

# Animal Science (BS): Science Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

The degree of Bachelor of Science in Animal Science may be obtained by selecting one of three concentrations offered by the Department of Animal Science in the College of Agriculture and Life Sciences: Veterinary Bioscience, Science, and Industry.

The Science concentration is designed for students with an interest in advanced study, such as MS and PhD programs, in disciplines such as physiology, nutrition, or genetics. This concentration gives students more flexibility to select courses that fit their disciplinary interests. There are many opportunities to gain undergraduate research experience with an Animal Science faculty member, to participate in one of the animal-related clubs, and to engage globally by participating in one of our Animal Science Study Abroad experiences.

## Accelerated Graduate Opportunities

Advanced undergraduates have the opportunity to complete the **Accelerated Bachelor's/Master's degrees**, which allows students to earn both the BS and the Master's of Animal Science degrees within five years. See listing of graduate degrees offered in the Graduate School (<https://grad.ncsu.edu/>).

For more information about our program, visit our website (<https://cals.ncsu.edu/animal-science/students/undergraduate/#bachelor-of-science>).

## Contact

### Department of Animal Science

North Carolina State University  
Campus Box 7621  
Raleigh, NC 27695-7621

### Dr. M. Todd See

Professor and Department Head  
North Carolina State University  
Polk Hall, Box 7621  
Raleigh, NC 27695-7621  
919.515.2755  
tsee@ncsu.edu

## Plan Requirements

Use of animals and animal specimens is critical to our educational program. To obtain full credit for Animal Science courses, students are required to participate in laboratory procedures involving animals and animal specimens. All activities with live animals are IACUC (Institutional Animal Care and Use Committee) approved. Many lectures also incorporate animals or animal specimens into the course.

Code	Title	Hours	Counts towards
<b>Orientation</b>			
ALS 103	Freshman Transitions and Diversity in Agriculture & Life Sciences	1	
or ALS 303	Transfer Transitions and Diversity in Agriculture & Life Sciences		
<b>Communication</b>			
Pre-vet students: this course also meets a vet school requirement.			
Select one of the following:			3
COM 110	Public Speaking		
COM 112	Interpersonal Communication		
COM 211	Argumentation and Advocacy		
<b>Mathematical &amp; Natural Sciences</b>			
MA 107	Precalculus I <sup>1</sup>	3	
ST 311	Introduction to Statistics	3	
or ST 350	Economics and Business Statistics		
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory <sup>1</sup>	4	
ANS 215	Agricultural Genetics <sup>3</sup>	3	
or GN 311	Principles of Genetics		
<b>Major Requirements</b>			
ANS 150 & ANS 151	Introduction to Animal Science and Introduction to Animal Science Lab <sup>1</sup>	4	
ANS 205 & ANS 206	Physiology of Domestic Animals and Anatomy of Domestic Animals Lab	4	
ANS 220 & ANS 221	Reproductive Physiology and Reproductive Physiology Lab	4	

ANS 230 & ANS 231	Animal Nutrition and Animal Nutrition Lab	4
Select one of the following Animal Management courses:		3
ANS 400	Companion Animal Management	
ANS 402	Beef Cattle Management	
ANS 403	Swine Management	
ANS 404	Dairy Cattle Management	
ANS 408	Small Ruminant Management	
ANS 410	Equine Breeding Farm Management	
ANS 411	Management of Growing and Performance Horses	
Animal Science Discipline Courses (p. 3)		6
Animal Science Electives (p. 4)		5
Select one of the following Economics courses:		3
ARE 201	Introduction to Agricultural & Resource Economics	
ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 202	Principles of Macroeconomics	
EC 205	Fundamentals of Economics	
<b>Science Option Requirements</b>		
Select one of the following Calculus I courses:		3
MA 121	Elements of Calculus	
MA 131	Calculus for Life and Management Sciences A	
MA 141	Calculus I	
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory	4

CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab	4
CH 223 & CH 224	Organic Chemistry II and Organic Chemistry II Lab	4
MB 351	General Microbiology	3
or MB 360	Scientific Inquiry in Microbiology: At the Bench	
Select one of the following Physics courses:		4
PY 131	Conceptual Physics	
PY 201	University Physics I	
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory	
PY 211	College Physics I	
<b>GEP Courses</b>		
ENG 101	Academic Writing and Research <sup>1</sup>	4
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http:// catalog.ncsu.edu/undergraduate/ gep-category-requirements/gep- humanities/</a> ) <sup>4</sup>		6
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http:// catalog.ncsu.edu/undergraduate/ gep-category-requirements/gep- social-sciences/</a> )		3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/ undergraduate/gep-category- requirements/gep-health-exercise- studies/</a> )		2
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/ undergraduate/gep-category- requirements/gep-interdisciplinary- perspectives/</a> )		5
GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/ undergraduate/gep-category- requirements/gep-usdei/</a> )		3
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http:// catalog.ncsu.edu/undergraduate/ gep-category-requirements/ gep-global-knowledge/</a> ) (verify requirement)		

Foreign Language Proficiency (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/>) (verify requirement)

#### CALS Group A, B, or C

Students who are planning to apply to a College of Veterinary Medicine should take BCH 451 (Principles of Biochemistry) and a business course (BUS, ARE, EC, or ACC prefix) to fill the A,B,C elective category. Many Graduate schools also require Biochemistry. Other students: take any courses from the College of Agriculture and Life Sciences Group A, Group B, or Group C electives.

CALS Group A, B, or C (p. 6)	9
------------------------------	---

#### Free Electives

Free Electives (12 Hr S/U Lmt) <sup>2,4</sup>	8
---	---

<b>Total Hours</b>	<b>120</b>
--------------------	------------

- <sup>1</sup> A grade of C- or higher is required.
- <sup>2</sup> Students should consult their academic advisors to determine which courses fill this requirement.
- <sup>3</sup> Students are required to take ANS 215 Agricultural Genetics or GN 311 Principles of Genetics . Students who choose to take both should take ANS 215 before GN 311. For students who choose to take both, ANS 215 will count as an Animal Science department elective or a CALS group A elective. Pre-vet students: GN 311 is a vet-school required course.
- <sup>4</sup> Students are encouraged to take an Ethics course as part of their Humanities, Additional Breadth, Interdisciplinary Perspectives, or Free Electives.

### Animal Science Discipline Elective

Code	Title	Hours	Counts towards
ANS 415	Comparative Nutrition	3	
ANS 425	Feed Manufacturing Technology	3	
ANS 440	Animal Genetic Improvement	3	
ANS 452	Comparative Reproductive Physiology and Biotechnology	3	
ANS 453	Physiology and Genetics of Growth and Development	3	
ANS 454	Lactation, Milk and Nutrition	3	
ANS 515	Comparative Nutrition	3	

ANS 525	Feed Manufacturing Technology	3
ANS 530		3
ANS 531		1
ANS 540	Animal Genetic Improvement	3
ANS 550	Applied Ruminant Nutrition	3
ANS 552	Comparative Reproductive Physiology and Biotechnology	3
ANS 553	Physiology and Genetics of Growth and Development	3
ANS 554	Lactation, Milk and Nutrition	3
ANS 561	Equine Nutrition	3
ANS 571	Regulation of Metabolism	3
ANS 575		3
ANS 590	Topical Problems in Animal Science	1-3
BCH 571	Regulation of Metabolism	3
FM 425	Feed Manufacturing Technology	3
FM 525	Feed Manufacturing Technology	3
NTR 415	Comparative Nutrition	3
NTR 419	Human Nutrition and Chronic Disease	3
NTR 425	Feed Manufacturing Technology	3
NTR 454	Lactation, Milk and Nutrition	3
NTR 515	Comparative Nutrition	3
NTR 525	Feed Manufacturing Technology	3
NTR 550	Applied Ruminant Nutrition	3
NTR 561	Equine Nutrition	3
PHY 452	Comparative Reproductive Physiology and Biotechnology	3

