snowboarding 1. Offered in Fall Only. 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.

PE 253 Orienteering 1. Offered in Fall and Spring. Navigating on foot from defined point to defined point, with use of map and compass in the shortest possible time.

PE 254 Beginning Equitation 1. Offered in Fall and Spring. Hunt seat equitation, care of horse and tack, and control skills at the walk, trot and canter. Meets off campus once a week. Additional fee assessed.

PE 255 Basic Canoeing 1. Offered in Fall and Spring. 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.
PE 256 Racquetball 1. Offered in Fall Spring Summer.. Skill development, strategies and rules of singles, doubles and cutthroat play..

PE 257 Backpacking 1. Offered in Fall and Spring.. 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..

PE 258 Basic Rock Climbing 1. Offered in Fall Spring Summer.. Instruction and direct experience for the beginning rock climber. Emphasis on safe rope systems for belaying and basic movement on rock..

PE 259 Intermediate Rock Climbing 1. Offered in Fall and Spring. Prerequisite: PE 258. 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..

PE 260 Intermediate Equitation 1. Offered in Fall and Spring.. Advanced techniques, theories and performance in equitation. Additional fee assessed.

PE 261 Basketball 1. Offered in Fall and Spring.. Offensive and defensive skills development and systems of team work. Coverage of strategies, history and rules of the sport..

PE 262 Introduction to Whitewater Canoeing 1. Offered in Fall and Spring. Prerequisite: PE 255, Intermediate swimming ability required. 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..

PE 263 Tap Dance 1. Offered in Fall and Spring.. Entry level dance course stressing fundamental movements of tap. Emphasis on foundation skill movements, rhythmic exercises, and the relationship of movement to music..

PE 264 Ballet 1. Offered in Fall and Spring.. Beginning level ballet technique course. Fundamental ballet concepts and vocabulary introduced through barre and center exercises and combinations.

PE 265 Softball 1. Offered in Fall Spring Summer.. Basic skills, rules, and strategies for playing softball..

PE 266 Ultimate Frisbee. Emphasis on skill development, aerobic fitness and spirit of competition. Includes flight dynamics, various throwing and catching techniques, offensive skills, defensive skills, equipment, strategies, and rules of the game.

PE 267 Flag Football 1. Offered in Fall and Spring.. An introduction to the skills, history, rules and strategy of flag football.

PE 268 Advanced Clogging 1. Offered in Fall and Spring. Prerequisite: PE 253. Experience in advanced Appalachian clogging techniques.

PE 269 Volleyball I 1. Offered in Fall Spring Summer.. Volleyball fundamentals: setting, passing, serving, spiking, court movement, and game strategy.

PE 270 Volleyball II 1. Offered in Fall and Spring. Prerequisite: PE 269. Advanced techniques, theories and strategies of volleyball.

PE 271 Varsity Sports Military Conditioning 1. Offered in Fall and Spring.. This course is for student athletes on a team sponsored by the NCSU Department of Athletics or currently enrolled ROTC students. Coursework will require a high level of skill acquisition and mastery of the fitness skills required to perform training techniques and safe sport practice. The rules and terminology of each activity will also be addressed. Course not repeatable.

PE 273 Jazz Dance 1. Offered in Fall and Spring.. Beginning level jazz dance technique course covering basic jazz skills in warm-up exercises, combinations, and compositions. Concentration on learning and performing combinations in jazz styles.

PE 274 Modern Dance I 1. Offered in Fall and Spring.. Introduction of movement and dance concepts and techniques through theory and analysis, improvisation and composition, structured dance exercises combinations.

PE 275 Modern Dance II 1. Offered in Fall and Spring. Prerequisite: PE/DAN 274 (or permission of instructor). Continuation of Modern Dance I. Emphasis on design of body in space, movement qualities and musicality through structured technical exercises and combinations.

PE 276 Whitewater Rafting 1. Offered in Fall Spring Summer.. Whitewater rafting skills and practices emphasizing safe river travel, minimal impact river camping techniques, and trip planning. Participate in one required weekend fieldtrip. Additional charge assessed for the fieldtrip. Refer to PackTracks for the current charge.

PE 277 Mountain Biking 1. Offered in Fall Spring Summer.. 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.

PE 278 Fly-Fishing 1. Offered in Fall Only.. 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.

PE 279 Yoga I 1. Offered in Fall Spring Summer.. 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.

PE 280 Yoga II 1.. This course will build upon material introduced in Yoga I by emphasizing the physical practice of yoga at an intermediate level. Coursework will require a deeper level of understanding of a variety of yoga poses, as well as mastery of the
fitness skills required to perform these poses and maintain a safe yoga practice. Breathing techniques and the philosophy of Hatha Yoga will also be addressed.

PEC 281 Introduction to Challenge Course Programming 1. Offered in Fall and Spring. Prerequisite: PE 258 or equivalent skills. Participants are introduced toropes 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).

PEC 282 Advanced Aerobics and Leadership 1. Offered in Fall and Spring. Prerequisite: PE 105 or PE 109. Safe and effective high-low impact aerobics program with emphasis on student choreography and leadership, development of individual exercise prescription, and related health topics.

PEC 283 Mountaineering 1. Offered in Fall Only. Prerequisite: PE 258, PE 257. 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.

PEC 284 Sea Kayaking 1. Offered in Fall and Spring. 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.

PEC 295 Special Topics in Physical Education 1-3. Offered in Fall and Spring. Examination of selected topics in health, fitness, outdoor leadership, physical education, and sport.

PEC 296 Independent Study in Physical Education 1-3. Offered in Fall Spring Summer. Independent study in Physical Education will vary according to the specialized topic of interest. Credit and content determined by instructor.

PEC 201 Coaching Baseball/Softball 2. Offered in Spring Only. Theories, techniques, and strategies of coaching baseball/softball.

PEC 202 Coaching Basketball 2. Offered in Fall Only. Theories, techniques, and strategies of coaching basketball.

PEC 203 Coaching Football 2. Offered in Fall Only. Theories, techniques, and strategies of coaching football.

PEC 204 Coaching Golf 2. Offered in Spring Only. Theories, techniques, and strategies of coaching golf.

PEC 205 Coaching Soccer 2. Offered in Fall Only. Theories, techniques, and strategies of coaching soccer.

PEC 206 Coaching Swimming and Diving 2. Offered in Spring Only. Theories, techniques and strategies of coaching swimming and diving.

PEC 207 Coaching Tennis 2. Offered in Spring Only. Theories, techniques, and strategies of coaching tennis.

PEC 208 Coaching Track & Field/Cross-Country 2. Offered in Spring Only. Theories, techniques, and strategies of coaching track and field and cross-country.

PEC 209 Coaching Volleyball 2. Offered in Fall Only. Theories, techniques, and strategies of coaching volleyball.

PEC 211 Strength Training and Conditioning 2. Offered in Fall and Spring. 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.


PEC 301 Coaching Practicum 1. Offered in Fall and Spring. 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 internshio liability insurance to participate in the practicum. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.

PEC 381 Athletic Training 3. Offered in Fall Spring Summer. Prerequisite: PEH 280 or PEH 281 or CPR/First Aid Certification. Incidence, causes, prevention and treatment of sports-related injuries. Conditioning for sports, injury recognition and evaluation, taping techniques, first aid care, treatment and reconditioning.

PEC 477 Coaching Concepts 3. Offered in Fall Spring Summer. Practical and theoretical concepts essential to the preparation of coaches. This course does not constitute credit toward meeting Physical Education requirements.

PEC 478 Exercise Physiology and Sports Science 3. Offered in Fall Spring Summer. Basic principles of human anatomy, physiology, and biomechanics and their relationship to athletic coaching.

PEC 479 Sport Management 3. Offered in Fall Spring Summer. 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.

PEC 212 Alcohol, Drugs and Tobacco 2. Offered in Fall and Spring. 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 GER requirement.

PEH 213 Human Sexuality 2. Offered in Fall Spring Summer. . 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.

PEH 280 Responding to Emergencies 2. Offered in Fall Spring Summer. . Information necessary to evaluate vital signs and bodily functions as related to emergency response; training to evaluate and react correctly to minor emergency situations which might arise, and to perform temporary medical care and the follow-up action as indicated. Optional fee assessed for certification. Does not satisfy the physical education requirement.

PEH 281 First Responder 3. Offered in Fall Summer. . Knowledge and skills necessary to respond appropriately in an emergency. Advanced skills in first aid and CPR (adult, child, and infant, pocket mask and oxygen use) fulfills requirements for First Responder (depending on local protocol).

PEH 284 Women's Health Issues 2. Offered in Fall and Spring. . This course will review health and wellness issues affecting women through their life span. It will explore medical concerns and prevention as well as social health issues that disproportionately affect women in contemporary society. Discussions of current critical topics in women's health will also take place. Minor courses.

PEH 285 Personal Health 2. Offered in Fall and Spring. . Behavior change, wellness, stress management, cardiovascular diseases, alcohol and tobacco use, cancer, infectious diseases, arthritis, human sexual response, sex, contraception, and sexually transmitted diseases. This course does not constitute credit toward the Physical Education GER requirement.

PEH 286 Nutrition, Exercise and Weight Control 2. Offered in Fall and Spring. . 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.

PEH 287 Stress Management 2. Offered in Fall and Spring. . 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.

PEH 300 Emergency Medical Technician Basic 4. Offered in Spring Only. Prerequisite: PEH 280 or PEH 281. This course leads to eligibility for optional certification as an emergency medical technician basic with the state of North Carolina and the National Registry of Emergency Medical Technicians. Topics include: roles and responsibilities; medical/legal considerations; respiratory/cardiac emergencies; CPR and airway adjuncts; bleeding and shock; trauma management; medical emergencies and their management; environmental emergencies; emergency childbirth; pediatrics; geriatrics; exposure to hazardous situations; introduction to hazardous materials; psychological emergencies; patient packaging and triage; stabilization and transport of the sick and injured; communications and report writing. Two Saturday classes are required. Certification requires additional time, fees and internship liability insurance.

PEH 335 Prevention of Sexual Assault and Violence 3. Offered in Fall and Spring. . Historical and cultural perspective on rape, sexual assault, and relationship violence will be presented. The course prepares students to deliver a standard outreach program that includes statistics, definitions, risk reduction techniques, medical, legal, psychological, community and campus resources.

PEH 375 Health Planning and Programming 2. Offered in Fall and Spring. Prerequisite: PEH 285 Personal Health. 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.

PEH 377 Methods of Health Promotion 2. Offered in Fall and Spring. . 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.

PEH 493 Practicum in Health 1. Offered in Fall and Spring. Prerequisite: PEH 285, PEH 375, PEH 377, and 6 hours of electives from the Health Minor. 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. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.

PHYSICAL EDUCATION - OUTDOOR

PEO 214 Introduction to Adventure Education 3. Offered in Fall Only. . 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.


PEO 216 Backcountry Instruction Methodology 2. Offered in Fall Only. Prerequisite: PE 255, PE 257, PE 258, or equivalent. . 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. Students must participate in two required weekend field trips. Additional charge assessed for the field trips. Refer to the online schedule of classes for the current charge and dates.

PEO 302 Practicum Experience in Outdoor Programs 1. Offered in Fall Spring Summer. Prerequisite: PEO 214, PEO 215, PEO 216, PEH 280 or equivalent. 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 Physical Education 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. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.
PER 101 Elementary Persian I 3. Offered in Fall Only. Elementary Persian 101 is a beginning course for students who have little or no prior knowledge of the language. It is designed to give the students an introduction to the phonology, morphology, and script of Persian which will develop, by the end of the semester, into outcome skills including the ability to read aloud and comprehend written texts from dictation, and carry on conversations at elementary levels. A textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 102 Elementary Persian II 3. Offered in Spring Only. Prerequisite: Elementary Persian 101 (PER 101) or instructor's permission. Elementary Persian 102 is the second-semester continuation of Persian 101. It continues and develops the students' familiarity with and command of the written and spoken forms of the language by actively involving them in communicative activities at the first-year level. A textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 201 Intermediate Persian I 3. Offered in Fall Only. Prerequisite: Elementary Persian 102, or instructor's permission. 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 and sophisticated communicational contexts. An intermediate textbook with grammar explanations in English is supplemented with tapes and videos of authentic language and culture used in situational communication.

PER 202 Intermediate Persian II 3. Offered in Spring Only. Prerequisite: Elementary Persian (PER 201) or instructor's permission. 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.

PES 214 Methods of Group Exercise Instruction 2. Offered in Fall and Spring. Prerequisite: Any 100-level PE course. A core course in teaching methods and concepts of multi-training and condition in group exercise, equipment and current trends; participation in selected activities designed to promote fitness; planning programs for physical fitness for educational institutions and social agencies. Course does not constitute credit toward meeting Physical Education GER requirement.

PES 303 Sports Science Practicum 1. Offered in Fall and Spring. 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 insurance to participate in the practicum. Contact University Insurance & Risk Management for details on acquiring the insurance and the current charge.

PES 480 Principles of Exercise Programming 3. Offered in Fall Only. Prerequisite: PEC 478. Fundamentals and scientific principles necessary to plan, design, implement, and evaluate individual exercise programs.

PHI 205 Introduction to Philosophy 3. Offered in Fall Spring and Summer. An 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.

PHI 214 Issues in Business Ethics 3. Offered in Fall Spring and Summer. 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.

PHI 221 Contemporary Moral Issues 3. Offered in Fall Spring and Summer. 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.

PHI 250 Thinking Logically 3. 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.

PHI 298 Special Topics in Philosophy 3. 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. Offered in Fall and Spring. Western philosophy of the ancient world, with special emphasis on Plato and Aristotle.

PHI 301 Early Modern Philosophy 3. Offered in Fall and Spring. Western philosophy of the 17th and 18th centuries, including such philosophers as Descartes, Hobbes, Leibniz, Locke, Berkeley, Hume, and Kant.

PHI 302 19th Century Philosophy 3. Western philosophy of the 19th century, including such philosophers as Kant, Hegel, Schopenhauer, Kierkegaard, Marx, and Nietzsche.

PHI 305 Philosophy of Religion 3. 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.

PHI 309 Contemporary Political Philosophy 3. Prerequisite: One PHI course. Current theories about basic concepts in political philosophy, such as liberty, equality, justice, natural rights, and democracy, with special attention to disputes concerning the nature of a just social order.
PHI 310 Existentialism 3. Philosophy of Existentialism, including such thinkers as Kierkegaard, Nietzsche, Dostoevsky, Sartre, Heidegger, and Camus.