PHY 552	Comparative Reproductive Physiology and Biotechnology	3
PO 415	Comparative Nutrition	3
PO 425	Feed Manufacturing Technology	3
PO 515	Comparative Nutrition	3
PO 525	Feed Manufacturing Technology	3
VMP 420	Disease of Farm Animals	3

## Animal Science Electives

Code	Title	Hours	Counts towards
<b>Animal Science Electives</b>			
VMP 420	Disease of Farm Animals	3	
<b>Any ANS Courses Not Planned</b>			
AEE 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 105	Introduction to Companion Animal Science	3	
ANS 110	Introduction to Equine Science	3	
ANS 150	Introduction to Animal Science	3	
ANS 151	Introduction to Animal Science Lab	1	
ANS 201	Techniques of Animal Care	2	
ANS 205	Physiology of Domestic Animals	3	
ANS 206	Anatomy of Domestic Animals Lab	1	
ANS 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 215	Agricultural Genetics	3	
ANS 220	Reproductive Physiology	3	
ANS 221	Reproductive Physiology Lab	1	
ANS 230	Animal Nutrition	3	

ANS 231	Animal Nutrition Lab	1
ANS 240	Livestock Merchandising	3
ANS 240A	Livestock Merchandising	3
ANS 260	Basic Swine Science	2
ANS 261	Swine Health and Biosecurity	1
ANS 262	Swine Breeding and Gestation Management	1
ANS 263	Farrowing Management	1
ANS 264	Swine Nursery and Finishing Management	1
ANS 265	Contemporary Issues in the Swine Industry	1
ANS 266	Swine Environment Management	1
ANS 267	Swine Manure and Nutrient Management	1
ANS 268	Employee Management for the Swine Industry	1
ANS 269	Internship in the Swine Industry	1
ANS 270	Pork Export Markets from a Swine Production Perspective	1
ANS 271	Swine Nutrition	1
ANS 281	Professional Development of PreVeterinary Track Students	1
ANS 290	Professional Development for Animal Science Careers	2
ANS 303	Principles of Equine Evaluation	2
ANS 304	Dairy Cattle Evaluation	2
ANS 309	Livestock Evaluation	3
ANS 322	Muscle Foods and Eggs	3
ANS 324	Milk and Dairy Products	3

ANS 330	Laboratory Animal Science	3	ANS 553	Physiology and Genetics of Growth and Development	3
ANS 395	Animal Science Study Abroad	1-6	ANS 554	Lactation, Milk and Nutrition	3
ANS 400	Companion Animal Management	3	ANS 561	Equine Nutrition	3
ANS 402	Beef Cattle Management	3	ANS 571	Regulation of Metabolism	3
ANS 403	Swine Management	3	ANS 575		3
ANS 404	Dairy Cattle Management	3	ANS 590	Topical Problems in Animal Science	1-3
ANS 408	Small Ruminant Management	3	BCH 571	Regulation of Metabolism	3
ANS 410	Equine Breeding Farm Management	3	FM 425	Feed Manufacturing Technology	3
ANS 411	Management of Growing and Performance Horses	3	FM 525	Feed Manufacturing Technology	3
ANS 415	Comparative Nutrition	3	FS 322	Muscle Foods and Eggs	3
ANS 425	Feed Manufacturing Technology	3	FS 324	Milk and Dairy Products	3
ANS 440	Animal Genetic Improvement	3	FS 435	Food Safety Management Systems	3
ANS 452	Comparative Reproductive Physiology and Biotechnology	3	FS 535	Food Safety Management Systems	3
ANS 453	Physiology and Genetics of Growth and Development	3	HS 215	Agricultural Genetics	3
ANS 454	Lactation, Milk and Nutrition	3	NTR 415	Comparative Nutrition	3
ANS 495	Special Topics in Animal Science	1-3	NTR 419	Human Nutrition and Chronic Disease	3
ANS 515	Comparative Nutrition	3	NTR 425	Feed Manufacturing Technology	3
ANS 525	Feed Manufacturing Technology	3	NTR 454	Lactation, Milk and Nutrition	3
ANS 530		3	NTR 515	Comparative Nutrition	3
ANS 531		1	NTR 525	Feed Manufacturing Technology	3
ANS 540	Animal Genetic Improvement	3	NTR 550	Applied Ruminant Nutrition	3
ANS 550	Applied Ruminant Nutrition	3	NTR 561	Equine Nutrition	3
ANS 552	Comparative Reproductive Physiology and Biotechnology	3	PB 208	Agricultural Biotechnology: Issues and Implications	3

PHY 452	Comparative Reproductive Physiology and Biotechnology	3
PHY 552	Comparative Reproductive Physiology and Biotechnology	3
PO 322	Muscle Foods and Eggs	3
PO 415	Comparative Nutrition	3
PO 425	Feed Manufacturing Technology	3
PO 515	Comparative Nutrition	3
PO 525	Feed Manufacturing Technology	3

### CALS Group A, B, or C

Code	Title	Hours	Counts towards
<b>Group A - Biological Sciences</b>			
AEC 360	Ecology	4	
AEC 420	Introduction to Fisheries Science	3	
AEC 423	Introduction to Fisheries Sciences Laboratory	1	
AEE 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 105	Introduction to Companion Animal Science	3	
ANS 110	Introduction to Equine Science	3	
ANS 150	Introduction to Animal Science	3	
ANS 151	Introduction to Animal Science Lab	1	
ANS 205	Physiology of Domestic Animals	3	
ANS 206	Anatomy of Domestic Animals Lab	1	
ANS 208	Agricultural Biotechnology: Issues and Implications	3	
ANS 215	Agricultural Genetics	3	

ANS 220	Reproductive Physiology	3
ANS 221	Reproductive Physiology Lab	1
ANS 230	Animal Nutrition	3
ANS 231	Animal Nutrition Lab	1
ANS 415	Comparative Nutrition	3
ANS 452	Comparative Reproductive Physiology and Biotechnology	3
ANS 453	Physiology and Genetics of Growth and Development	3
ANS 454	Lactation, Milk and Nutrition	3
ANS 515	Comparative Nutrition	3
ANS 552	Comparative Reproductive Physiology and Biotechnology	3
ANS 553	Physiology and Genetics of Growth and Development	3
ANS 554	Lactation, Milk and Nutrition	3
BCH 101	Introduction to Microbiology and Biochemistry Laboratory Practices	3
BCH 220	Role of Biotechnology in Society	3
BCH 351	General Biochemistry	3
BCH 451	Principles of Biochemistry	4
BCH 452	Introductory Biochemistry Laboratory	2
BCH 453	Biochemistry of Gene Expression	3
BCH 454	Advanced Biochemistry Laboratory	4
BCH 455	Proteins and Molecular Mechanisms	3
BCH 553	Biochemistry of Gene Expression	3