PHI 312 Philosophy of Law 3. 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.

PHI 313 Ethical Problems in the Law 3. Prerequisite: PHI 221, 275, or 375. 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.

PHI 325 Bio-Medical Ethics 3. Offered in Fall and Spring. 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, factual interplay, and questions of impact assessment and policy formulation.

PHI 330 Metaphysics 3. Prerequisite: One PHI course. Metaphysical problems: distinction between appearance and reality, nature of space and time, free will and determinism, mind and body, nature of identity.

PHI 331 Philosophy of Language 3. Prerequisite: One PHI course. Introduction to traditional and modern accounts of the relations between language and reality, the nature of truth, problems of intentionality and propositional attitudes.

PHI 332 Philosophy of Psychology 3. Prerequisite: One PHI course or one PSY course. 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.

PHI 333 Theory of Knowledge 3. Prerequisite: One PHI course. Analysis of such central concepts as knowledge, belief, and truth, and the investigation of the principles by which claims to knowledge may be justified.

PHI 340 Philosophy of Science 3. Offered in Fall Spring Summer. 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.

PHI 375 Ethics 3. Offered in Fall Spring. 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.

PHI 376 History of Ethics 3. Prerequisite: One PHI course. Topics in the history of ethics. Philosophers to be studied may include Plato, Aristotle, Aquinas, Butler, Hume, Kant, Sidgewick and Nietzsche.

PHI 401 Kant's Critique of Pure Reason 3. Prerequisite: 6 credits in PHI. 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.

PHI 420 Global Justice 3. Prerequisite: One PHI course. 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.

PHI 425 Introduction to Cognitive Science 3. Prerequisite: One upper-level PHI, PSY, CSC or Linguistics course. 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.

PHI 440 The Scientific Method 3. Prerequisite: One upper-level PHI course. 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.

PHI 447 Philosophy, Evolution and Human Nature 3. Prerequisite: One 300 level or higher course in Philosophy, Biology, Psychology or Anthropology. 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.

PHI 475 Ethical Theory 3. Prerequisite: PHI 375 or PHI 376. 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.

PHI 494 Writing in Ethics 1. Prerequisite: PHI 250 or LOG/MA 201 or LOG/MA 335 and one other PHI course. Corequisite: One of (PHI 275,298,306,309,310,311,313,325,375,376,420,422,475, or 498). A substantial paper in ethics, assigned by the instructor of the corequisite; enrollment subject to departmental approval; may be repeated for credit.

PHI 495 Writing in History of Philosophy 1. Offered in Fall and Spring. Prerequisite: PHI 250, LOG 201 or 335 and one other PHI course, Corequisite: One of PHI 298, 300, 301, 302, 303, 310, 401 or 498. A substantial paper in history of philosophy, assigned by the instructor of the corequisite; enrollment subject to departmental approval; may be repeated or credit.

PHI 496 Writing in Contemporary Philosophy 1. Offered in Fall and Spring. Prerequisite: PHI 250, LOG 201 or 335 and one other PHI course, Corequisite: One of PHI 298, 305, 306, 330, 331, 332, 333, 340, 425, 440, 445, 447 or 498. A substantial paper in contemporary philosophy, assigned by the instructor of the corequisite; enrollment subject to departmental approval; may be repeated for credit.
PHI 497 Writing in Logic, Representation and Reasoning 1. Offered in Fall and Spring. Prerequisite: LOG 201 or 335, and one other PHI course, not PHI 250, Corequisite: One of LOG 335, 435/535, 437, PHI 298, 330, 331, 332, 333, 340, 425/525, 440/540, 445/545, 447. 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.

PHI 498 Special Topics in Philosophy 1-6. Offered in Fall and Spring. Prerequisite: Six credits in PHI courses. 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.

PHYSICAL & MATHEMATICAL SCIENCES

PMS 100 Perspectives on Learning 1. Offered in Fall Only. Undergraduates in College of Physical and Mathematical Sciences. The campus computing and information environment; levels of learning; recognition and application of good reasoning; academic and career resources and opportunities.

PMS 295 Special Topics in Physical and Mathematical Sciences 1-3. Offered in Fall Spring Summer. Special topics in physical and mathematical sciences at the early undergraduate level. Available as directed individual or group study.

PMS 498 Spec Topics in the Mathematical and Physical Sci 2-3. Special Topics for advanced undergraduates will be selected from the mathematical and physical sciences.

POULTRY SCIENCE

PO 201 Poultry Science and Production 4. Offered in Fall and Spring. Fundamental principles of broiler, turkey and egg production including poultry physiology, breeding, incubation, housing, nutrition, disease control, management and marketing.

PO 290 Poultry Seminar 1. Offered in Fall Only. 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.

PO 322 Muscle Foods and Eggs 3. Offered in Fall Only. Prerequisite: ZO 160, BIO 181 or BIO 183. 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.

PO 350 Introduction to HACCP 3. Offered in Fall and Spring. Introductory course on the Hazard Analysis and Critical Control Points System (HACCP) which is designed to decrease hazards in foods. An International HACCP Alliance approved curriculum which covers prerequisite programs. A step by step approach for developing and implementing a HACCP plan for USDA regulated food processing plants. Offered only as a world wide web course through the Office of Instructional Telecommunications.

PO 405 Avian Physiology 4. Offered in Fall Only. Prerequisite: CH 220. 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 environmental influences on physiological systems.

PO 410 Production and Management of Game Birds in Confinement 3. 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. Offered in Spring Only. This course is designed to increase the awareness of the issues and vulnerabilities of the US 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.

PO 415 Comparative Nutrition 3. Offered in Fall Only. Prerequisite: ANS 225 or ANS 230 or CH 220 or CH 223. 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.

PO 421 Commercial Egg Production 2. Offered in Fall and Spring. Prerequisite: PO 201. Principles and current practices of commercial egg production.

PO 422 Incubation and Hatchery Management 2. Offered in Fall Only. Prerequisite: PO 201. Principles and current practices of hatching egg production, incubation, and hatchery management, beginning with the placement of broiler breeder chicks on the breeder farm and ending with the placement of chicks at the brooding facility.

PO 424 Poultry Meat Production 3. Offered in Spring Only. Prerequisite: PO 201. Principles and current practices of vertically integrated broiler and turkey production; encompassing management, nutrition, poultry health, environmental, and related areas.

PO 425 Feed Manufacturing Technology 3. Offered in Spring Only. 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 430 Poultry Breeding 3. Offered in Spring Only. Prerequisite: PO 201. Application of reproductive and genetic principles to the reproduction of poultry breeding stocks.

PO 435 Poultry Incubation & Breeding 4. Offered in Spring Only. Prerequisite: PO 201. 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.
related to the breeding of poultry, production of hatching eggs, and the subsequent incubation and hatching process.

PO 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

PO 493 Special Problems in Poultry Science 1-6. Offered in Fall and Spring. 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.

PO 495 Special Topics in Poultry Science 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PLANT PATHOLOGY

PP 150 Introduction to Plant Molecular Biology 3. 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.

PP 222 Kingdom of Fungi 3. Offered in Fall and Spring. Prerequisite: Any 100-level course in Biology or 200-level course in Plant Biology. 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.

PP 315 Principles of Plant Pathology 4. Offered in Fall Only. 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.

PP 318 Forest Pathology 3. Offered in Spring Only. Prerequisite: PB 200. 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.

PP 450 Challenges in Plant Resource Protection 3. Offered in Spring Only. Prerequisite: CS 414 or ENT 425 or PP 315. This course provides applied training to students in the scientific and regulatory aspects of plant protection using real-world studies, scenarios, and addressing important contemporary issues for safeguarding American agriculture. Students will gain hands-on problem solving abilities regarding the diagnosis, containment, and mitigation of introduced plant pests and pathogens.

PP 460 Fundamentals of (Pest) Risk Analysis 1.... This course provides students with a historical perspective as well as real-time exposure to working professionals involved in the development of risk analysis documents for plant protection. The course uses real world scenarios and addresses contemporary issues facing scientists and regulators tasked with safeguarding American agriculture. Students will gain hands-on problem solving abilities regarding the identification and mitigation of plant pathogens, insects, and noxious weeds that can be introduced into the USA through international trade in agricultural commodities.

PP 470 Advanced Turfgrass Pest Management 2. Offered in Spring Only. Prerequisite: CS 200. 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.

PP 490 Critical Issues in Plant Protection 1.... This course is of particular interest to students minoring in plant biosecurity and regulatory science; however, it is open to all students. The course will feature subject-matter experts in the area of regulatory plant science that will deliver one hour lectures on emerging and critical topics in regulatory plant protection.

PP 492 External Learning Experience 1-6. Offered in Fall and Spring. 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, a prospective employer, the departmental teaching coordinator and the academic dean prior to the experience.

PP 493 Special Problems in Plant Pathology 1-6. Offered in Fall and Spring. 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.

PP 495 Special Topics in Plant Pathology 1-3. Offered in Fall Spring Summer. Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

PARK SCHOLARS

PRK 102 Topics in Scholarship, Leadership, and Service II 0. Offered in Spring Only. Prerequisite: PRK 101, restricted to Park Scholars. 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.
Parks, Recreation, & Tourism Management

PRT 150 Parks, Recreation and Tourism Management Orientation 1. Offered in Fall and Spring. 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.

PRT 152 Introduction to Parks, Recreation and Tourism 3. Offered in Fall and Spring Summer. 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.

PRT 156 Professional Golf Management Orientation 3. Offered in Fall Only. 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.

PRT 200 Leisure Behavior, Health and Wellness 3. Offered in Fall Spring Summer. Leisure as a lifelong resource for human satisfaction and fulfillment; its potential for physical, mental, social and emotional growth and emotional growth and development of the individual. Leisure opportunity areas presented and evaluated.

PRT 210 Golf Management I 1. Offered in Spring Only. Prerequisite: PRT 156. Emphasis on concepts, techniques, and practices of teaching golf; teaching golf; understanding the Professional Golfers' Association Constitution; rules of golf, golf tournament operations; and golf car fleet management.

PRT 211 Golf Management II 1. Offered in Fall Only. Prerequisite: PGM Majors, PRT/PEG 210. Advanced concepts, techniques, and practices of teaching golf; golfer development programs, golf club design and repair.

PRT 212 Golf Instructor Development 2. Offered in Fall Only. Prerequisite: PRT 156 and PRT 210. 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.

PRT 214 Introduction to Adventure Education 3. Offered in Fall Only. History and philosophy, social psychology of adventure, theories of adventure, benefits, risk-taking behavior, current tends and issues, research and evaluation, and model programs. Field trip required. Students are responsible for their own transportation for field trip.

PRT 215 Principles and Practices of Outdoor Leadership 3... 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.

PRT 220 Commercial Recreation and Tourism Management 3. Offered in Fall and Spring. Prerequisite: PRT 152. Commercial recreation and the tourism industry, including its origin, present characteristics, behavioral foundations and societal impacts. Emphasis on recreation administration in the commercial sector.

PRT 238 Diversity and Inclusion in Recreation and Sport 3. Offered in Fall and Spring. Prerequisite: PRT 152. 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.

PRT 250 Management of Park and Recreation Facilities 3. Offered in Fall and Spring. Prerequisite: PRT 152. 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.

PRT 266 Introduction to Sport Management 3... 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.

PRT 277 Psychological & Cultural Dimensions of Sport 3. Prerequisite: Sport Management or PRT Majors, PRT 266. 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.
PRT 266 Writing and Speaking in Sports Organizations 3. Offered in Fall and Spring. Prerequisite: Sport Management or PRT Majors, PRT 266. 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.

PRT 311 Golf Course Turf Grass Management 3. Offered in Fall Only. Prerequisite: PGM Majors, Sophomore standing, PRT 211. 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.

PRT 312 Golf Management III 3. Offered in Spring Only. Prerequisite: PGM Majors, PRT 311. 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.

PRT 315 Organization and Administration of Adventure Programs 3. Offered in Spring Only. Prerequisite: PRT 152. Overview of the organizational and administration of adventure programs and services, professional standards, programming, management, staffing, budgeting, public relations, liability and risk management.

PRT 320 Convention and Visitor Services 3. Offered in Fall Only. Prerequisite: PRT 152. An examination of the programmatic issues of providing visitor services for conventions, meetings, group tours and special events. The focus is on the planning and delivery of visitor service programs designed to enhance visitor experiences in a community.

PRT 350 Outdoor Recreation Management 3. Offered in Fall and Spring. Prerequisite: PRT 152. Concepts and methods of outdoor recreation planning and management explored with emphasis on the public sector. Current issues relative to recreation provision identified and debated.

PRT 351 Outdoor Consortium 3. Offered in Spring Only. 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 week-long field experience that may conflict with other scheduled courses. Field experience held in conjunction with four other universities in the Great Smoky Mountains National Park. A fee will be assessed for the trip.

PRT 358 The Recreation Program 3. Offered in Fall and Spring. Prerequisite: PRT 152. Theoretical and applied approaches to the recreation program planning process. Basic elements of programming using a variety of recreational settings and diversity of practical experience.

PRT 359 Leadership and Supervision in Recreation 3. Offered in Fall and Spring. Prerequisite: PRT 250. 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.

PRT 365 Arts Management in Recreation 3. Offered in Fall Only. Introduction to arts management in recreation programs; emphasis on the importance and benefits of arts to the individual and community. Understanding and appreciation of the role of the arts in a comprehensive recreation program plan. Emphasis on arts management principles including philosophy, fiscal, technical and physical community resources.

PRT 366 Sport Programming 3. Offered in Fall and Spring. Prerequisite: Sport Management and PRT Majors, PRT 266. 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.

PRT 375 Internship Orientation 1. Offered in Fall Only. Prerequisite: PRT 152. Preparation for recreation and park internship. Resume writing, interviewing skills, cover letters and internship search techniques and resources.

PRT 376 Sport Administration 3. Prerequisite: Sport Management and PRT Majors, PRT 266. Concepts related to policy development, organization and management specific to sport organizations. Including theory and practices of policy development and implementation, management theories, organizational behavior, the strategic management process, organizational design, managing change, and operational planning.

PRT 380 Analysis and Evaluation in Parks, Recreation 3. Offered in Fall and Spring. Prerequisite: 300-level Statistics course, PRT 359. 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 systematic evaluation designs. Activities leading to the analysis and development of performance reports to assess and improve managerial operational efficiency are covered.