BCH 555	Proteins and Molecular Mechanisms	3
BEC 463	Fermentation of Recombinant Microorganisms	2
BEC 563	Fermentation of Recombinant Microorganisms	2
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
BIO 267	Research in the Life Sciences I: Research Skills	3
BIO 414	Cell Biology	3
BIO 434	Hormones and Behavior	3
BIO 440	The Human Animal: An Evolutionary Perspective	3
BIT 410	Manipulation of Recombinant DNA	4
BIT 462		2
BIT 463	Fermentation of Recombinant Microorganisms	2
BIT 464	Protein Purification	2
BIT 466	Animal Cell Culture Techniques	2
BIT 467	PCR and DNA Fingerprinting	2
BIT 468		2
BIT 476	Applied Bioinformatics	2
BIT 481	Plant Tissue Culture and Transformation	2
BIT 501	Ethical Issues in Biotechnology	1
BIT 562		2
BIT 563	Fermentation of Recombinant Microorganisms	2
BIT 564	Protein Purification	2
BIT 566	Animal Cell Culture Techniques	2
BIT 567	PCR and DNA Fingerprinting	2
BIT 568		2

CHE 463	Fermentation of Recombinant Microorganisms	2
CHE 563	Fermentation of Recombinant Microorganisms	2
ENT 201	Insects and People	3
ENT 207	Insects and Human Disease	3
ENT 402	Forest Entomology	3
ENT 425	General Entomology	3
FOR 402	Forest Entomology	3
FS 231	Principles of Food and Bioprocess Engineering	4
FS 301	Introduction to Human Nutrition	3
FS 401	Advanced Nutrition and Metabolism	3
FS 402	Chemistry of Food and Bioprocessed Materials	4
FS 403	Analytical Techniques in Food & Bioprocessing Science	4
FS 405	Food Microbiology	3
FS 406	Food Microbiology Lab	1
FS 501	Advanced Nutrition and Metabolism	3
FS 502	Chemistry of Food and Bioprocessed Materials	4
FS 505	Food Microbiology	3
FS 506	Food Microbiology Lab	1
FW 313	Mountain Wildlife Ecology and Management	1
FW 353	Wildlife Management	3
FW 403	Urban Wildlife Management	3
FW 404	Wildlife Habitat Management	3

FW 453	Principles of Wildlife Science	4	PB 403	Systematic Botany	4
HS 215	Agricultural Genetics	3	PB 413	Plant Anatomy	2
MB 101	Introduction to Microbiology and Biochemistry Laboratory Practices	3	PB 421	Plant Physiology	3
MB 405	Food Microbiology	3	PB 445	Paleobotany	4
MB 406	Food Microbiology Lab	1	PB 464	Rare Plants of North Carolina	3
MB 505	Food Microbiology	3	PB 480	Introduction to Plant Biotechnology	3
MB 506	Food Microbiology Lab	1	PB 481	Plant Tissue Culture and Transformation	2
NTR 301	Introduction to Human Nutrition	3	PB 503	Systematic Botany	4
NTR 401	Advanced Nutrition and Metabolism	3	PB 513	Plant Anatomy	2
NTR 415	Comparative Nutrition	3	PB 545	Paleobotany	4
NTR 419	Human Nutrition and Chronic Disease	3	PB 564	Rare Plants of North Carolina	3
NTR 454	Lactation, Milk and Nutrition	3	PB 580	Introduction to Plant Biotechnology	3
NTR 501	Advanced Nutrition and Metabolism	3	PHY 452	Comparative Reproductive Physiology and Biotechnology	3
NTR 515	Comparative Nutrition	3	PHY 552	Comparative Reproductive Physiology and Biotechnology	3
PB 103	Perspectives on Botany	1	PO 415	Comparative Nutrition	3
PB 200	Plant Life	4	PO 466	Animal Cell Culture Techniques	2
PB 205	Our Green World	3	PO 515	Comparative Nutrition	3
PB 208	Agricultural Biotechnology: Issues and Implications	3	PO 566	Animal Cell Culture Techniques	2
PB 213	Plants and Civilization	3	PP 150	Introduction to Plant Molecular Biology	3
PB 215	Medicinal Plants	3	PP 222	Kingdom of Fungi	3
PB 219	Plants in Folklore, Myth, and religion	3	<b>Group A - Biological Sciences</b>		
PB 220	Local Flora	3	AEC 419	Freshwater Ecology	4
PB 250	Plant Biology	4	AEC 420	Introduction to Fisheries Science	3
PB 277	Space Biology	3	AEC 423	Introduction to Fisheries Sciences Laboratory	1
PB 321	Introduction to Whole Plant Physiology	3	AEC 441	Biology of Fishes	3
PB 360	Ecology	4	AEC 442	Biology of Fishes Laboratory	1
PB 400	Plant Diversity and Evolution	4			

AEC 460	Field Ecology and Methods	4
AEC 519	Freshwater Ecology	4
ANS 215	Agricultural Genetics	3
ANS 415	Comparative Nutrition	3
ANS 515	Comparative Nutrition	3
BEC 463	Fermentation of Recombinant Microorganisms	2
BEC 563	Fermentation of Recombinant Microorganisms	2
BIO 140	Survey of Animal Diversity	3
BIO 141	Animal Diversity Laboratory	1
BIO 227	Understanding Structural Diversity through Biological Illustration	3
BIO 315	General Parasitology	3
BIO 330	Evolutionary Biology	3
BIO 361	Developmental Biology	3
BIO 370	Developmental Anatomy of the Vertebrates	3
BIO 375	Developmental Anatomy Laboratory	2
BIO 405	Functional Histology	3
BIO 414	Cell Biology	3
BIO 424	Endocrinology	3
BIO 482	Capstone Course in Molecular, Cellular, and Developmental Biology	3
BIO 483	Capstone Course in Integrative Physiology and Neurobiology	3
BIO 484	Capstone Course in Human Biology	3
BIO 485	Capstone Course in Ecology, Evolution, and Conservation Biology	3
BIO 488	Neurobiology	3

BIO 588	Neurobiology	3
BIT 210	Phage Hunters	3
BIT 211	Phage Genomics	2
BIT 463	Fermentation of Recombinant Microorganisms	2
BIT 563	Fermentation of Recombinant Microorganisms	2
BME 301	Human Physiology : Electrical Analysis	4
BME 302	Human Physiology: Mechanical Analysis	4
CHE 463	Fermentation of Recombinant Microorganisms	2
CHE 563	Fermentation of Recombinant Microorganisms	2
CS 211	Plant Genetics	3
ENT 425	General Entomology	3
FS 301	Introduction to Human Nutrition	3
FS 405	Food Microbiology	3
FS 406	Food Microbiology Lab	1
FS 505	Food Microbiology	3
FS 506	Food Microbiology Lab	1
FW 353	Wildlife Management	3
GN 301	Genetics in Human Affairs	3
GN 311	Principles of Genetics	4
GN 312	Elementary Genetics Laboratory	1
GN 421	Molecular Genetics	3
GN 423	Population, Quantitative and Evolutionary Genetics	3
GN 425	Advanced Genetics Laboratory	2
GN 434	Genes and Development	3

GN 441	Human and Biomedical Genetics	3	MB 480	Current Issues in Microbiology	1
GN 451	Genome Science	3	MB 505	Food Microbiology	3
GN 490	Genetics Colloquium	1	MB 506	Food Microbiology Lab	1
GN 521	Molecular Genetics	3	MB 520	Fundamentals of Microbial Cell Biotransformations	2
GN 541	Human and Biomedical Genetics	3	MEA 200	Introduction to Oceanography	3
HS 215	Agricultural Genetics	3	MEA 210	Oceanography Lab	1
HS 451	Plant Nutrition	3	MEA 220	Marine Biology	3
HS 551	Plant Nutrition	3	MEA 250	Introduction to Coastal Environments	3
MB 180	Introduction to Microbial Bioprocessing	3	MEA 251	Introduction to Coastal Environments Laboratory	1
MB 200	The Fourth Horseman: Plagues that Changed the World	3	MEA 369	Life on Earth: Principles of Paleontology	3
MB 210	Phage Hunters	3	NTR 301	Introduction to Human Nutrition	3
MB 211	Phage Genomics	2	NTR 415	Comparative Nutrition	3
MB 351	General Microbiology	3	NTR 419	Human Nutrition and Chronic Disease	3
MB 352	General Microbiology Laboratory	1	NTR 420		3
MB 354	Inquiry-Guided Microbiology Lab	1	NTR 421	Life Cycle Nutrition	3
MB 405	Food Microbiology	3	NTR 490	Senior Capstone Experience in Nutrition	4
MB 406	Food Microbiology Lab	1	NTR 515	Comparative Nutrition	3
MB 411	Medical Microbiology	3	NTR 521	Life Cycle Nutrition	3
MB 412	Medical Microbiology Laboratory	1	PO 404	Avian Anatomy and Physiology	4
MB 414	Microbial Metabolic Regulation	3	PO 415	Comparative Nutrition	3
MB 420	Fundamentals of Microbial Cell Biotransformations	2	PO 504	Avian Anatomy and Physiology	4
MB 441	Immunology	3	PO 515	Comparative Nutrition	3
MB 451	Microbial Diversity	3	SSC 200	Soil Science	3
MB 452	Microbial Diversity Lab	2	SSC 201	Soil Science Laboratory	1
MB 455	Microbial Biotechnology	3	SSC 332	Environmental Soil Microbiology	3
MB 461	Molecular Virology	3	SSC 470	Wetland Soils	3
			SSC 570	Wetland Soils	3

ZO 233	Human-Animal Interactions	3
ZO 250	Animal Anatomy and Physiology	4
ZO 317	Primate Ecology and Evolution	3
ZO 333	Captive Animal Biology	3
ZO 350	Animal Phylogeny and Diversity	4
ZO 402	Invertebrate Biology	4
ZO 410	Introduction to Animal Behavior	3
ZO 486	Capstone Course in Zoology	3

**Group A - Biological Sciences**

BIT 100	Current Topics in Biotechnology	4
BIT 465	Real-time PCR Techniques	2
BIT 471	RNA Interference and Model Organisms	2
BIT 473	Protein Interactions	2
BIT 474	Plant Genetic Engineering	2
BIT 565	Real-time PCR Techniques	2
BIT 571	RNA Interference and Model Organisms	2
BIT 573	Protein Interactions	2
BIT 574	Plant Genetic Engineering	2
ENT 305	Introduction to Forensic Entomology	3

**Group A - Physical Sciences**

AEE 226	Computer Applications and Information Technology in Agricultural & Extension Ed	3
BAE 200	Computer Methods in Biological Engineering	2
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3

BMA 574	Mathematical Modeling of Physical and Biological Processes II	3
BUS 340	Information Systems Management	3
BUS 350	Economics and Business Statistics	3
CE 435	Engineering Geology	3
CE 479	Air Quality	3
CE 581	Fluid Mechanics in Natural Environments	3
CH 230	Computational Chemistry Lab I	1
CH 232	Computational Chemistry Lab II	1
CH 315	Quantitative Analysis	3
CH 316	Quantitative Analysis Laboratory	1
CH 331	Introductory Physical Chemistry	4
CH 401	Systematic Inorganic Chemistry I	3
CH 403	Systematic Inorganic Chemistry II	3
CH 415	Analytical Chemistry II	3
CH 431	Physical Chemistry I	3
CH 433	Physical Chemistry II	3
CH 435	Introduction to Quantum Chemistry	3
CH 437	Physical Chemistry for Engineers	4
CH 441	Forensic Chemistry	3
CH 442	Advanced Synthetic Techniques	4
CH 444	Advanced Synthetic Techniques II	4
CH 452	Advanced Measurement Techniques I	4

CH 454	Advanced Measurement Techniques II	4	CSC 295	Special Topics in Computer Science	1-3
CH 463	Molecular Origins of Life	3	CSC 302	Introduction to Numerical Methods	3
CH 563	Molecular Origins of Life	3	CSC 316	Data Structures and Algorithms	3
CSC 110	Computer Science Principles - The Beauty and Joy of Computing	3	CSC 326	Software Engineering	4
CSC 111	Introduction to Computing: Python	3	CSC 333	Automata, Grammars, and Computability	3
CSC 112	Introduction to Computing-FORTRAN	3	CSC 342	Applied Web-based Client-Server Computing	3
CSC 113	Introduction to Computing - MATLAB	3	CSC 379	Ethics in Computing	1
CSC 116	Introduction to Computing - Java	3	CSC 401	Data and Computer Communications Networks	3
CSC 200		3	CSC 402	Networking Projects	3
CSC 216	Software Development Fundamentals	3	CSC 405	Computer Security	3
CSC 217	Software Development Fundamentals Lab	1	CSC 406	Architecture Of Parallel Computers	3
CSC 226	Discrete Mathematics for Computer Scientists	3	CSC 411	Introduction to Artificial Intelligence	3
CSC 230	C and Software Tools	3	CSC 412	Compiler Construction	3
CSC 236	Computer Organization and Assembly Language for Computer Scientists	3	CSC 415	Software Security	3
CSC 246	Concepts and Facilities of Operating Systems for Computer Scientists	3	CSC 416	Introduction to Combinatorics	3
CSC 251	Web Page Development	1	CSC 417	Theory of Programming Languages	3
CSC 255	String Processing Languages	1	CSC 422	Automated Learning and Data Analysis	3
CSC 281	Foundations of Interactive Game Design	3	CSC 427	Introduction to Numerical Analysis I	3
			CSC 428	Introduction to Numerical Analysis II	3
			CSC 431	File Organization and Processing	3
			CSC 440	Database Management Systems	3
			CSC 442	Introduction to Data Science	3
			CSC 450	Web Services	3

CSC 453	Introduction to Internet of Things (IoT) Systems	3
CSC 454	Human-Computer Interaction	3
CSC 455	Social Computing and Decentralized Artificial Intelligence	3
CSC 456	Computer Architecture and Multiprocessors	3
CSC 461	Computer Graphics	3
CSC 462	Advanced Computer Graphics Projects	3
CSC 467	Multimedia Technology	3
CSC 474	Network Security	3
CSC 481	Game Engine Foundations	3
CSC 482	Advanced Computer Game Projects	3
CSC 484	Building Game AI	3
CSC 492	Senior Design Project	3
CSC 495	Special Topics in Computer Science	1-6
CSC 499	Independent Research in Computer Science	1-6
CSC 501	Operating Systems Principles	3
CSC 503	Computational Applied Logic	3
CSC 505	Design and Analysis Of Algorithms	3
CSC 506	Architecture Of Parallel Computers	3
CSC 510	Software Engineering	3
CSC 512	Compiler Construction	3
CSC 513	Electronic Commerce Technology	3
CSC 515	Software Security	3