PRT 406 Sports Law 3. Offered in Fall Only. 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 well as key state and federal statutory legislation such as civil rights and antitrust.

PRT 407 Services, Facilities and Event Marketing 3. Offered in Fall and Spring. Prerequisite: PRT 358. 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.

PRT 410 Food and Beverage Management 3. Offered in Spring Only. Prerequisite: PGM Majors, Junior standing, PRT 312. 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.

PRT 411 Club Management 3. Offered in Spring Only. Prerequisite: Junior standing, PRT 152. Introduction to practices and procedures in contemporary club management. Application of general management functions to club environments including human resources, training, financial management, leadership food
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.

PRT 453 Administrative Processes of Recreation/Park Organizations 3. Offered in Fall Only. Prerequisite: PRT 359. Basic administrative processes; the internal organization of the recreation/park department; board and executive relationships; legal foundations and legal liability considerations; personnel practices and policies; and public relations administration.

PRT 454 Parks and Recreation Finance and Administration 3. Offered in Fall and Spring. Prerequisite: PRT 359. 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.

PRT 455 Personnel and Administrative Practices for Zoos and Aquariums 3. . Personnel and administrative practices identified with zoos and aquariums. Administrative philosophy and application, organizational structure, personnel management, fiscal procedures, communications, specific administrative problems.

PRT 456 Issues in Golf Management 3. Offered in Spring Only. Prerequisite: PGM Majors, PRT 312; Senior standing. Critical analysis of issues in professional golf management; integration of knowledge, theory and experience from course work and internship experiences; preparation for completion of the Professional Golfers' Association of America's Golf Professional Training Program.

PRT 458 Special Events Planning 3. Offered in Spring Only. Prerequisite: PRT 358. Theoretical and applied approaches to the planning of special events. Concepts and considerations of event planning, applied to various recreational settings. Participation in a community special event is required. Attendance at professional conference also required.

PRT 466 Sport Finance and Economics 3. . Prerequisite: Sport Management and PRT Majors, PRT 266, ACC 210, and (ARE 201 or EC 201 or EC 205). 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.

PRT 475 Recreation and Park Internship 8. Offered in Fall Spring Summer. Prerequisite: PRT 350, PRT 355, PRT 359, PRT 375, PRT 380, 100 hours of approved work experience. 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.

PRT 476 Sport Marketing 3. Offered in Fall and Spring. Prerequisite: PRT 486, Sport Management or PRT Majors, PRT 266. 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..
PRT 477 Park, Recreation and Tourism Management 3. Offered in Fall and Spring. Integration of knowledge, theory and methods from coursework and experience; development and presentation of comprehensive operational and management problems and plans. Designed to encourage students to function as professionals and to relate areas of specialty to the broader Parks, Recreation and Tourism Management profession. Must be taken during student's last semester of coursework.

PRT 486 Senior Seminar in Sports Management 3. Offered in Spring Only. Prerequisite: Sport Management Majors, Senior standing, PRT 476. Issues affecting sport management at a national and global level. Interactive effect of strategies and decisions in each cognate area in sport management. Professional ethics and the notion of rights and responsibilities will be examined in the context of sport marketing, finance, communications, risk management and other management functions inherent in the sport enterprise. Students will also examine various theories of ethics and concepts of morality and develop a personal philosophy for social responsibility and management values.

PRT 491 Special Topics in Recreation 1-3. Offered in Fall Spring Summer. Investigation and analysis of a problem associated with recreation resources.

POLITICAL SCIENCE

PS 101 Internet Research 1. Offered in Fall Spring Summer. Tools and techniques for conducting Internet research and electronic literature reviews. Documentation and ethics of using and citing information sources.

PS 102 Data Analysis 1. Offered in Fall Spring Summer. Statistical analysis of governmental and survey data. Introduction to data sets and collecting, computerizing and analyzing political and social data.

PS 103 Designing Political Web Pages 1. Offered in Fall Spring Summer. 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.

PS 200 Workshop in Political Science 1. Offered in Fall and Spring. Core questions in political science using current political issues, events and debates as examples. Emphasis on methods of investigating political questions and the role of values in political debates.

PS 201 American Politics and Government 3. Offered in Fall Spring Summer. 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.

PS 202 State and Local Government 3. Offered in Fall Spring Summer. 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.

PS 203 Introduction to Nonprofits 3. Offered in Fall and Spring. 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.

PS 204 Problems of American Democracy 3. Offered in Fall Only. Political problems in America from the perspective of political theory. Democracy, economics and politics, racial and sexual equality, civil disobedience, and individual freedom.

PS 205 Law and Justice 3. Offered in Fall Spring Summer. Role of law from practical, political and theoretical perspective: linkages between law and justice in addressing social problems, such as gun control; drug legalization; civil disobedience; gender equality; and property rights; the impact of media on public perceptions of law and justice.

PS 231 Introduction to International Relations 3. Offered in Fall Spring Summer. 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.

PS 236 Issues in Global Politics 3. Offered in Fall and Spring. 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.

PS 241 Introduction to Comparative Politics 3. Offered in Fall Only. 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.

PS 298 Special Topics in Political Science 1-6. Experimental course at the freshman and sophomore levels.

PS 301 The Presidency and Congress 3. Offered in Spring Only. Prerequisite: PS 201. 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.

PS 302 Campaigns and Elections in the US Political System 3. Offered in Fall Only. Prerequisite: PS 201. 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.

PS 303 Race in U.S. Politics 3. Offered in Spring Only. 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.

PS 305 The Justice System in the American Political Process 3. Offered in Fall Spring Summer. 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.

PS 306 Gender and Politics in the United States 3. Offered in Spring Only. Prerequisite: PS 201. 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.

PS 307 Introduction to Criminal Law in the United States 3. Offered in Fall and Spring. Prerequisite: PS 201. 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 punishment, etc., but we will also pay attention to policy debates in the news.

PS 308 Supreme Court and Public Policy 3. Offered in Spring Only. 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.

PS 309 Equality and Justice in United States Law 3. Offered in Spring Only. 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; immigration law; criminal justice practices.

PS 310 Public Policy 3. . . Introduction to public policy formulation and analysis, including agenda-setting strategies, problems of legitimation, the appropriations process, implementation, evaluation, resolution, and termination.

PS 312 Introduction to Public Administration 3. Offered in Fall and Spring. Administration in city, state and national governments: effectiveness and responsiveness, involvement in policy areas, and issues of ethics and responsibilities.

PS 313 Criminal Justice Policy 3. Offered in Fall Only. Prerequisite: PS 201. 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 punishment, etc., but we will also pay attention to policy debates in the news.


PS 315 Public Leadership 3. Offered in Spring Only. . . 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 drawing on literature in political science, self-assessment of student's leadership characteristics and examination of outlets for political leadership activity.

PS 320 U.S. Environmental Law and Politics 3. Offered in Fall and Spring. . . 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.

PS 331 U.S. Foreign Policy 3. Offered in Fall and Spring. . . 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 policy-making process.

PS 333 International Law 3. Offered in Spring Only. . . Purpose and effectiveness of international law, including the rights and duties of sovereign states, peaceful settlement of disputes, laws of war, humanitarian law and role of non-state actors. Emphasis on formal legal reasoning and political analysis.

PS 336 Global Environmental Politics 3. Offered in Fall and Spring. . . International politics, laws, and policies pertaining to global environmental problems in the realms of population, pollution, climate change, biological diversity, forests oceans, fisheries, Antarctica, and outer space.

PS 339 Politics of the World Economy 3. Offered in Spring Only. . . 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.

PS 341 European Politics 3. Offered in Fall Only. . . 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.

PS 342 Politics of China and Japan 3. Offered in Fall and Spring. . . Politics, public policy, and foreign affairs of China and Japan.

PS 343 Government and Politics in South Asia 3. Offered in Fall Only. . . 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.

PS 345 Governments and Politics in the Middle East 3. . . 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.

PS 361 Introduction to Political Theory 3. Offered in Fall Spring Summer. . . Nature and purpose of politics, as treated by such writers as
Plato, Aristotle, St. Augustine, Machiavelli, Locke, Rousseau, Mill, Marx, and Nietzsche.

**PS 362 American Political Thought 3. Offered in Spring Only.** 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.

**PS 371 Research Methodology of Political Science 3. Offered in Fall Spring Summer. Prerequisite: ST 311 or (ST301 and ST302).** Research methods in social science and quantitative analysis in political science and public policy including research design, data collection, statistical analysis and computer applications.

**PS 391 Internship in Political Science 1-6. Offered in Fall Spring Summer.** Internship in a governmental agency, interest group, or like organization involves seminar or formal report.

**PS 401 American Parties and Interest Groups 3. Offered in Spring Only.** American parties and interest groups as instruments for mobilizing electorates, shifting public opinion and setting political priorities. The role of parties and interest groups in operating and financing elections. Strategies, tactics and problems of parties and interest groups influencing elected officials, bureaucrats and the policy process.

**PS 406 American State Politics 3. Comparative study of the politics and policies of the fifty American states. Socioeconomic and political variations and state response to intergovernmental domestic programs. Analysis of state policy in economic development, environment, health, housing, education, transportation, criminal justice and regulation.**

**PS 408 Urban Politics 3. Examination of politics in small towns, cities, counties, and urban regions including political development of cities, groups in urban politics, governmental institutions, local government officials, citizen participation, suburban development, metropolitan reform, and intergovernmental relations.**

**PS 409 Black Political Participation in America 3. Offered in Fall Only.** 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.

**PS 411 Public Opinion and the Media in American Politics 3. Prerequisite: PS 201. 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.**

**PS 413 Criminal Justice Field Work 4. Offered in Fall and Spring. Prerequisite: Acceptance in Criminal Justice Option; Senior standing; SOC 306 and PS 311. 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.**

**PS 415 Administration of Justice 3. Offered in Fall Only. Prerequisite: PS 311 and Junior standing. Politics and administration in the American system of justice. Credit will not be given for both PS 415 and PA 515.**

**PS 418 Gender Law and Policies 3. Offered in Fall Only. Prerequisite: Nine hours of Political Science. 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.**

**PS 431 The United Nations and Global Order 3. Prerequisite: PS 231 or PS 236 or PS 335. 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.**

**PS 432 Violence, Terrorism, and Public Policy 3. Offered in Fall and Spring. Prerequisite: SOC 300 or PS 371. 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.**

**PS 433 Global Problems and Policies 3. Offered in Fall Only. Prerequisite: PS 231 or PS 236 or PS 241. 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.**

**PS 434 Ethnic Conflict and Political Violence 3. Offered in Spring Only. In this course, students will examine the phenomenon of ethnic conflict in the modern world. Why is ethnicity such a potent source of conflict? How important is "ethnicity" as opposed to politics, economic, or other factors in generating ethnic conflict? Is ethnic conflict inevitable? Why is it more prominent in some places than others? What can states, international organizations, and peoples of the world do to prevent or ameliorate interethnic strife? We will examine these questions through a mix of theoretical readings and in-depth case studies of sectarian violence, terrorism, state failure and collapse, riots, and racial tensions, and etc...**

**PS 437 U.S. National Security Policy 3. Prerequisite: PS 331. 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 discontemporary context.**

**PS 443 Seminar in Latin American & Caribbean Politics 3. Offered in Spring Only. Prerequisite: Six hours of Political Science including PS 231. 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 443.**

**PS 445 Comparative Systems of Law and Justice 3. Prerequisite: PS 311 and Junior standing. 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.**

**PS 462 Seminar in Political Theory 3. Offered in Spring Only. Prerequisite: PS 361 or Consent of Instructor. 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.**
PS 463 Public Choice and Political Institutions 3. Offered in Fall
Only. Prerequisite: Junior standing or Senior standing, Political
Science Majors, 12 hours of Political Science Courses. Examination of
public choice approach to political science. Analysis of political
institutions and how they modify human behavior and influence
political and policy outcomes. Fullfills department's undergraduate
senior seminar requirement.

PS 471 Public Opinion Research Methodology 3. Offered in Fall
and Spring. 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.

PS 490 Readings and Research in Political Science 1-6. Offered in
Fall and Spring. Extensive readings or research in political science
under direct faculty supervision.

PS 492 Honors Readings and Thesis in Political Science 1-6.
Offered in Fall Spring Summer. Independent reading and preparation
of an honors thesis in political science.

PS 498 Special Topics in Political Science 1-6. Offered in Fall and
Spring. Prerequisite: Six hours of Political Science. Detailed
investigation of a topic. Topic and mode of study determined by the
student and a faculty member.

PAPER SCIENCE ENGINEERING

PSE 201 Pulping and Papermaking Technology 3. Offered in
Spring Only. 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. Papermaking
variables and equipment, particularly on a Fourdrinier machine,
secondary fiber processing, and aspects of printing and converting
discussed.

PSE 211 Pulp and Paper Internship 1. Offered in Fall Only.
Prerequisite: PSE 201. Experience in the pulp and paper industry.
Problem solving in an industrial setting to gain insight of pulp and
paper technology. Written report required.

PSE 212 Paper Properties 4. Offered in Fall Only. Prerequisite:
PSE 201. 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.

PSE 220 From Papyrus to Plasma Screens: Paper and Society 2.
Offered in Spring Only. 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,
ermmerce, 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.

PSE 322 Wet End and Polymer Chemistry 4. Offered in Fall
Only. Prerequisite: PSE 212, CH 221, and CH 222. Prepares students
to solve problems related to chemical usage on paper machines.

Subjects include water chemistry, paper machine operations, fibers,
fillers, alum, sizing agents, polyelectrolytes, colloidal interactions,
strength agents, dyes, strategies to optimize retention, dewatering
strategies, strategies to achieve more uniform paper, strategies to
improve production rates, recycling aqueous coatings, and wet-end
chemical process control.

PSE 332 Wood and Pulping Chemistry 3. Offered in Spring Only.
Prerequisite: CH221, CH222, CH223, CH224. 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.

PSE 355 Pulp and Paper Unit Processes 3. Offered in Fall Only.
Prerequisite: CHE 205. Selected topics in chemical engineering as
applied in the pulp and paper industry. Emphasis on computational
practice.

PSE 360 Pulp and Paper Unit Processes II 3. Offered in Spring
Only. Prerequisite: PSE 201, PSE 355 or CHE 311. 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. Preparation and evaluation of different types of
wood pulp. A new wood raw material is selected each year with the
purpose of studying and critically evaluating the principal pulping and
bleaching variables.