CSC 517	Object-Oriented Design and Development	3
CSC 519	DevOps: Modern Software Engineering Practices	3
CSC 520	Artificial Intelligence I	3
CSC 522	Automated Learning and Data Analysis	3
CSC 530	Computational Methods for Molecular Biology	3
CSC 533	Privacy in the Digital Age	3
CSC 540	Database Management concepts and Systems	3
CSC 541	Advanced Data Structures	3
CSC 546	Management Decision and Control Systems	3
CSC 547	Cloud Computing Technology	3
CSC 548	Parallel Systems	3
CSC 554	Human-Computer Interaction	3
CSC 555	Social Computing and Decentralized Artificial Intelligence	3
CSC 561	Principles of Computer Graphics	3
CSC 562	Introduction to Game Engine Design	3
CSC 563	Visual Interfaces for Mobile Devices	3
CSC 565	Graph Theory	3
CSC 568	Enterprise Storage Architecture	3
CSC 570	Computer Networks	3
CSC 573	Internet Protocols	3
CSC 574	Computer and Network Security	3
CSC 575	Introduction to Wireless Networking	3

CSC 576	Networking Services: QoS, Signaling, Processes	3	ECE 577	Switched Network Management	3
CSC 577	Switched Network Management	3	ECE 579	Introduction to Computer Performance Modeling	3
CSC 579	Introduction to Computer Performance Modeling	3	ECG 528	Options and Derivatives Pricing	3
CSC 580	Numerical Analysis I	3	ET 320	Fundamentals of Air Pollution	3
CSC 582	Computer Models of Interactive Narrative	3	FIM 528	Options and Derivatives Pricing	3
CSC 583	Introduction to Parallel Computing	3	FIM 548	Monte Carlo Methods for Financial Math	3
CSC 584	Building Game AI	3	FIM 549	Financial Risk Analysis	3
CSC 591	Special Topics In Computer Science	1-6	GIS 582	Geospatial Modeling	3
E 531	Dynamic Systems and Multivariable Control I	3	ISE 441	Introduction to Simulation	3
ECE 406	Architecture Of Parallel Computers	3	ISE 505	Linear Programming	3
ECE 460	Embedded System Architectures	3	ISE 546	Management Decision and Control Systems	3
ECE 506	Architecture Of Parallel Computers	3	LOG 201	Logic	3
ECE 514	Random Processes	3	LOG 335	Symbolic Logic	3
ECE 517	Object-Oriented Design and Development	3	MA 105	Mathematics of Finance	3
ECE 547	Cloud Computing Technology	3	MA 205		3
ECE 560	Embedded System Architectures	3	MA 225	Foundations of Advanced Mathematics	3
ECE 570	Computer Networks	3	MA 242	Calculus III	4
ECE 573	Internet Protocols	3	MA 302	Numerical Applications to Differential Equations	1
ECE 574	Computer and Network Security	3	MA 303	Linear Analysis	3
ECE 575	Introduction to Wireless Networking	3	MA 305	Introductory Linear Algebra and Matrices	3
ECE 576	Networking Services: QoS, Signaling, Processes	3	MA 315	Mathematics Methods in Atmospheric Sciences	4
			MA 325	Introduction to Applied Mathematics	3
			MA 331	Differential Equations for the Life Sciences	3
			MA 335	Symbolic Logic	3

MA 341	Applied Differential Equations I	3	MA 450	Methods of Applied Mathematics I	3
MA 351	Introduction to Discrete Mathematical Models	3	MA 451	Methods of Applied Mathematics II	3
MA 401	Applied Differential Equations II	3	MA 491	Reading in Honors Mathematics	1-6
MA 402	Mathematics of Scientific Computing	3	MA 493	Special Topics in Mathematics	1-6
MA 403	Introduction to Modern Algebra	3	MA 494	Major Paper in Math	1
MA 405	Introduction to Linear Algebra	3	MA 499	Independent Research in Mathematics	1-6
MA 407	Introduction to Modern Algebra for Mathematics Majors	3	MA 501	Advanced Mathematics for Engineers and Scientists I	3
MA 408	Foundations of Euclidean Geometry	3	MA 502	Advanced Mathematics for Engineers and Scientists II	3
MA 410	Theory of Numbers	3	MA 504	Introduction to Mathematical Programming	3
MA 412	Long-Term Actuarial Models	3	MA 505	Linear Programming	3
MA 413	Short-Term Actuarial Models	3	MA 507	Survey of Real Analysis	3
MA 416	Introduction to Combinatorics	3	MA 508	Survey of Geometry	3
MA 421	Introduction to Probability	3	MA 509	Survey of Abstract Algebra	3
MA 425	Mathematical Analysis I	3	MA 510	Selected Topics In Mathematics For Secondary Teachers	1-6
MA 426	Mathematical Analysis II	3	MA 511	Advanced Calculus I	3
MA 427	Introduction to Numerical Analysis I	3	MA 512		3
MA 428	Introduction to Numerical Analysis II	3	MA 513	Introduction To Complex Variables	3
MA 430	Mathematical Models in the Physical Sciences	3	MA 515	Analysis I	3
MA 432	Mathematical Models in Life Sciences	3	MA 518	Geometry of Curves and Surfaces	3
MA 437	Applications of Algebra	3	MA 520	Linear Algebra	3
MA 440		3	MA 521	Abstract Algebra I	3
MA 444	Problem Solving Strategies for Competitions	1	MA 522	Computer Algebra	3
			MA 523	Linear Transformations and Matrix Theory	3

MA 524	Combinatorics I	3	MA 583	Introduction to Parallel Computing	3
MA 526	Mathematical Analysis II	3	MA 584	Numerical Solution of Partial Differential Equations--Finite Difference Methods	3
MA 528	Options and Derivatives Pricing	3	MA 587	Numerical Solution of Partial Differential Equations--Finite Element Method	3
MA 531	Dynamic Systems and Multivariable Control I	3	MA 591	Special Topics	1-6
MA 532	Ordinary Differential Equations I	3	MBA 528	Options and Derivatives Pricing	3
MA 534	Introduction To Partial Differential Equations	3	MEA 100	Earth System Science: Exploring the Connections	4
MA 537	Nonlinear Dynamics and Chaos	3	MEA 101	Geology I: Physical	3
MA 540	Uncertainty Quantification for Physical and Biological Models	3	MEA 110	Geology I Laboratory	1
MA 544	Computer Experiments In Mathematical Probability	3	MEA 130	Introduction to Weather and Climate	3
MA 546	Probability and Stochastic Processes I	3	MEA 135	Introduction to Weather and Climate Laboratory	1
MA 547	Stochastic Calculus for Finance	3	MEA 202	Geology II: Historical	3
MA 548	Monte Carlo Methods for Financial Math	3	MEA 211	Geology II Laboratory	1
MA 549	Financial Risk Analysis	3	MEA 300	Environmental Geology	4
MA 551	Introduction to Topology	3	MEA 312	Atmospheric Thermodynamics	4
MA 555	Introduction to Manifold Theory	3	MEA 315	Mathematics Methods in Atmospheric Sciences	4
MA 561	Set Theory and Foundations Of Mathematics	3	MEA 320	Fundamentals of Air Pollution	3
MA 565	Graph Theory	3	MEA 321	Fundamentals of Air Quality and Climate Change	3
MA 573	Mathematical Modeling of Physical and Biological Processes I	3	MEA 323	Geochemistry of Natural Waters	3
MA 574	Mathematical Modeling of Physical and Biological Processes II	3	MEA 409	Watershed Forensics	3
MA 580	Numerical Analysis I	3	MEA 410	Introduction to Mineralogy	4
			MEA 411	Marine Sediment Transport	3

MEA 412	Atmospheric Physics	3	MEA 469	Ecology of coastal Resources	3
MEA 415	Climate Dynamics	3	MEA 470	Introduction to Geophysics	3
MEA 421	Atmospheric Dynamics I	3	MEA 471	Exploration and Engineering Geophysics	3
MEA 422	Atmospheric Dynamics II	3	MEA 473	Principles of Chemical Oceanography	3
MEA 425	Introduction to Atmospheric Chemistry	3	MEA 476	Worldwide River and Delta Systems: Their Evolution and Human Impacts	3
MEA 440	Igneous and Metamorphic Petrology	4	MEA 479	Air Quality	3
MEA 443	Synoptic Weather Analysis and Forecasting	4	MEA 481	Geomorphology: Earth's Dynamic Surface	3
MEA 444	Mesoscale Analysis and Forecasting	4	MEA 485	Introduction to Hydrogeology	3
MEA 449	Principles of Biological Oceanography	3	MEA 488	Meteorology for Media	3
MEA 450	Introductory Sedimentology and Stratigraphy	4	MEA 493	Special Topics in MEAS	1-6
MEA 451	Structural Geology	4	MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
MEA 454	Marine Physical-Biological Interactions	3	MEA 498	Internship in MEAS	1-6
MEA 455	Micrometeorology	3	MEA 507	Discipline-based Education Research in the Geosciences	3
MEA 458	Introduction to Tropical Meteorology	3	MEA 510	Air Pollution Meteorology	3
MEA 459	Field Investigation of Coastal Processes	5	MEA 511	Introduction to Meteorological Remote Sensing	3
MEA 460	Principles of Physical Oceanography	3	MEA 514	Advanced Physical Meteorology	3
MEA 462	Observational Methods and Data Analysis in Marine Physics	3	MEA 515	Climate Dynamics	3
MEA 463	Fluid Physics	3	MEA 517	Fundamentals of Climate Change Science	3
MEA 464	Ocean Circulation Systems	3	MEA 518	Adaptation to Climate Change	3
MEA 465	Geologic Field Camp	4	MEA 519	Barriers to Climate Change Literacy	3
MEA 466	Preparatory Course for Field Camp	1	MEA 525	Introduction to Atmospheric Chemistry	3
MEA 467	Marine Meteorology	3			

MEA 540	Principles of Physical Oceanography	3	OR 579	Introduction to Computer Performance Modeling	3
MEA 549	Principles of Biological Oceanography	3	PSY 240	Introduction to Behavioral Research I	3
MEA 553	Estuarine Biogeochemistry	3	PSY 241	Introduction to Behavioral Research I Lab	1
MEA 554	Marine Physical-Biological Interactions	3	PSY 242	Introduction to Behavioral Research II	3
MEA 562	Marine Sediment Transport	3	PSY 243	Introduction to Behavioral Research II Lab	2
MEA 570	Geological Oceanography	3	PY 414	Electromagnetism I	3
MEA 573	Principles of Chemical Oceanography	3	PY 415	Electromagnetism II	3
MEA 574	Advanced Igneous Petrology	3	PY 514	Electromagnetism I	3
MEA 577	Electron Microprobe Analysis of Geologic Material	2	PY 515	Electromagnetism II	3
MEA 579	Principles of Air Quality Engineering	3	ST 350	Economics and Business Statistics	3
MEA 580	Air Quality Modeling and Forecasting	4	ST 412	Long-Term Actuarial Models	3
MEA 581	Fluid Mechanics in Natural Environments	3	ST 413	Short-Term Actuarial Models	3
MEA 582	Geospatial Modeling	3	ST 442	Introduction to Data Science	3
MEA 585	Physical Hydrogeology	3	ST 546	Probability and Stochastic Processes I	3
MEA 591	Special Topics in Marine Science	1-6	<b>Group A - Physical Sciences</b>		
MEA 592	Special Topics in Earth Sciences	1-6	BME 201	Computer Methods in Biomedical Engineering	3
MEA 593	Special Topics in Atmospheric Science	1-6	CSC 442	Introduction to Data Science	3
MEA 599	Regional Geology of North America	1-6	EC 351	Econometrics I	3
OR 504	Introduction to Mathematical Programming	3	ECE 489	Solid State Solar and Thermal Energy Harvesting	3
OR 505	Linear Programming	3	ECE 589	Solid State Solar and Thermal Energy Harvesting	3
OR 531	Dynamic Systems and Multivariable Control I	3	ECG 561	Applied Econometrics I	3
OR 565	Graph Theory	3	EMS 519	Teaching and Learning of Statistical Thinking	3

GPH 404	Epidemiology and Statistics in Global Public Health	3
MA 412	Long-Term Actuarial Models	3
MA 413	Short-Term Actuarial Models	3
MA 546	Probability and Stochastic Processes I	3
MA 555	Introduction to Manifold Theory	3
MEA 150	Environmental Issues in Water Resources	4
MEA 463	Fluid Physics	3
MSE 489	Solid State Solar and Thermal Energy Harvesting	3
MSE 589	Solid State Solar and Thermal Energy Harvesting	3
NE 528	Introduction to Plasma Physics and Fusion Energy	3
NE 529	Plasma Physics and Fusion Energy II	3
PSY 240	Introduction to Behavioral Research I	3
PSY 241	Introduction to Behavioral Research I Lab	1
PSY 242	Introduction to Behavioral Research II	3
PSY 243	Introduction to Behavioral Research II Lab	2
PY 123	Stellar and Galactic Astronomy	3
PY 124	Solar System Astronomy	3
PY 125	Astronomy Laboratory	1
PY 131	Conceptual Physics	4
PY 203	University Physics III	4
PY 301	Introduction to Quantum Mechanics	3

PY 328	Stellar and Galactic Astrophysics	3
PY 341	Relativity, Gravitation and Cosmology	3
PY 401	Quantum Physics I	3
PY 402	Quantum Physics II	3
PY 407	Introduction to Modern Physics	3
PY 411	Mechanics I	3
PY 412	Mechanics II	3
PY 413	Thermal Physics	3
PY 414	Electromagnetism I	3
PY 415	Electromagnetism II	3
PY 452	Advanced Physics Laboratory	3
PY 489	Solid State Solar and Thermal Energy Harvesting	3
PY 495	Special Topics in Physics	1-4
PY 499	Independent Research in Physics	1-6
PY 501	Quantum Physics I	3
PY 502	Quantum Physics II	3
PY 506	Nuclear and Subatomic Physics	3
PY 507	Elementary Particle Physics	3
PY 509	General Relativity	3
PY 511	Mechanics I	3
PY 512	Mechanics II	3
PY 514	Electromagnetism I	3
PY 515	Electromagnetism II	3
PY 516	Physical Optics	3
PY 517	Atomic and Molecular Physics	3
PY 519	Biological Physics	3
PY 525	Computational Physics	3