PSE 415 Paper Industry Strategic Project Analysis 3. Offered in
Fall Only. 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.

Prerequisite: PSE 417. 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.

Offered in Fall Only. Prerequisite: PSE 360. Application of modeling
and simulation techniques for the analysis of pulping and papermaking
processes. Model development and computer simulation using existing
models will allow analysis of process interactions and
operating/economic feasibility of process modifications of complex
manufacturing systems.

PSE 425 Bioenergy & Biomaterials Engineering 3. Offered in Fall
Only. Prerequisite: For PSE Majors: MAE 301 or CHE 316) and PSE
360: For CHE Majors: CHE 312 and CHE 316; For BAE Majors:
MAE 301 and BAE 402. 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).

PSE 465 Paper Physics and Product Design 3. Offered in Spring Only. Study of fundamental knowledge on the structure and properties of fibers and fibrous products, and the related physical and physiochemical mechanisms. Product design exercises will apply the fundamental understanding to specific end use requirements.


PSE 475 Process Control in Pulp and Paper 3. Offered in Fall Only. Overview of the various aspects of control including process modeling, design of control loops and stability analysis in pulp and paper. Emphasis on distributed digital control (DDC), including hands-on programming and control loop development on aDDC computer.

**PSYCHOLOGY**

PSY 200 Introduction to Psychology 3. Offered in Fall Spring Summer. 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.

PSY 201 Controversial Issues in Psychology 3. Offered in Fall Only. Students will explore contemporary controversial issues within several areas of psychology (biological, human development, cognitive processes, mental health, psychological treatment, and social psychology) and encounter the diverse approaches used by psychologists and other scientists. Students will have the opportunity to refine and use their critical thinking skills as they inquire into basic psychological concepts relevant to issues they help select and will practice confronting differing opinions responsibly and respectfully to fully contribute to and gainfully receive from the university community.

PSY 220 Orientation to Psychology 1. Offered in Fall Only. Orientation for new or potential Psychology majors. Analysis of expectations and demands of the psychology degree programs. Exploration of the challenges and opportunities presented by various post-baccalaureate educational and career options.

PSY 230 Introduction to Psychological Research 3. Offered in Fall and Spring. Prerequisite: PSY 200. 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 prove a professional presentation of a group research project. The course is restricted to psychology majors and must be taken under the graded option.

PSY 240 Introduction to Behavioral Research I 3. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY 200, Corequisite: PSY (ST) 241. Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference.

PSY 241 Introduction to Behavioral Research I Lab 1. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY 200, Corequisite: PSY (ST) 240. Students design, analyze and report a variety of simple experiments.

PSY 242 Introduction to Behavioral Research II 3. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY (ST) 240. Corequisite: PSY (ST) 243. 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.

PSY 243 Introduction to Behavioral Research II Lab 2. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY (ST) 240, Corequisite: PSY (ST) 242. Design and analysis of a major research project.

PSY 307 Industrial and Organizational Psychology 3. Offered in Fall Spring Summer. Prerequisite: PSY 200 or PSY 201, Junior standing or Senior standing. 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.

PSY 311 Social Psychology 3. Offered in Fall Spring Summer. Prerequisite: PSY 200 or PSY 201. 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.

PSY 312 Applied Psychology 3. Prerequisite: PSY 200 or PSY 201. 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.

PSY 340 Ergonomics 3. Offered in Fall Only. Prerequisite: PSY 200 or PSY 201. 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.

PSY 345 Psychology and the African American Experience 3. Offered in Fall Only. Prerequisite: PSY 200 or PSY 201. Historical and cultural examination of the psychological experiences of African American experience from pre-African 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.

PSY 350 Human Resource Development Skills 3. Offered in Fall Only. Prerequisite: HRD Majors, Junior standing. Corequisite: PSY 495, COM 112. Theoretical, conceptual and intervention principles of human resource development practice in public and private settings; ethics and values; individual, group and organizational behavior.
assessment methods; intervention methods. Emphasis on applying principles to internship settings.

**PSY 360 Community Psychology Principles and Practice 3.** Offered in Fall Only. Prerequisite: PSY 200. 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.

**PSY 370 Personality 3.** Prerequisite: PSY 200. 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.

**PSY 376 Developmental Psychology 3.** Offered in Fall Spring Summer. Prerequisite: PY 200, PY 201 or PY 304 or ED 304. Behavioral development during the life span, including study of current theories and project work with persons at various stages of the life cycle.

**PSY 400 Perception 3.** Offered in Fall Spring Summer. Prerequisite: PSY 200 or PSY 201. Junior standing. 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.

**PSY 406 Psychology of Gender 3.** Offered in Fall and Spring. Prerequisite: PSY 200, PSY 201 or HSS 200. 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 cannot be given for both PSY 406 and PSY 506.

**PSY 410 Learning and Motivation 3.** Offered in Fall Only. Prerequisite: PSY 200. Junior standing. 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.

**PSY 416 Psychology of Emotion 3.** Offered in Fall Only. Prerequisite: PSY 200. 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.

**PSY 420 Cognitive Processes 3.** Offered in Fall Spring Summer. Prerequisite: PSY 200. Junior standing. Introduction to research and theory in cognition, including such topics as memory, acquisition and use of language, reading, problem-solving, reasoning, and concepts.

**PSY 425 Introduction to Cognitive Science 3.** Prerequisite: One upper-level course in either PHI, PSY, CSC or Linguistics. 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.

**PSY 430 Biological Psychology 3.** Offered in Fall and Spring. Prerequisite: BIO 105/106 or BIO 181. Biological mechanisms of behavior, including elementary neuroanatomy and neurophysiology, sensory and motor processes, and their application to motivation, learning, and psychological processes.

**PSY 431 Health Psychology 3.** Offered in Fall and Spring. Prerequisite: PSY 200 and (PSY 230 or PSY 240/242 OR equivalent research methods course). 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.

**PSY 436 Introduction to Psychological Measurement 3.** Offered in Spring Only. Prerequisite: PSY 240-241. 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.

**PSY 470 Abnormal Psychology 3.** Offered in Spring and Summer. Prerequisite: PSY 200 or 304 or EDP 304. Common psychological disorders of children and adults. Historical and theoretical perspectives on abnormal behavior; issues of assessment and classification, etiology, symptoms, and treatment of disorders.

**PSY 475 Child Psychology 3.** Offered in Fall and Spring. Prerequisite: PSY 200 or 304 or EDP 304. Psychological theory and 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.

**PSY 476 Psychology of Adolescent Development 3.** Offered in Fall Spring Summer. Prerequisite: PSY 200 or EDP 304. Theories, principles, and issues of human psychological development emphasizing adolescence. Cognitive, social, and physical changes; their interaction. Implications for teaching and parenting adolescents.

**PSY 491 Special Topics in Psychology 3.** Offered in Fall and Spring. Prerequisite: PSY 200. Exploration in depth of advanced areas and topics of current interest in psychology.

**PSY 495 Human Resource Development Practicum 1-8.** Offered in Fall and Spring. Supervised practicum in a human resource development organization during two consecutive semesters. Application of human resource development knowledge and skills.

**PSY 497 Senior Seminar in Psychology 2.** Offered in Spring Only. Readings and discussions in depth of a special topic, which integrates several fields covered in the undergraduate psychology or HRD major.

**PSY 498 Psychology Honors Seminar 3.** 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.

**PSY 499 Individual Study in Psychology 1-6. Offered in Fall and Spring. Corequisite: PSY 495 for HRD majors during their work semester. Individual research project (literature review, experiment, survey, field study) open to any undergraduate, under the direction of a Psychology Department faculty member.**

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**PHY 101 Perspectives on Physics 1. Offered in Fall Only. Orientation to the current practice of physics, including discussion of historical background, scientific viewpoint, current topics, and careers in physics. Visits to departmental research laboratories.**

**PHY 123 Stellar and Galactic Astronomy 3. Offered in Fall and Spring. Introduction, 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.**

**PHY 124 Solar System Astronomy 3. Offered in Fall and Spring. 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.**

**PHY 125 Astronomy Laboratory 1. Offered in Fall and Spring. Corequisite: PY 123 or 124. Introduction to astronomical observing.**

**PHY 126 Computer-based Astronomy Laboratory 1. Offered in Fall and Spring. Corequisite: PY 123 or PY 124. Ten computer-based laboratory exercises in astronomy. Celestial coordinates, motions of celestial objects, and bright stars and constellations. Simulated observing of planets, stars, and galaxies, with data reduction and analysis.**


**PHY 133 Conceptual Physics: Optics 4. Offered in Fall and Spring. Fundamentals of optics from a conceptual rather than a mathematical viewpoint. Properties of light, color, optical devices, light in the atmosphere, vision in animals and man, light in modern physics, light in the cosmos.**

**PHY 201 University Physics I 4. Offered in Fall Only. Corequisite: MA 141. 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.**

**PY 202 University Physics II 4. Offered in Spring Only. Prerequisite: PY 201, MA 141. Corequisite: PY 241. 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.**

**PY 203 University Physics III 4. Offered in Fall Only. Prerequisite: PY 202, MA 241. Corequisite: MA 242. 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.**

**PY 204 General Physics 3. Prerequisite: MA 141. Introduction to physics, including the study of mechanics, sound, heat, and thermodynamics. The analytical approach is employed with emphasis on problem solving. Identical to PY 205, except that there is no laboratory. Offered only through Independent Study by Extension. Credit cannot be earned for both PY 204 and PY 205.**

**PY 205 Physics for Engineers and Scientists I 4. Offered in Fall Spring Summer. Prerequisite: MA 141 with a grade of C or better or MA 241 Placement. First semester of a two-semester sequence in introductory physics, with laboratory. A calculus-based study of mechanics, sound and heat.**

**PY 206 General Physics Laboratory I. Offered in Fall Spring Summer. Prerequisite: PY 204. Approximately ten experiments taken from the fields of mechanics, sound, heat and thermodynamics. Enrollment subject to approval of Physics Department. Not open to students having credit for PY 205.**

**PY 208 Physics for Engineers and Scientists II 4. Offered in Fall Spring Summer. Prerequisite: PY 205 (C or better) and MA 241 (C or better). Second semester of a two-semester sequence in introductory physics, with coordinated laboratory problem-solving experiences. 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.**

**PY 211 College Physics I 4. Offered in Fall Spring Summer. Prerequisite: MA 107 or MA 111. 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.**

**PY 212 College Physics II 4. Offered in Fall Spring Summer. Prerequisite: PY 211 or PY 205. 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.**

**PY 299 Special Problems in Physics 1-3. Offered in Fall Spring Summer. Study in experimental or analytical topics in classical and modern physics.**

**PY 328 Stellar and Galactic Astrophysics 3. Offered in Spring Only. Prerequisite: PY 202 or PY 208. 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.**
PY 341 Spacetime Physics 3. Offered in Spring Only. Prerequisite: PY 203 or 407. Introduction to spacetime physics in accordance with Einstein's special theory of relativity; time dilation, twin paradox, Doppler effect, relativistic space travel, four-vectors, relativistic momentum and energy conservation laws in high energy physics. Consequences of Einstein's gravitational theory in cosmology; models of the expanding universe, neutron stars, black holes and the "big bang" hypothesis.

PY 401 Quantum Physics I 3. Offered in Fall and Spring. Prerequisite: C- or better in PY 411. An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.

PY 402 Quantum Physics II 3. Offered in Fall and Spring. Prerequisite: C- or better in PY 401. An introduction to the basic principles of quantum physics with an emphasis on selected applications to atoms, molecules, solids, nuclei and elementary particles.

PY 407 Introduction to Modern Physics 3. Offered in Fall Spring Summer. Prerequisite: MA 242, PY 208. 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.

PY 411 Mechanics I 3. Offered in Fall Only. Prerequisite: C- or better in PY 202 or C- or better in PY 208, and Corequisite of MA 341. 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.

PY 412 Mechanics II 3. Offered in Spring Only. Prerequisite: C- or better in PY 411. 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.

PY 413 Thermal Physics 3. Offered in Spring Only. Prerequisite: PY 203 or 407, MA 341. 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.

PY 414 Electromagnetism I 3. Offered in Fall Only. Prerequisite: C- or better in PY 203 or C- or better in PY 407, and MA 341. 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.

PY 415 Electromagnetism II 3. Offered in Spring Only. Prerequisite: C- or better in PY 414. A continuation of PY 414. Electromagnetic induction, magnetic fields in matter, Maxwell's equations, wave guides, radiation.

PY 452 Advanced Physics Laboratory 3. Offered in Fall and Spring. Introduction to laboratory electronics and instrumentation. Experiments in mechanics; electromagnetism; electronics; optics; and atomic, nuclear, plasma and solid state physics. Senior Physics students only.

PY 463 Fluid Physics 3. Offered in Fall Only. Prerequisite: MA 341 and PY 208. 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.

PY 499 Independent Research in Physics 1-6. Offered in Fall Spring Summer. Study and research in physics. Topics for experimental or theoretical investigation.

REL 200 Introduction to the Study of Religion 3. Offered in Fall and Spring. 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.

REL 230 South Asian Religious Traditions 3. . . Hindu, Buddhist, Jain, Sikh, Islamic, Christian, Jewish, and Zoroastrian religious traditions in comparative perspective. Religious and cultural history through literature, film, and art of India, Pakistan, Bangladesh, Sri Lanka, Nepal, and Afghanistan. Doctrine, practice, teaching tales, and issues of change and conflict in South Asia and in the diaspora, especially the USA.

REL 298 Special Topics in Religious Studies 3. . . 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 300 Religious Traditions of the World 3. . . 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.

REL 309 Religion and Society 3. Prerequisite: 3 cr. in SOC, 200 level. 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.

REL 311 Introduction to the Old Testament 3. . . Study of Old Testament books, examining their content, background and development. Comparisons of the biblical material with other Ancient Near Eastern literature. Assessment of contributions from archeology and literary studies to clarifying the text.

REL 314 Introduction to Intertestamental Literature 3 . . .
Intertestamental literature in the context of Jewish history, institutions and beliefs of the Intertestamental Period (ca. 300 B.C.-ca. 100 A.D.).

REL 317 Christianity 3 . . . Development of Christianity from its origins to the present: events, persons, ideas, beliefs and practices which were most significant in this development.

REL 320 Religion in American History 3 . . . Prerequisite: 3 hours of History or Sophomore standing. Representative people, movements and thought in the major religions within the context of American society and culture.

REL 323 Religious Cults, Sects, and Minority Faiths in America 3 . . . 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.

REL 327 Issues in Contemporary Religion 3 . . . Responses of contemporary Western religious thinkers to criticisms 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.

REL 331 The Hindu Tradition 3 . . . 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.

REL 332 The Buddhist Traditions 3 . . . 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.

REL 333 Chinese Religions 3 . . . Survey of Chinese religions from prehistoric times to present. Confucianism, Daoism, primary Buddhist schools in China, spirit possession, divination and popular religious worship.

REL 340 Islam 3 . . . 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.

REL 350 Introduction to Judaism 3 . . . 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.

REL 383 Religion, Globalism, and Justice 3 . . . Prerequisite: One course in religion, philosophy, history, political science, anthropology or sociology. Issues and problems in religion and societies since 1945. Historical, theoretical, sociological, and cultural approaches to globalism and religion. Inquiry into the role of ethical reasoning in religious debates on the problem of globalization.

REL 402 Early Christianity to the Time of Eusebius 3 . . . Prerequisite: One of REL 312, REL 317, or HI 207. 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 Christian movements; anti-heretical writings; orthodox institutions of authority.

REL 407 Islamic History to 1798 3 . . . Prerequisite: 3 hrs. of History. Credit will not be given for both HI 407 and HI 507. 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.

REL 408 Islam in the Modern World 3 . . . Prerequisite: 3 hours of history or religious studies. 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.

REL 412 Advanced Readings in the Christian Gospels 3 . . . Prerequisite: REL 312 or REL 317. 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.

REL 413 The Life and Letters of the Apostle Paul 3 . . . Prerequisite: REL 312 or REL 317. 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.

REL 423 Religion and Politics in America 3 . . . Prerequisite: one 300-level course in religion, philosophy, or history. 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.

REL 471 Darwinism and Christianity 3 . . . Prerequisite: One course in religious studies, biological sciences, philosophy of science, or history of science. 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 evolutionary world.

REL 472 Women and Religion 3 . . . Prerequisite: one course in religious studies or women's and gender studies. 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.

REL 473 Religion, Gender, and Reproductive Technologies 3 . . . 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.


REL 491 Advanced Readings in Theological and Religious Literature 3. Prerequisite: 300-level course in Religion. 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.

REL 496 Seminar in Religious Studies 3. Prerequisite: 300-level course in Religion. 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.

REL 498 Special Topics in Religious Studies 1-6. Prerequisite: 6 hours REL. 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.

SOCIOLOGY

SOC 202 Principles of Sociology 3. Offered in Fall Spring Summer. Introduction to sociology. Analyses of key processes and institutions including interaction, inequality, organization, socialization, and social change. Includes core sociological concepts, methods, theories.

SOC 203 Current Social Problems 3. Offered in Fall Spring Summer. 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.

SOC 204 Sociology of Family 3. Offered in Fall Spring Summer. Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

SOC 205 Jobs and Work 3. Offered in Fall Spring Summer. 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.

SOC 206 Social Deviance 3. Offered in Fall Spring Summer. Social processes in the creation and maintenance of deviant populations: classification, objectification of social meanings, functions of subcultures and social outcomes of the deviance-ascription process. Includes core sociological concepts, methods, theories.

SOC 220 Cultural Geography 3. Offered in Fall and Spring. 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.

SOC 241 Sociology of Agriculture and Rural Society 3. Offered in Fall and Spring. 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.

SOC 261 Technology in Society and Culture 3. Offered in Fall and Spring. Processes of social and cultural change with a focus on role of technological innovation. Cross-cultural emphasis. Workplace changes and societal risks 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.

SOC 295 Special Topics in Sociology 1-3. Offered in Fall Spring Summer. Offered as needed to present 200-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 300 Social Research Methods 4. Offered in Fall Spring Summer. Prerequisite: SOC 202, Corequisite: ST 311. Basic methods of social research, research design, sampling, data collection, measurement, and analysis; the relationship between theory and research. Laboratory exercises on computer applications.

SOC 301 Human Behavior 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. 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.

SOC 304 Women and Men in Society 3. Offered in Fall and Spring. Prerequisite: 3 cr. in SOC, 200 level. A sociological analysis of women and men in contemporary American society. Perpetuation of and change in gender stratification using sociological concepts, theories and research. How gender expectations developed and transmitted. Historical data and research on diversity in American society used for analysis of causes and consequences of gender inequality.

SOC 305 Racial and Ethnic Relations 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. 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.
SOC 306 Criminology 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. 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.

SOC 309 Religion and Society 3. Prerequisite: 3 cr. in SOC, 200 level. Religious beliefs, practices and organizations addressed as social phenomena. Functionalism, conflict and subjectivism as theoretical orientations for understanding influences between religion and society. Relationship of religious to family, government, and economy and to social divisions, conflict and change.

SOC 310 Managers, Work, and Organizations 3. Offered in Fall Summer. Prerequisite: Any 200-level SOC, SOC 205 recommended. Sociological analysis of managers, who they are, and what they do. How recent changes in the U.S. economy have altered managers' work. How managers influence and adapt to the organizational environment. Relationship of management and labor in the production process.

SOC 311 Community Relationships 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. Institutions, organizations and agencies found in modern communities; social problems and conditions with which they deal; their interrelationships and trends toward comprehensive planning.

SOC 342 International Development 3. Offered in Fall Only. Prerequisite: 3 cr. in SOC, 200 level. Sociological explanations of the causes of development and underdevelopment and origins of the present world system with emphasis on lesser developed countries. Recent global changes in the world situation including the increasing internationalization and interdependence of all countries.

SOC 351 Population and Planning 3. Offered in Fall Only. Prerequisite: 3 credits in SOC at the 200 level. Effects of births, deaths and migration on population size, composition and distribution. Impact of alternative policies on demographic processes.

SOC 381 Sociology of Medicine 3. Offered in Fall and Spring. Prerequisite: 200 level Sociology. 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.

SOC 389 Sociology of Organizations 3. Offered in Fall Spring Summer. Prerequisite: 3 credits of a 200-level Sociology. Offered as needed to present 300-level subject materials not normally available in regular course offerings or for new courses on a trial basis.

SOC 395 Special Topics in Sociology 1-3. Offered in Fall Spring Summer. Prerequisite: 3 credits and in SOC, 200 level. 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.

SOC 400 Theories of Social Structure 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. Contributions of Weber, Simmel, Mead, Homans, Goffman and others to contemporary micro-level sociological theories. Origins and development of symbolic interaction, ethnomethodology, exchange theory and dramaturgy.

SOC 401 Theories of Social Interaction 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC, 200 level. Contributions of Weber, Simmel, Mead, Homans, Goffman and others to contemporary micro-level sociological theories. Origins and development of symbolic interaction, ethnomethodology, exchange theory and dramaturgy. Theories of the self, social construction of reality, emotions, interpersonal relationships. Interrelationship of theory and research; use of original works.

SOC 402 Urban Sociology 3. Prerequisite: SOC 300. 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.

SOC 404 Families and Work 3. Offered in Spring Only. Prerequisite: SOC 200 level, SOC 300. 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.

SOC 405 Racism in the U.S. 3. Prerequisite: SOC 300. The course will examine the nature of racism in American society and its correlates: prejudice, discrimination, political and social 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.

SOC 407 Sociology of Sexualities 3. Offered in Spring Only. Prerequisite: 3 hours SOC 200 level, 300 level. Exploration of sexuality in a social context. Relationship between sexuality, gender and power in the U.S. Historical trends in behaviors and identities: social movements and sexual issues; current behavioral trends. Some issues covered; identity, social construction, sexual meanings.

SOC 410 Sociology of Organizations 3. Prerequisite: 3 cr. in SOC, 200 level, SOC 300. Application of sociological theories to study of organizational structures and processes. Special attention to control and coordination, relations with other organizations, and decision making.

SOC 413 Criminal Justice Field Work 4. Offered in Fall and Spring. Prerequisite: SOC 306 and PS 305, Senior standing in Criminal Justice option. 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.

SOC 414 Social Class 3. Prerequisite: SOC 300. 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.


SOC 425 Juvenile Delinquency 3. Offered in Fall Spring Summer. Prerequisite: 3 cr. in SOC 200-level; SOC 300. Nature and extent of juvenile delinquency; measurement problems; and biogenic, psychogenic and sociogenic theories of delinquency causation. Policy implications of delinquency theories for treatment and prevention. Evaluation of treatment and prevention programs.

SOC 427 Sociology of Law 3. Offered in Fall Only. Prerequisite: 3 cr. in SOC 200-level; SOC 300. Sociological concepts, theories and research of law as social control. Social forces behind the creation, maintenance and application of law in American Society.
SOC 428 Formal Institutions of Social Control 3. Offered in Spring Only. Prerequisite: 3 hours SOC 200 level; SOC 300. 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.


SOC 430 Community and Crime 3. Offered in Spring Only. Prerequisite: 3 credits in SOC 200 level; SOC 300. Neighborhood development, structure and processes as related to delinquency, crime and criminality. Divergent theories of the effect of neighborhood context on crime and crime on neighborhood processes. The interaction of person and neighborhood context. Implications of community processes for social control.

SOC 432 Violence, Terrorism, and Public Policy 3. Offered in Fall and Spring. Prerequisite: SOC 300 or PS 371. 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.

SOC 440 Social Change 3. Offered in Spring Only. Prerequisite: 3 cr. in SOC, 200 level; SOC 300. 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.

SOC 445 Inequality, Ideology, and Social Justice 3. Offered in Fall Only. Prerequisite: 3 hours of 200-level SOC and SOC 300. 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.

SOC 450 Environmental Sociology 3. Offered in Fall Only. Prerequisite: 3 hours SOC 200 level, SOC 300. 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.

SOC 457 Corporate Power in America 3. Offered in Spring Only. Prerequisite: (SOC 202 or SOC 203) and SOC 300. 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.

SOC 465 Social Aspects of Mental Health 3. Offered in Spring Only. Prerequisite: SOC 300. 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.

SOC 492 External Learning Experience 1-6. Offered in Fall and Spring. 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.

SOC 493 Special Problems in Sociology 1-6. Offered in Fall and Spring. A learning experience in agriculture and life sciences within an academic framework that utilizes campus facilities and resources. Arrangements must be initiated by student and approved by a faculty advisor and departmental teaching coordinator.

SOC 495 Special Topics in Sociology 1-3. 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. Prerequisite: Six hours SOC above the 200 level. 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.

SOIL SCIENCE

SSC 103 Introductory Topics in Crop, Soil and Turfgrass Sciences 1. Offered in Fall Only. Introduction to the scope, purpose, and objectives of a university education with an emphasis on areas related to Crop, Soil and Turfgrass Sciences. Students will explore university, college and departmental resources, academic policies and procedures, opportunities for minors, career opportunities, and current trends and issues in our related disciplines. Students cannot receive credit for both CS 103 and ALS 103. Freshman Only; PAA, PAB, PAC, PAA, PCB, SSS, TFG.

SSC 185 Land and Life 3. Offered in Fall and Spring. 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.

SSC 200 Soil Science 3. Offered in Fall Spring Summer. Prerequisite: CH 101 or CH 100. 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.

SSC 201 Soil Science Laboratory 1. Offered in Fall and Spring. Corequisite: SSC 200. 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.

**SSC 323 Water Management 3. Offered in Full Only.** Water management principles applied to agriculture; hydrologic cycle, runoff, surface and sub-surface drainage, soil conservation measures to reduce erosion and sedimentation, irrigation, pond construction, open channel flow, water rights and environmental laws pertaining to water management. Emphasis on problem solving.

**SSC 332 Environmental Soil Microbiology 3. Offered in Spring Only. Prerequisite: BIO 181 and SSC 200.** 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.

**SSC 341 Soil Fertility and Fertilizers 3. Offered in Full Only. Prerequisite: SSC 200.** Principles of managing plant nutrition for crop production, fertilizer materials, crop fertilization, soil fertility maintenance and management practices for optimizing fertilizer use; soil and plant tissue testing as diagnostic tools in nutrient management.

**SSC 342 Soil Fertility Laboratory 1. Offered in Full Only. Corequisite: SSC 341.** Soil sampling and analyses for acidity and nutrient content. Calculating lime and fertilizer recommendations and calibrating fertilizer spreaders. Discussion of fertilizer materials and calculation of least cost blends. Computer programs to confirm recommendations and least cost blends. Field trip to a fertilizer distributor and to a fertilizer user.

**SSC 361 Role of Soils in Environmental Management 3. Offered in Spring Only. Prerequisite: SSC 200.** 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.

**SSC 435 Precision Agriculture Technology 3. Offered in Spring Only.** 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/SSC 435 and BAE/SSC 535.

**SSC 440 Geographic Information Systems in Production Agriculture 3. Offered in Spring Only. Prerequisite: SSC 341.** Fundamentals of the global positioning system, geographic information systems, and site-specific management. Geospatially located soil sampling strategies will be addressed as well as appropriate interpolation methods for point-sampled data. The course will cover variable rate fertilizer recommendation models and the technology necessary for variably applying fertilizer. Spatial measurement of crop yields.

**SSC 442 Soil and Environmental Biogeochemistry 3. Offered in Spring Only. Prerequisite: SSC 200 and (CH 101, or CH 201, or CH 220, or CH 221).** 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.

**SSC 452 Soil Classification 4. Offered in Spring Only. Prerequisite: SSC 200.** 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.

**SSC 461 Soil Physical Properties and Plant Growth 3. Offered in Fall Only. Prerequisite: SSC 200.** 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.

**SSC 462 Soil-Crop Management Systems 3. Offered in Spring Only. Prerequisite: CS 213, CS 414, SSC 342, SSC 452; senior standing.** 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.

**SSC 470 Wetland Soils 3. Offered in Fall Only. Prerequisite: SSC 200, SSC 452 recommended.** 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. Credit will not be given for both SSC 470 and SSC 570.

**SSC 472 Forest Soils 3. Offered in Spring Only. Prerequisite: SSC 341, or FOR 304.** Soil as a medium for tree growth; relation of soil physical, chemical and biological factors to the practice of silviculture; extensive soil management in the forest and intensive soil management in forest nurseries and in seed orchards; relation of soil and site to forest genetics, ecology, pathology and entomology.

**SSC 490 Senior Seminar in Crop Science and Soil Science 1. Offered in Spring Only.** Review and discussion of current topics in crop science, soil science, agronomy and natural resource management. Preparation and presentation of scientific information in written and oral format. Senior standing in Agronomy, Plant and Soil Sciences, or Turfgrass Science.