PY 528	Introduction to Plasma Physics and Fusion Energy	3	ST 413	Short-Term Actuarial Models	3
PY 529	Plasma Physics and Fusion Energy II	3	ST 421	Introduction to Mathematical Statistics I	3
PY 543	Astrophysics	3	ST 422	Introduction to Mathematical Statistics II	3
PY 552	Condensed Matter Physics I	3	ST 430	Introduction to Regression Analysis	3
PY 570	Polymer Physics	3	ST 431	Introduction to Experimental Design	3
PY 581	Matter & Interactions for Teachers I	3	ST 432	Introduction to Survey Sampling	3
PY 582	Matter & Interactions for Teachers II	3	ST 433	Applied Spatial Statistics	3
PY 589	Solid State Solar and Thermal Energy Harvesting	3	ST 434	Applied Time Series	3
PY 590	Special Topics In Physics	1-6	ST 435	Statistical Methods for Quality and Productivity Improvement	3
PY 599	Special Topics in Physics	1-6	ST 437	Applied Multivariate and Longitudinal Data Analysis	3
SSC 200	Soil Science	3	ST 440	Applied Bayesian Analysis	3
SSC 201	Soil Science Laboratory	1	ST 442	Introduction to Data Science	3
ST 311	Introduction to Statistics	3	ST 445	Introduction to Statistical Computing and Data Management	3
ST 312	Introduction to Statistics II	3	ST 446	Intermediate SAS Programming with Applications	3
ST 370	Probability and Statistics for Engineers	3	ST 491	Statistics in Practice	3
ST 371	Introduction to Probability and Distribution Theory	3	ST 495	Special Topics in Statistics	1-6
ST 372	Introduction to Statistical Inference and Regression	3	ST 498	Independent Study In Statistics	1-6
ST 380	Probability and Statistics for the Physical Sciences	3	ST 501	Fundamentals of Statistical Inference I	3
ST 401	Experiences in Data Analysis	4	ST 502	Fundamentals of Statistical Inference II	3
ST 404	Epidemiology and Statistics in Global Public Health	3	ST 503	Fundamentals of Linear Models and Regression	3
ST 405	Applied Nonparametric Statistics	3			
ST 412	Long-Term Actuarial Models	3			

ST 505	Applied Nonparametric Statistics	3
ST 506		3
ST 507	Statistics For the Behavioral Sciences I	3
ST 508		3
ST 511	Statistical Methods For Researchers I	3
ST 512	Statistical Methods For Researchers II	3
ST 513	Statistics for Management and Social Sciences I	3
ST 514	Statistics For Management and Social Sciences II	3
ST 515	Experimental Statistics for Engineers I	3
ST 516	Experimental Statistics For Engineers II	3
ST 517	Applied Statistical Methods I	3
ST 519	Teaching and Learning of Statistical Thinking	3
ST 520	Statistical Principles of Clinical Trials	3
ST 524		3
ST 533	Applied Spatial Statistics	3
ST 534	Applied Time Series	3
ST 535	Statistical Methods for Quality and Productivity Improvement	3
ST 537	Applied Multivariate and Longitudinal Data Analysis	3
ST 540	Applied Bayesian Analysis	3
ST 542	Statistical Practice	3
ST 544	Applied Categorical Data Analysis	3

ST 546	Probability and Stochastic Processes I	3
ST 555	Statistical Programming I	3
ST 556	Statistical Programming II	3
ST 557		3
ST 558	Data Science for Statisticians	3
ST 561	Applied Econometrics I	3
ST 562	Data Mining with SAS Enterprise Miner	3
ST 563	Introduction to Statistical Learning	3
ST 590	Special Topics	1-6
ST 701	Statistical Theory I	3
ST 702	Statistical Theory II	3
ST 705	Linear Models and Variance Components	3
TE 570	Polymer Physics	3
<b>Group B - Economics &amp; Business</b>		
ACC 210	Concepts of Financial Reporting	3
ACC 220	Introduction to Managerial Accounting	3
ACC 280	Survey of Financial and Managerial Accounting	3
ACC 310	Intermediate Financial Accounting I	3
ACC 311	Intermediate Financial Accounting II	3
ACC 330	An Introduction To Income Taxation	3
ACC 340	Accounting Information Systems	3
ACC 411	Business Valuation	3
ACC 420	Cost Accounting for Effective Management	3

ACC 440	Enterprise Resource Planning Systems	3	BUS 370	Operations and Supply Chain Management	3
ACC 450	Auditing and Assurance Services	3	BUS 420	Financial Management of Corporations	3
ACC 451	Internal Auditing	3	BUS 422	Investments and Portfolio Management	3
ACC 460	Governmental and Nonprofit Accounting	3	BUS 425	Advanced Personal Financial Management	3
ARE 215	Small Business Accounting	3	BUS 426	International Financial Management	3
ARE 301	Intermediate Microeconomics	3	BUS 440	Database Management	3
ARE 303	Farm Management	3	BUS 441	Business Data Communications and Networking	3
ARE 304	Agribusiness Management	3	BUS 442	Information Systems Development	3
ARE 306	Agricultural Law	3	BUS 443	Web Development for Business Applications	3
ARE 309	Environmental Law & Economic Policy	3	BUS 444	Systems Analysis and Design	3
ARE 311	Agricultural Markets	3	BUS 461	Channel and Retail Marketing	3
ARE 312	Agribusiness Marketing	3	BUS 462	Marketing Research	3
ARE 321	Agricultural Financial Management	3	BUS 464	International Marketing	3
ARE 336	Introduction to Resource and Environmental Economics	3	BUS 465	Traditional and Digital Brand Promotion	3
ARE 345	Global Agribusiness Management	3	BUS 466	Personal Selling	3
ARE 404	Advanced Agribusiness Management	3	BUS 467	Product and Brand Management	3
ARE 413	Applied Agribusiness Marketing	3	BUS 468	Marketing Strategy	3
ARE 433	U.S. Agricultural Policy	3	BUS 469	Digital Marketing Practicum	3
ARE 490	Career Seminar in Agriculture & Resource Economics	1	BUS 470	Operations Modeling and Analysis	3
BUS 225	Personal Finance	3	BUS 472	Operations Planning and Control Systems	3
BUS 320	Financial Management	3	BUS 473	Supply Chain Strategy	3
BUS 340	Information Systems Management	3	BUS 475	Purchasing and Supply Management	3
BUS 360	Marketing Methods	3			

BUS 479	Supply Chain Management Undergraduate Practicum	3	ARE 412	Advanced Agribusiness Marketing	3
EC 301	Intermediate Microeconomics	3	BUS 340	Information Systems Management	3
EC 336	Introduction to Resource and Environmental Economics	3	BUS 449	Information Technology Capstone	3
FTM 482	Global Brand Management in Textiles and Apparel	3	BUS 474	Logistics Management	3
M 100	Personal and Professional Identity Development	1	EC 202	Principles of Macroeconomics	3
MIE 201	Introduction to Business Processes	3	EC 301	Intermediate Microeconomics	3
MIE 305	Legal and Regulatory Environment	3	EC 302	Intermediate Macroeconomics	3
MIE 330	Human Resource Management	3	EC 305	A Closer Look at Capitalism	3
MIE 335	Organizational Behavior	3	EC 336	Introduction to Resource and Environmental Economics	3
MIE 432	Labor and Employee Relations	3	EC 348	Introduction to International Economics	3
MIE 434	Compensation Systems	3	EC 351	Econometrics I	3
MIE 435	Leadership and Management	3	EC 404	Money, Financial Markets, and the Economy	3
MIE 436	Training and Development	3	EC 410	Public Finance	3
MIE 438	Staffing	3	EC 413	Industrial Organization	3
MIE 480	Business Policy and Strategy	3	EC 431	Labor Economics	3
PRT 406	Sports Law	3	EC 437		3
<b>Group B - Economics &amp; Business</b>			EC 449	International Finance	3
ACC 220	Introduction to Managerial Accounting	3	EC 451	Econometrics II	3
ACC 280	Survey of Financial and Managerial Accounting	3	EC 474	Economics of Financial Institutions and Markets	3
ARE 301	Intermediate Microeconomics	3	EC 480		3
ARE 332	Human Resource Management for Agribusiness	3	EC 490	Research Seminar in Economics	3
ARE 336	Introduction to Resource and Environmental Economics	3	FTM 482	Global Brand Management in Textiles and Apparel	3
			MIE 412	Finance and Accounting for Entrepreneurs	3
			MIE 413	New Venture Planning	3
			MIE 419	Entrepreneurship Practicum	3