**SSC 492 External Learning Experience 1-6. Offered in Fall and Spring.** 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 the 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.

**SSC 493 Special Problems in Soil Science 1-6. Offered in Fall and Spring.** 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 prior to the experience.

**SSC 495 Special Topics in Soil Science 1-6. Offered in Fall and Spring, Prerequisite: SSC 200.** Offered as needed to present materials not normally available in regular course offerings or for offering of new courses on a trial basis.

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**STATISTICS**

**ST 101 Statistics by Example 3.** 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.

**ST 240 Introduction to Behavioral Research I** 3. Offered in Fall and Spring. Prerequisite: PSY and HRD Majors, PSY 200, Corequisite: PSY (ST) 241. Introduction to quantitative methods in psychology, including measurement, experimental control, validity, and fundamentals of research design. Discussion of distributions and statistical inference.

**ST 241 Introduction to Behavioral Research I Lab** 1. Offered in Fall and Spring. Prerequisite: PSY 200, PSY and HRD Majors, Corequisite: PSY (ST) 240. Students design, analyze and report a variety of simple experiments.

**ST 242 Introduction to Behavioral Research II** 3. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY (ST) 240, Corequisite: PSY (ST) 243. 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.

**ST 243 Introduction to Behavioral Research II Lab** 2. Offered in Fall and Spring. Prerequisite: PSY or HRD Majors, PSY (ST) 240, Corequisite: PSY (ST) 242. Design and analysis of a major research project.

**ST 295 Special Topics ST 1-3...**

**ST 301 Statistical Methods I** 3. Prerequisite: MA 141 and either PMS 100 or E 115. Contemporary description and analysis of single samples of data. Graphical data presentation methods for determination of patterns and relationships among variables. Classical and robust alternative methods for single sample data summary procedures. Probability concepts, sampling, and expectations. Confidence interval and hypothesis testing for sample mean and proportion. Computer use emphasized.

**ST 302 Statistical Methods II** 3. Prerequisite: ST 301. Confidence intervals and hypothesis testing with graphics in multiple samples and/or variables cases: tests for means/proportions of two independent groups, analysis of variance for completely randomized design, contingency table analysis, correlation, single and multiple linear regression; design of experiments with randomized blocks, factorial design and analysis of covariance. Computer use emphasized.

**ST 305 Statistical Methods 4. Offered in Fall and Spring.** Prerequisite: MA 141 and either PMS 100 or E 115. Basic concepts of data collection, sampling, and experimental design. Descriptive analysis and graphical displays of data. Probability concepts, and expectations. Normal and binomial distributions. Sampling distributions and the Central Limit Theorem. Confidence intervals and hypothesis testing. Tests for means/proportions of two independent groups. One factor analysis of variance. Understanding relationships among variables; correlation and simple linear regression. Computer use is emphasized.

**ST 311 Introduction to Statistics** 3... Examining 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.

**ST 312 Introduction to Statistics II** 3. Offered in Fall and Spring. Prerequisite: ST 311. 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.

**ST 350 Economics and Business Statistics** 3. Offered in Fall Spring Summer. Prerequisite: MA 114; College of Management Majors must have passed Software Applications Proficiency Requirement. Introduction to statistics applied to management, accounting, and economic problems. Emphasis on statistical estimation, inference, correlation and multiple regression, and analysis of variance. Use of computers to apply statistical methods to problems encountered in management and economics.

**ST 351 Data Analysis for Economists** 3. Offered in Fall Only. Prerequisite: BUS/ST 350. 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.

**ST 361 Introduction to Statistics for Engineers** 3. Offered in Fall Spring Summer. Statistical techniques useful to engineers and physical scientists. Includes elementary probability, frequency distributions, sampling variation, estimation of means and standard deviations, basic design of experiments, confidence intervals, significance tests, elementary least squares curve fitting. Credit not allowed for both ST 361 and ST 370 or ST 380.

**ST 370 Probability and Statistics for Engineers** 3. Offered in Fall and Spring. Prerequisite: MA 241. 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 and surface fitting (regression analysis). The principles of experimental design and statistical process control introduced. Credit not allowed for both ST 370 and ST 361 or ST 380.

**ST 371 Introduction to Probability and Distribution Theory** 3. Offered in Fall Spring Summer. Prerequisite: MA 241, Corequisite: MA 242. 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.

**ST 372 Introduction to Statistical Inference and Regression** 3. Offered in Fall Spring Summer. Prerequisite: ST 371. Statistical inference and regression analysis including theory and applications. Point and interval estimation of population parameters. Hypothesis testing including use of 1, chi-square and F. Simple linear regression and correlation. Introduction to multiple regression and one-way analysis of variance.

**ST 380 Probability and Statistics for the Physical Sciences** 3. Offered in Fall and Spring. Prerequisite: MA 241. 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 and surface fitting (regression analysis). Credit not allowed for both ST 380 and ST 361 or ST 370.

**ST 401 Experiences in Data Analysis** 4. Offered in Summer. Prerequisite:Permission of Instructor and either ST 311 or ST 305. 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.

**ST 412 Long-Term Actuarial Models 3. Offered in Fall Only.**
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.
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.

**ST 413 Short-Term Actuarial Models 3. Offered in Spring Only.**
Prerequisite: MA 241 or MA 231, and one of MA 421, ST 301, ST 305, ST 370, ST 371, ST 380, ST 421. 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, reinsurance and business decisions.

**ST 421 Introduction to Mathematical Statistics I 3. Offered in Fall Only.**
Prerequisite: MA 242. First of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Introduction to probability, univariate and multivariate probability distributions and their properties, distributions of functions of random variables, random samples and sampling distributions.

**ST 422 Introduction to Mathematical Statistics II 3. Offered in Spring Only.**
Prerequisite: ST 421. Second of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Random samples, point and interval estimators and their properties, methods of moments, maximum likelihood, tests of hypothesis, elements of nonparametric statistics and elements of general linear model theory.

**ST 430 Introduction to Regression Analysis 3. Offered in Fall Only.**
Prerequisite: (ST 302 or ST 305) and (MA 305 or MA 405). Regression analysis as a flexible statistical problem solving methodology. Matrix review; variable selection; prediction; multicollinearity; model diagnostics; dummy variables; logistic and non-linear regression. Emphasizes use of computer.

**ST 431 Introduction to Experimental Design 3. Offered in Spring Only.**
Prerequisite: ST 302 or ST 305. Experimental design as a method for organizing analysis procedures. Completely randomized, randomized block, factorial, nested,拉丁 squares, split-plot and incomplete block designs. Response surface and covariance adjustment procedures. Stresses use of computer.

**ST 432 Introduction to Survey Sampling 3. Offered in Spring Only.**
Prerequisite: ST 302 or ST 305. 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.

**ST 435 Statistical Methods for Quality and Productivity Improvement 3. Offered in Fall Only.**
Prerequisite: ST 302 or ST 305. 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.

**ST 445 Introduction to Statistical Computing and Data Management 3. Offered in Spring Only.**
Prerequisite: ST 302 or ST 305. Use of computers to manage, process and analyze data. Concepts of research; data management; JCL and utility programs; use of statistical program package for data analyses and graph production; and writing statistical programs to perform simulation experiments. Major paper required.

**ST 495 Special Topics in Statistics I-6. Offered in Fall Spring.**
Offered as needed to present material not normally available in regular departmental course offerings, or for offering new courses on a trial basis.

**ST 498 Independent Study In Statistics I-6. Offered in Fall Spring.**
Prerequisite: Six hours of ST. Detailed investigation of topics of particular interest to advanced undergraduates under faculty direction.

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**SCIENCE, TECHNOLOGY, & SOCIETY**

**STS 210 Women and Gender in Science and Technology 3.**
Offered in Fall Only. 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.

**STS 214 Introduction to Science, Technology, and Society 3.**
Offered in Fall Only. 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.

**STS 257 Technology in the Arts 3. Offered in Fall Only.** 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.

**STS 301 Science and Civilization 3.** 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.

**STS 302 Contemporary Science, Technology and Human Values 3.** Interdisciplinary evaluation of recent and potential influences of current scientific and technological developments on society. 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.

**STS 303 Humans and the Environment 3. Offered in Fall and Spring.** 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.
STS 304 Ethical Dimensions of Progress 3. Offered in Fall Only. 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.

STS 320 Ethics in Engineering 3. . Engineering in American culture and the emerging ethical issues confronting the profession: corporate responsibility, personal rights, whistle blowing, conflicts of interest, professional autonomy, risk assessment, sustainable development, and the place and purpose of Engineering codes of ethics.

STS 322 Technological Catastrophes 3. Offered in Fall Only. 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.

STS 323 World Population and Food Prospects 3. . 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.

STS 324 Alternative Futures 3. . Perspectives on possible alternative futures as well as the cutting edge of the present. Nature and likelihood of various alternatives. Methodology and limitations of forecasting, selected futurist issues and interactions between present and possible future technologies and human values.

STS 325 Bio-Medical Ethics 3. Offered in Fall and Spring. 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.

STS 326 Technology Assessment 3. . Impacts of technologies as they are applied in society. Description and forecasting of effects, interactions, and potential irreversibilities.

STS 402 Peace and War in the Nuclear Age 3. An interdisciplinary examination of contemporary wars and international conflict, arms, races, nuclear strategy and defense policy, arms control, theories and strategies of peace.

STS 403 Seminar in Science, Technology, and Society 3. . Prerequisite: STS 214, STS or STB Majors. 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.

STS 405 Technology and American Culture 3. . An interdisciplinary study of the role of technology in American culture which examines the ideological, political, social, economic, and institutional contexts of technological change from the 1760's to the present, and explores the cultural impacts of new technological systems.

STS 412 Entering the 21st Century: Agricultural, Technological & Environmental Perspective 3. . Systems approach to predictions about the world in the 21st century from the perspectives of agricultural and environmental studies. Attention to food production, fisheries, forests, water, energy, material resources for fuel, climate, and population. Guest lectures and class projects.

STS 451 The Practice of Science and the Arts 3. Offered in Fall Only. An introduction to the practice of scientists and artists in terms of the beginning of their projects, their modes of moving forward, their goals, and the nature of completeness in their work. The relation of art and science in theory and practice.

STS 471 Darwinism and Christianity 3. Prerequisite: One course in religious studies, biological sciences, philosophy of science, or history of science. 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 anevolutionary world.

STS 484 Cross Cultural Technology Transfer 3. Offered in Fall Only. Technology transfer into cultures with different values and traditions. Special attention to the role of local and international organizations and to gender and environmental concerns. Case studies: crop science, water, energy, forest resources, banking, information technology.

STS 490 Issues in Science, Technology, and Society 3. Offered in Fall Spring Summer. Examination of a significant issue, method, or historical episode in the area of science, technology, and society.

STS 491 Independent Study in Science, Technology, and Society 3. Offered in Fall Spring Summer. Independent investigation and discussion of a selected topic in science, technology, and society.

**SOCIAL WORK**

SW 201 Community Social Services 4. Offered in Fall and Spring. 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.

SW 290 The Development of Social Welfare and Social Work in the U.S. 3. Offered in Fall and Spring. 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.

SW 300 Research Methods in Social Work 3. Offered in Fall and Spring. Prerequisite: Social Work Majors or Social Work Minors, ST 311. 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.

SW 307 Social Welfare Policy: Analysis and Advocacy 3. Offered in Fall and Spring. Prerequisite: SW 290. 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.

SW 310 Human Behavior Theory for Social Work Practice 3. Offered in Fall and Spring. Prerequisite: SW 201. 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.

SW 312 Multicultural Social Work 3. Offered in Fall and Spring. 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.

SW 320 Social Work Practice I 4. Offered in Fall and Spring. Corequisite: Social Work Majors, and a prerequisite or corequisite of SW 310. 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.

SW 405 Social Work Practice II 4. Offered in Fall and Spring. Prerequisite: Social Work Majors, SW 320, Corequisite: SW 480/SW 408. 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 interviewing 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.

SW 408 Social Work Practice III 3. Offered in Fall and Spring. Prerequisite: Social Work Majors, SW 320. Corequisite: SW 405, SW 480. Course prepares students for practice with 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.

SW 412 Social Work in Schools 3. Offered in Fall and Spring. Prerequisite: Nine credits in Social Work courses, including SW 320. 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 developmental variations. Transportation to and from community settings is the responsibility of the student.

SW 414 Social Work Practice in Health Care 3. Offered in Fall and Summer. Prerequisite: SW 201. Practice skills and knowledge required of social workers in health care settings. Multi-disciplinary team work in health care. Social components of major illnesses and disabilities, including prevention and rehabilitation. Emotional, cultural, economic and social factors in health and illness. Health needs of specific population groups.


SW 416 Addiction Recovery and Social Work Practice 3. Offered in Fall Only. Prerequisite: SW 310. 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, effectiveness, 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.

SW 417 Social Work and Aging 3. . . . 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.
SW 420 The Legal Aspects of Social Work 3. Offered in Fall and Spring. Legal environment of the social work profession. Relationships among legal processes, the delivery of social work services and client problems.

SW 440 International Learning Experience in Social Work 6. Offered in Summer. 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.

SW 480 Preparation for Field Work 1. Offered in Fall and Spring. Prerequisite: Social Work Majors, SW 320, Corequisite: SW 405, SW 408. Introduction to aspects of field placement process and necessary skills for a successful internship. Application, interview, ethical practice, documentation, supervision and learning contract.

SW 490 Field Work in Social Services 12. Offered in Fall and Spring. Prerequisite: Social Work Majors, SW 405, SW 408, SW 480, Supervised placement in a social service organization; demonstration of CSWE core competencies and professional practice behaviors. Weekly integrative seminar. Intern liability insurance required. Students are expected to provide their own transportation to the internship site.

SW 495 Special Topics in Social Work 3. Offered in Fall Spring Summer. Detailed investigation of a topic in social work. Topic and mode of study determined by faculty member.

SW 498 Independent Studies in Social Work 1-6. Offered in Fall Spring Summer. Prerequisite: Junior standing or Senior standing, Social Work Majors or Social Work Minor, Nine credits in social work courses. Independent or small group study of a social work practice or social welfare area.

T 101 Introduction to the College of Textiles 2. Offered in Fall Only. 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.

T 102 Introduction to Product Evolution 2. Offered in Fall and Spring. 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.

T 110 Textiles Scholars Forum 0. Offered in Fall and Spring. 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.

T 200 Introduction to Textiles 3. Offered in Spring Only. 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.

T 210 Textiles Scholars Forum 0. Offered in Fall and Spring. 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.

T 491 Honors Seminar in Textiles 1. Offered in Fall and Spring. A seminar on current university and industrial research in the field of textiles.

T 493 Industrial Internship in Textiles 3. Offered in Fall Spring Summer. 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.

T 495 International Collaboration in Textiles Research 1-6. Offered in Fall Spring Summer. 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 different countries to work together using various communication tools. Students shall arrange international contacts and provide a written proposal of the project to the undergraduate administrator or course coordinator prior to registration.

T 497 Independent Research in Textile Engineering, Chemistry and Materials Science I 3. Offered in Fall Spring Summer. Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required.

T 498 Independent Research in Textile Engineering, Chemistry and Materials Science II 3-3. Offered in Fall Spring Summer. Prerequisite: T 497. Independent research in Textile Engineering, Chemistry and Materials Science topics through experimental, theoretical and literature studies. Written and oral reports required.

TDE 101 Introduction to Technology Education 1. Offered in Fall Only. 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.

TDE 110 Materials & Processes Technology 4. Offered in Fall and Spring. 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.

TDE 131 Technology through Engineering and Design I 3. Offered in Fall Only. Prerequisite: TDE 110. 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.

TDE 161 Imaging Technology 4. Offered in Fall and Spring. Basic principles of imaging for mass reproduction including relief, gravure, offset lithography, screen, and electronic printing. Projects in prepress design and plate making techniques including digital and conventional photography and understanding of how visual art and technology principles are combined to communicate effectively. Students will be responsible for transportation to field trips.

TDE 202 Introduction to Teaching Technology Engineering and Design Education 1. Offered in Fall and Spring. Prerequisite: Sophomore standing; Corequisite: ED 204. Introduction to teaching technology engineering and design education programs in middle and secondary schools. Field experiences and course assignments include two hours each week assisting classroom teachers in the public schools. Students are responsible for their own transportation to the 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. The URL for information on this policy is: http://www2.acs.ncsu.edu/insurance/Students.html.


TDE 207 Introduction to Teaching Technology Education 3. Offered in Spring Only. Introduction to teaching technology education programs in middle and secondary schools. Field experiences and course assignments including three hours each week assisting classroom teachers in the public schools. Students are responsible for their own transportation to the field experience sites.

TDE 220 Civil Engineering Graphics 3. Offered in Fall and Spring. 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.

TDE 221 Construction Technology 3. Offered in Spring Only. Prerequisite: TED/TDE 110. Overview of structures and their construction. Drawings and models completed in a laboratory environment to simulate construction methods.

TDE 230 Scientific and Technical Visualization 3. Offered in Spring Only. 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. 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.

TDE 261 Digital Media Education 3. Offered in Spring Only. Prerequisite: TDE 205. 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.

TDE 276 Transportation Technology: Energy, Power and Infrastructures 3. Offered in Fall Only. Prerequisite: TED/TDE 110. Theoretical and practical aspects of transportation. Topics include energy conversion, application of power, infrastructures for transmission and control of energy, transportation systems and industries, and conservation of energy. Activities include laboratory testing, experiments, development of activities for teaching secondary students about transportation technology, and use and care of equipment.

TDE 330 Manufacturing Technology 3. Offered in Fall Only. Prerequisite: TED/TDE 221 or TED/TDE 276. Corequisite: TED/TDE 481. Manufacturing organization, product design, and production system design. Students design, operate and evaluate a small-scale manufacturing system.

TDE 331 Technology Through Engineering and Design II 3. Offered in Spring Only. Prerequisite: TDE 131 and Corequisite: GC 350. 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.

TDE 331 Technology Through Engineering and Design II 3... 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 351 Ceramics: The Art and Craft of Clay 3... 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.

TDE 359 Electronics Technology 3... Direct current, alternating current, and semiconductors. Measurement and circuit behavior. Experimentation with application circuits.

TDE 371 Emerging Issues in Technology 3. Offered in Fall Only. Prerequisite: TED/TDE 261, TED/TDE 221, and GC 120. 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.

TDE 384 Computer Applications in Industry 3. Offered in Spring Only. Computerized control systems used in industry including computers and controllers, automated machines, and robots. Students design and operate automated systems.
TDE 385 Robotics Education 1. Offered in Fall and Spring. Corequisite: TDE 386. This course is an introduction to design and invention system control mechanisms and robot sensors. Students will classify foundational technical developments in autonomous, computer, and radio-control teleoperations. Students will explore the history and evolution of robots and automation and their social, economic, industrial, and educational impacts.

TDE 386 Robotics Education Lab 3. Offered in Fall and Spring. Corequisite: TDE 385. 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.

TDE 407 Field Work in Technology Education 1-6. Offered in Fall and Spring Summer.. Supervised off-campus field experience in Technology Education that relates on-the-job experiences in the field to the technical competencies which are the content of the curriculum. May be repeated for a maximum of 6 credits.

TDE 452 Lab Planning in Technology Education 3. Offered in Spring Only. 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.

TDE 456 Curriculum and Methods in Technology Education 4. Offered in Fall Only. 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.


TDE 481 Research & Development in Technology Education 3. Offered in Fall Only. Prerequisite: TED/TDE 330 or TED/TDE 384. 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.

TDE 490 Special Problems in Technology Education 1-6. Offered in Fall and Spring. Supervised, independent investigation in a defined area of interest in Technology Education.

TDE 495 Senior Seminar in Technology Education 3. Offered in Spring Only. An in-depth investigation of a topic or a set of problems and/or issues in Technology Education.

TE 105 Textile Engineering: Materials and Systems 2. Offered in Spring Only. Corequisite: CH 101. 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.

TE 110 Computer-Based Modeling for Engineers 3. Offered in Fall and Spring. Prerequisite: E 115, Corequisite: MA 141. 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.

TE 200 Introduction to Polymer Science and Engineering 3. Offered in Fall Only. Prerequisite: CH 101. 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.

TE 201 Textile Engineering Science 4. Offered in Spring Only. Prerequisite: MA 241, PY 205, TE/ISE 110. Structure, physical and mechanical properties of fibers; structure of assemblies. Structure/property relations. Laboratory exercises in characterization of fiber properties.

TE 205 Analog and Digital Circuits 4. Offered in Spring Only. Prerequisite: C- or better in TE 110, PY 208, Corequisite: MA 341. 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.

TE 301 Engineering Textile Structures I: Linear Assemblies 3. Offered in Fall Only. Prerequisite: (MAE 206 or CE 214) and MA 242. 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.


TE 303 Thermodynamics for Textile Engineers 3. Prerequisite: MA 242, PY 208. 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

TDE 498 Independent Study in Technology Education 1-3. Offered in Fall Spring Summer. 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.

TEXTILE ENGINEERING
emphasized, although more applied examples and problems will be heavily utilized.

**TE 401 Textile Engineering Design I 4. Prerequisite: TE 302.** 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.

**TE 402 Textile Engineering Design II 4. Prerequisite: TE 401.** 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.

**TE 403 Mechanics of Fibrous Structures 3. Prerequisite: TE 201, TE 302, MA 341, MAE 314.** Mechanics of fibrous structures including fibers, yarns and fabrics. Transverse isotropy of fibers; tensile, bending, and shear behavior of fabrics.

**TE 404 Textile Engineering Quality Improvement 3. Prerequisite: ST 370 and C- or better in TE/ISE 110.** Defining and quantifying quality of textile products; quality improvement using statistical process control (SPC) and design of experiment (DOE) techniques.

**TE 424 Textile Engineering Quality Improvement Laboratory I. Offered in Spring Only. Corequisite: TE 404.** Application of process improvement methods to textile systems using statistical software. Laboratory supplements lecture material presented in TE 404.

**TE 435 Process Systems Analysis and Control 3. Offered in Fall and Spring. Prerequisite: (MA 341 and TE 205) or CHE 312.** 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.

**TE 440 Textile Information Systems Design 4. Offered in Fall Only. Prerequisite: TE/ISE 110 and JR standing.** 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.

**TE 463 Polymer Engineering 3. Offered in Fall Only. Prerequisite: TE 201 or BME 203 and Corequisite of TE 303 or equivalent.** Chemical and physical properties of polymers and fibers; thermodynamics of crystallization, time dependent phenomena, fracture mechanics and rheology. Advanced topics in extrusion.

**TE 466 Polymeric Biomaterials Engineering 3. Offered in Fall Only. Prerequisite: PY 208 and (TE 200 or CH 220 or CH 221 and MAE 206 or CE 214).** 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.

**TE 467 Mechanics of Tissues & Implants Requirements 3. Offered in Spring Only. Prerequisite: (ZO 160 or BIO 183) and (MAE 314 or CE 313).** 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.

**TE 492 Special Topics in Textile Engineering 1-3. Offered in Fall and Spring.** 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.

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**TEXTILE MATERIAL SCIENCE**

**TMS 211 Introduction to Fiber Science 3. Offered in Fall Spring Summer. Prerequisite: TT 105, or PCC 105, Corequisite: MA 131 or 141.** Properties of fibers related to type and chemical structure. Fiber classification and identification. Reaction to moisture, stress-strain properties, and methods of measuring physical properties. Relationship between polymer structure, fiber properties and utilization.

**TMS 212 Yarn and Fabric Formation and Properties 2. Offered in Fall Only. Prerequisite: TMS 211; Corequisite: TMS 212.** 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.

**TMS 214 Yarn and Fabric Formation and Properties Lab 1. Offered in Fall Only. Prerequisite: TMS 211; Corequisite: TMS 212.** The development of products from textiles 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 manufactured.

**TMS 460 Physical & Mechanical Properties of Textile Materials 3. Offered in Fall Only. Prerequisite: MA 230 or MA 241, PY 211, TMS 211.** Structural and physical properties of fibers, yarns and fabrics, including mechanical, thermal, optical, frictional, electrical and moisture properties. Relationships between structure, properties and performance.

**TMS 471 Textile Materials Design I 3. Offered in Fall Only.** Functional textile materials design, modeling techniques and fault analysis methodologies. Product development from initial design phase, testing, analysis, to prototype production. Project will be completed in TMS 472.


**TMS 492 Special Topics in Textile Materials Science 1-3. Offered in Fall and Spring.** 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.
TOX 201 Poisons, People and the Environment 3. Offered in Spring Only. Introduction to the fascinating world of chemical poisons including their many and varied effects on people as well as the environment. Learn how and why poisons have played an important role in history, how to critically evaluate the chemical risk information reported in the media, and the underlying principles of “the basic science of poisons.”

TOX 401 Principles of Toxicology 4. Offered in Fall Only. Prerequisite: CH 220 or CH 221; BIO 181 or ZO 160. 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.

TOX 415 Environmental Toxicology and Chemistry 4. Offered in Spring Only. Prerequisite: CH 220 or CH 221; BIO 181 or ZO 160 recommended. 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.

TOX 490 Seminar in Environmental Toxicology 1. Offered in Spring Only. Prerequisite: TOX 401. Presentation of research findings by invited scientist; presentation of literature research by students; guidelines for presenting oral and poster presentations at scientific meetings.

TOX 495 Special Topics in Toxicology 1-3. Offered in Fall Spring Summer. Offered as needed to present materials unavailable in regular course offerings or for offering new courses on a trial basis.

TOX 499 Undergraduate Research in Toxicology 1-3. Offered in Fall Spring Summer. Research for students in Toxicology. In lieu of a syllabus, student and professor will prepare a contract which details the research and how the results will be disseminated.

TEXTILE TECHNOLOGY

TT 105 Introduction to Textile Technology 3. Offered in Fall and Spring. 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 fiber that are practically and aesthetically desirable. Design of end products as well as fundamental economic and supply chain issues.

TT 203 Materials, Polymers and Fibers Used in Nonwovens 3. Offered in Fall Only. Prerequisite: MA 141; PY 205. 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. Credit will not be given for both TT 203 and TMS 211.

TT 221 Yarn Production and Properties I 2. Offered in Fall Spring Summer. Prerequisite: TT 105; Corequisite: MA 131 or MA 141; PY 211 or PY 205. 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, drawing frames, roving frames and different spinning machines. Filament yarn processing.

TT 252 Formation and Structure of Textile Fabrics 4. Offered in Fall and Spring. Prerequisite: TT 221. Fundamentals of the conversion of fibers and yarns into woven, knitted, and nonwoven fabrics, and fabrics’ conversion systems. Introduction to woven, knitted and nonwoven fabric design structure. Structure, property, and performance relations of textile fabrics. Testing and evaluation of textile structures.

TT 305 Introduction to Nonwoven Products and Processes 3. Offered in Fall and Spring. Prerequisite: TT 203 or (PCC 203 and TMS 211), (MA 231 or MA 241), and (PY 211 or PY 205). Corequisite: TT 252 and ST 361. 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/process interaction. Plant visits whenever possible.

TT 321 Yarn Production and Properties II 3. Offered in Fall and Spring. Prerequisite: TT 221. Fiber and machine interactions in blending, carding, drawing and spinning. Drafting theories and the influence of fiber and machine variables on irregularity. The role of twist on yarn structure, properties and productivity. Developments and limitations in processing technology.

TT 331 Performance Evaluation of Textile Materials 4. Offered in Fall and Spring. Prerequisite: ST 311 or ST 361, TMS 211, TT 221, TT 252 or TT 251, PY 211 or PY 205, and MA 231 or MA 241. 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.


TT 351 Woven Products and Processes 3. Offered in Fall Only. Prerequisite: PY 212 or PY 208. 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 automotive, agriculture, construction, etc. and stimulate understanding of their structure, performance requirements, and relevant manufacturing principles including braiding.

TT 370 Technical Fabric Design 4. Offered in Spring Only. Prerequisite: Two courses out of TT 341, 351 and 305. Properties of woven, knitted and nonwoven fabrics. Computer techniques and other methods of reproducing structural designs and means of designing fabrics to specifications. Laboratory consists of projects involving design analysis and testing.

TT 371 Woven Textile Design 3. Offered in Spring Only. Prerequisite: TT 252. Design and production of woven fabrics. Exploration of various basic structures, color and textural effects.

TT 380 Management and Control of Textile and Apparel Systems 3. Prerequisite: TT 252. Management approaches, practices and basic economic considerations in the development, production and distribution of industrial and consumer textile and apparel products.

TT 405 Advanced Nonwovens Processing 3. Offered in Spring Only. Prerequisite: TT 331, MAE 308, MAE 310. Fundamentals of fluid mechanics and heat transfer mechanisms during the bonding of nonwovens. In-depth description of hydroentangling, thermal bonding and needle punching techniques. Modeling methods and laboratory work are assigned.


TT 421 Developments in Yarn Manufacturing 3. Offered in Spring Only. Prerequisite: TT 321. A critical appraisal of developments in yarn manufacturing, with emphasis on their influence on process and product quality and range.


TT 431 Quality Management and Control in Textile Manufacturing 3. Offered in Fall and Spring. Prerequisite: TT 221, TT 252, TT 331, and ST 361 or BUS 350. Principles of quality and process management and control in textile/apparel manufacturing with emphasis in quality management systems, quality costs, statistical control chart procedures, process capability, acceptance sampling, and optimal process and product design and improvement methods.

TT 441 Advanced Knitting Systems and Fabrics 3. Offered in Fall Only. Prerequisite: TT 341. Loop forming concepts and mechanisms of complex warp and weft-knitted fabrics. Structural design and limitations, potential applications and knitability. Analysis of mechanical systems and tensioning forces on fabric formation. The effect on dimensional and mechanical properties.

TT 451 Advanced Woven Fabric Design 3. Offered in Spring Only. Prerequisite: TT 252 and Senior Standing. 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.

TT 470 Jacquard Woven Fabric Design 3. Offered in Fall Only. Prerequisite: TT 252, TT 371. 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 uses is addressed, from art fabrics to unique specialty products. A field trip in this course will require personal transportation.

TT 480 Operations Management Decisions for Textiles 3. Prerequisite: FTM 380, ACC 210, ST 361, (MA 131 and 132 or MA 141). Quantitative techniques for decision making and management in the textile complex. Applications include vendor selection, plant location, retail inventory management, forecasting demand, project management, and logistics planning. Techniques covered include simulation, PERT/CPM, mathematical modeling.

TT 481 Design and Technology of Technical Textiles 3. Offered in Spring Only. Prerequisite: TT 305, TT 341 and TT 351. Performance requirements of various technical textiles. Underlying principles of design, application, manufacture, and evaluation of fibrous structures intended to meet specific end-use requirement.

TT 485 Textile Computer Integrated Enterprise 3. Prerequisite: FTM 380. 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.

TT 486 Supply Chain Management in the Textile Industry 3. Prerequisite: FTM 380. 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 TAM 486 and MT 386.

TT 499 Textile Senior Project 4. Offered in Fall and Spring. 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 be presented formally at the end of the semester. Course should be taken in the last semester of the Senior year. It cannot be substituted by other project courses.

UNIVERSITY STUDIES

USC 100 Transition into a Diverse Community 1. Offered in Summer. USC 100 is required for all Summer Starts 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.

**USC 101 Introduction to University Education I . 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; available university resources; overview of university majors and minors as well as policies and procedures. FYC students only. Student cannot get credit for both USC 101 and 103.

**USC 102 Introduction to University Education II I . Offered in Spring Only. Prerequisite: USC 101. Continuation of USC 101; Emphasis on making a decision with respect to an undergraduate major. Credit may not be earned for both USC 102 and 104. FYC Students Only; Credit cannot be received for both USC 102 and 104.

**USC 103 Introduction to University Education for Varsity Student Athletes I I . Offered in Fall Only.** 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.

**USC 104 Introduction to University Education for Varsity Student-Athletes II I . Offered in Spring Only. Prerequisite: USC 103.** USC 104 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 would relate to the day-to-day responsibilities and challenges that student-athletes face, as well as a review of NCAA and NCSU continuing eligibility.

**USC 105 University Orientation I I . Offered in Fall Only.** USC 105 serves as an orientation to academic requirements of the various colleges and departments as N.C. State. A review of study skills, time management, advising procedures, decision making and career exploration through inside and outside of class activities is designed to assist students in developing knowledge of major requirements and requisite comprehension and skills needed to succeed in college. Course is restricted to 31TP students.

**USC 106 University Orientation II I . Offered in Spring Only. Prerequisite: USC 105.** USC 106 continues to serve as an orientation to academic requirements of the various colleges and departments at the university. A review of study skills, time management, decision making and career exploration through in and out of class activities is designed to assist students in making well informed choices about majors. Students will also be required to focus on career interviews as well as the development of university academic networks. Course is restricted to second semester 31TP students.

**USC 110 Freshman Advancement Seminar 1 I .** 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.

**USC 120 SERV-Seminar Education for Military Veterans/Service Members I I . Offered in Fall and Spring.** 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).

**USC 210 Introduction to College Tutoring I I . Offered in Fall Spring Summer.** Offered in Fall. Offered in Spring Only. Offered in Summer Only. GPA 3.0 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.

**USC 220 Leadership and the Resident Mentor 3 I . 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.

**USC 223 Orientation Counselor Development 2 I . Offered in Fall Only.** For new student orientation counselors 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 orientation counselors. Class discussion, small groups activities, simulations, and journal writing employed. Individual projects and out-of-class team building experiences are required, including Saturday activities. Departmental Approval Required.

**USC 298 Special Topics in University Studies I-3 I . Offered in Fall Spring Summer.** Special Topics in University Studies at the Undergraduate level for offering of courses on an experimental basis.

**USC 301 Transfer Student Success I I . Offered in Fall and Spring.** 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.

**USC 401 Transitions for the College Graduate 3 I . Offered in Fall and Spring.** 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.

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**VETERINARY MEDICINE**

**VMC 300** Lab Animal Management

**VMM 333** Medical Vocabulary

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**VETERINARY SCIENCE**

**VMP 401** Poultry Diseases. Offered in Spring Only. 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.

**VMP 420** Disease of Farm Animals. Offered in Spring Only. Pathology of bacterial, viral, parasitic, nutritional, thermal and mechanical disease processes for farm animals. This emphasis practices for prevention and control of each disease.

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**WOMEN’S & GENDER STUDIES**

**WGS 200** Introduction to Women's and Gender Studies. Offered in Fall. 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.

**WGS 204** Sociology of Family. Offered in Fall Spring Summer. Contemporary American family structures and processes and their development. Focus on socialization, mate selection, marital adjustment and dissolution. Includes core sociological concepts, methods, theories.

**WGS 210** Women and Gender in Science and Technology. Offered in Fall. 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.

**WGS 293** Special Topics in WGS. Offered in Fall and Spring. Examination of varying topics on women and/or gender from an interdisciplinary perspective at an introductory level.

**WGS 304** Women and Men in Society. Offered in Fall and Spring. Prerequisite: 3 cr. in SOC, 200 level. A sociological analysis of women and men in contemporary American society. Perpetuation of and change in gender stratification using sociological concepts, theories and research. How gender expectations developed and transmitted. Historical data and research on diversity in American society used for analysis of causes and consequences of gender inequality.

**WGS 305** Women and Literature. Offered in Spring Only. Nineteenth- and twentieth-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.

**WGS 306** Gender and Politics in the United States. Offered in Fall Spring Summer. Prerequisite: PSY 201. 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.

**WGS 310** Women's and Gender Studies Internship. Offered in Fall and Spring. 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.

**WGS 327** Language and Gender. Offered in Spring Only. Prerequisite: ENG 111, ENG 112. 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).

**WGS 330** Women and Health. Offered in Fall Spring Summer. 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.

**WGS 336** Women In Music. Offered in Spring Only. 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.

**WGS 362** Communication and Gender. Offered in Fall and Spring. Prerequisite: Junior standing, COM 112. 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.

**WGS 406** Psychology of Gender. Offered in Fall and Spring. Prerequisite: PSY 200, 201 or HSS 200. 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 cannot be given for both PSY 406 and PSY 506.
WGS 407 Sociology of Sexualities 3. Offered in Spring Only. Prerequisite: 3 hours SOC 200 level, 300 level, or equivalent research methods course. Exploration of sexuality in a social context. Relationship between sexuality, gender and power in the U.S. Historical trends in behaviors and identities: social movements and sexual issues; current behavioral trends. Some issues covered; identity, social construction, sexual meanings.

WGS 410 Studies in Gender and Genre 3. Offered in Fall Only. This course examines the ways in which writers have revised the literary genres to include gendered experience. It will focus on a different generic area, such as poetry, fiction, drama or autobiography, depending on its instructor.

WGS 418 Gender Law and Policies 3. Offered in Fall Only. Prerequisite: Nine hours of Political Science. 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.

WGS 444 Cross-Cultural Perspectives on Women 3. Offered in Spring Only. Prerequisite: ANT 252 and one of the following: ANT 310, 325, 330 or 346. 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.

WGS 447 History of American Women to 1900 3. The historical experience of women in America from the colonial period to 1890. Women's work, education, legal and political status, religious experience, 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 447 and HI (WGS) 547.

WGS 448 American Women in the Twentieth Century 3. Prerequisite: 3 hrs. of History. 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.

WGS 472 Women and Religion 3. Prerequisite: one course in religious studies or women's and gender studies. 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.

WGS 473 Religion, Gender, and Reproductive Technologies 3. 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.

WGS 492 Theoretical Issues in Women's and Gender Studies 3. Offered in Spring Only. Prerequisite: WGS 200. 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.

WGS 493 Special Topics in Women's and Gender Studies 3. Offered in Fall Only. Examination of varying topics on women and/or gender from a multidisciplinary perspective.

WOOD & PAPER SCIENCE

WPS 100 Introduction to Pulping & Papermaking 1. Offered in Fall Only. Introduction to the paper industry and the Pulp & Paper Science Curriculum. Overview of pulping and papermaking processes including plant tours and laboratory exercises. Two Saturday field trips to paper mills required. Concepts of professional development including resumes, interviewing, and summer job placement procedures.

WPS 104 Introduction to Wood Products 2. Offered in Fall Only. Introduction to College of Natural Resources and University services, including libraries, computer labs, Leadership Development Series. Awareness of size and diversity of wood industry, career potential. Setting career goals, educational and professional development goals.

WPS 201 Sustainable Materials for Green Housing 2. Offered in Spring Only. 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.

WPS 202 Wood Anatomy and Properties 3. Offered in Fall Only. Formation, anatomy and properties of wood. Structural features of softwoods and hardwoods and the relationships among anatomy, physiology, physical and mechanical properties. Variability, naturally occurring defects, and wood deterioration are discussed and related to wood utilization. Techniques on hand lens and microscopic identification of wood.


WPS 205 Wood Products Practicum 5. Offered in Summer. Prerequisite: WPS 202 or 203. Preparation of drawings and bill of materials for a furniture item. Parts are machined, assembled, and finished. Lumber grading, drying, and gluing principles. Four to five days are spent visiting industries to provide an appreciation for products and processes. The student is responsible for room and board; transportation is provided.

WPS 210 Wood Products Internship 1. Offered in Fall Spring Summer. Experience in the forest products or related industries with a departmentally selected employer.

WPS 240 Wood Products 3. Offered in Fall Only. Introduction to forest products industries, including the economic importance, current manufacturing technology, raw material requirements and the future of the industries.
WPS 242 Wood Fiber Analysis. 2. Offered in Fall and Spring. The macro and micro structure of wood and the relationships of anatomical structures to the physical properties of wood and paper.

WPS 301 Introduction to Wood Chemistry. 4. Offered in Spring Only. Prerequisite: CH 101, CH 102, and WPS 202 or 203 or permission. Introduction of polymer science concepts (thermal transitions, molecular weight, viscoelasticity). Detailed instruction on wood chemistry, including wood reactivity, wood decay, the chemical aspects of thermal treatments, the separation of wood into its individual components, the reactivity and modification of the individual components, and the conversion of wood into energy products.

WPS 302 Wood Processing II. 4. Offered in Fall Only. Prerequisite: WPS 202 or 203. Theories and techniques of processing raw wood into usable products. Principles of operation of current industrial wood milling equipment including primary and secondary processing. Machining of reconstituted wood products.

WPS 308 Wood Products Process Facilities Infrastructure. 4. Offered in Fall Only. Wood Products production methods-simulation, optimization, plant layout and material handling. Plant infrastructure-hydraulics, compressed air, electrical, dust extraction.

WPS 344 Introduction to Quality Control in Wood Products. 3. Offered in Spring Only. Prerequisite: ST 361. Statistical quality control techniques applicable to the manufacture of wood products. Control chart techniques for monitoring defects, defectives and measurements. Acceptance sampling procedures. Examples from the wood products industries will be used.

WPS 346 Forest Prod Business Mktg. 3. Offered in Spring Only. 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 play 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.

WPS 350 Wood Products Literature. 2. Offered in Spring Only. Prerequisite: Completion of WPS 205. Exploration of the wood products literature; use of library services, oral and written reports, with emphasis on independent study.

WPS 423 Forest Machinery and Systems. 3. Offered in Fall Only. Applications of engineering principles to problems in forest operations: power sources; testing; rating and capabilities of forest machinery; power requirements and utilization efficiencies; effects of vehicle design parameters on stability, safety, and operation under load; traction devices and vehicle mechanics.


WPS 444 Wood Composites. 3. Offered in Fall Only. Prerequisite: WPS 301 and senior standing in Wood Products. Structure-property relationships of common wood adhesives, bond formation fundamentals, bond performance; manufacture, properties, and processing of wood-based composites such as plywood, particleboard, waferboard, and oriented strandboard, as well as specialty composite products.

WPS 450 Wood Industry Case Studies. 2. Offered in Spring Only. Presentation of relevant Wood industry problems involving material selection, processing and managerial techniques. Causes of in-use failures of wood products and means of prevention.

WPS 483 Projects in Wood Products. 3. Offered in Fall Only. Exploration of the wood products literature; use of library services and on-line databases, oral and written reports, with emphasis on independent study. Individual library or laboratory research projects selected and conducted with the approval and guidance of faculty.

WPS 491 Special Topics in Wood and Paper Science. 1-4. Offered in Fall and Spring. Independent study of management or technology problems selected with faculty approval or the offering of experimental courses.

ZO 492 External Learning Experience. 1-6. Offered in Fall and Spring. 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 and the departmental teaching coordinator prior to the experience.

ZO 493 Special Problems/Research Exploration. 1-6. Offered in Fall and Spring. 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 and the departmental teaching coordinator prior to the experience.

ZO 495 Special Topics in Zoology. 1-3. Offered in Fall and Spring. Offered as needed for development of new courses in various areas of zoology.