PRT 406	Sports Law	3	AEE 427	Student Teaching in Agriculture	8
<b>Group C - Applied Sci &amp; Tech</b>			AEE 433	Leadership and Management of Volunteers in Agricultural and Extension Education	3
AEE 101	Introduction to Career and Technical Education	1	AEE 435	Professional Presentations in Agricultural Organizations	3
AEE 208	Agricultural Biotechnology: Issues and Implications	3	AEE 460	Organizational Leadership Development in Agriculture and Life Sciences	3
AEE 230	Introduction to Cooperative Extension	3	AEE 478	Advanced Issues in Extension Education	3
AEE 303	Administration and Supervision of Student Organizations	3	AEE 490	Seminar in Agricultural and Extension Education	1
AEE 311	Communication Methods and Media	3	AEE 533	Leadership and Management of Volunteers in Agricultural and Extension Education	3
AEE 322	Experiential Learning in Agriculture	3	BAET 201	Shop Processes and Management	3
AEE 323	Leadership Development in Agriculture and Life Sciences	3	BAET 323	Water Management	3
AEE 325	Planning and Delivering Non-Formal Education	3	BAET 332	Management of Animal Environments	4
AEE 326	Teaching Diverse Learners in AED	3	BAET 333	Processing Agricultural Products	4
AEE 327	Conducting Summer Programs in Agricultural Education	1	BAET 343	Agricultural Electrification	4
AEE 350	Personal Leadership Development in Agriculture and Life Sciences	3	BAET 411	Agricultural Machinery and Power Units	4
AEE 360	Developing Team Leadership in Agriculture and Life Sciences	3	BAET 432	Agricultural and Environmental Safety and Health	3
AEE 423	Practicum in Agricultural Extension/ Industry	8	BAET 443	Environmental Restoration Implementation	3
AEE 424	Planning Agricultural Educational Programs	3	ALS 110	Academic and Career Skills Seminar	1
AEE 426	Methods of Teaching Agriculture	3	ANS 105	Introduction to Companion Animal Science	3

ANS 110	Introduction to Equine Science	3
ANS 150	Introduction to Animal Science	3
ANS 151	Introduction to Animal Science Lab	1
ANS 201	Techniques of Animal Care	2
ANS 208	Agricultural Biotechnology: Issues and Implications	3
ANS 225	Principles of Animal Nutrition	3
ANS 303	Principles of Equine Evaluation	2
ANS 304	Dairy Cattle Evaluation	2
ANS 309	Livestock Evaluation	3
ANS 322	Muscle Foods and Eggs	3
ANS 324	Milk and Dairy Products	3
ANS 400	Companion Animal Management	3
ANS 402	Beef Cattle Management	3
ANS 403	Swine Management	3
ANS 404	Dairy Cattle Management	3
ANS 408	Small Ruminant Management	3
ANS 410	Equine Breeding Farm Management	3
ANS 425	Feed Manufacturing Technology	3
ANS 440	Animal Genetic Improvement	3
ANS 453	Physiology and Genetics of Growth and Development	3
ANS 454	Lactation, Milk and Nutrition	3
ANS 525	Feed Manufacturing Technology	3
ANS 540	Animal Genetic Improvement	3

ANS 553	Physiology and Genetics of Growth and Development	3
ANS 554	Lactation, Milk and Nutrition	3
BAE 100	Introduction to Biological and Agricultural Engineering and Technology	1
BAE 202	Introduction to Biological and Agricultural Engineering Methods	4
BAE 302	Transport Phenomena	3
BAE 322	Introduction to Food Process Engineering	3
BAE 361	Analytical Methods in Engineering Design	3
BAE 371	Fundamentals of Hydrology for Engineers	3
BAE 401	Sensors and Controls	3
BAE 435	Precision Agriculture Technology	3
BAE 451	Engineering Design I	2
BAE 452	Engineering Design II	2
BAE 462	Machinery Design and Applications	3
BAE 472	Irrigation and Drainage	3
BAE 473	Introduction to Hydrologic and Water Quality Modeling	3
BAE 474	Principles and Applications of Ecological Engineering	3
BAE 481	Structures & Environment	3
BAE 501	Sensors and Controls	3
BAE 535	Precision Agriculture Technology	3

BAE 572	Irrigation and Drainage	3	FS 535	Food Safety Management Systems	3
BAE 573	Introduction to Hydrologic and Water Quality Modeling	3	MSE 203		3
BEC 330	Principles and Applications of Bioseparations	2	NTR 425	Feed Manufacturing Technology	3
BEC 436	Introduction to Downstream Process Development	2	NTR 454	Lactation, Milk and Nutrition	3
BEC 440		3	NTR 525	Feed Manufacturing Technology	3
BEC 536	Introduction to Downstream Process Development	2	PB 208	Agricultural Biotechnology: Issues and Implications	3
BEC 540		3	PO 322	Muscle Foods and Eggs	3
BME 203		3	PO 425	Feed Manufacturing Technology	3
BME 207	Biomedical Electronics	4	PO 525	Feed Manufacturing Technology	3
BME 342		3	PP 470	Advanced Turfgrass Pest Management	2
BME 365	Linear Systems in Biomedical Engineering	3	SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
BME 385	Bioinstrumentation	3	SSC 473	Introduction to Hydrologic and Water Quality Modeling	3
BME 412	Biomedical Signal Processing	3	SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
BME 425	Bioelectricity	3	SSC 573	Introduction to Hydrologic and Water Quality Modeling	3
BME 525	Bioelectricity	3	USC 291	Service Learning Program Leader Development I	1
CS 470	Advanced Turfgrass Pest Management	2	USC 292	Service Learning Program Leader Development II	2
ECI 424	Student Teaching in Modern Foreign Languages	12	<b>Group C - Applied Sci &amp; Tech</b>		
ENT 470	Advanced Turfgrass Pest Management	2	AEC 420	Introduction to Fisheries Science	3
FM 425	Feed Manufacturing Technology	3	AEE 206	Introduction to Teaching Agriculture	3
FM 525	Feed Manufacturing Technology	3			
FS 322	Muscle Foods and Eggs	3			
FS 324	Milk and Dairy Products	3			
FS 435	Food Safety Management Systems	3			

AEE 303	Administration and Supervision of Student Organizations	3
AEE 322	Experiential Learning in Agriculture	3
AEE 327	Conducting Summer Programs in Agricultural Education	1
AEE 424	Planning Agricultural Educational Programs	3
AEE 426	Methods of Teaching Agriculture	3
AEE 427	Student Teaching in Agriculture	8
ANS 322	Muscle Foods and Eggs	3
ANS 324	Milk and Dairy Products	3
ANS 330	Laboratory Animal Science	3
ANS 411	Management of Growing and Performance Horses	3
ANS 425	Feed Manufacturing Technology	3
ANS 525	Feed Manufacturing Technology	3
BAE 325	Introductory Geomatics	3
BAE 425	Industrial Microbiology and Bioprocessing	3
BAE 525	Industrial Microbiology and Bioprocessing	3
BAE 535	Precision Agriculture Technology	3
BBS 201	Introduction to Biopharmaceutica Science	3
BBS 301	Process Validation Science	3
BBS 426	Upstream Biomanufacturing Laboratory	2

BBS 526	Upstream Biomanufacturing Laboratory	2
BCH 220	Role of Biotechnology in Society	3
BEC 426	Upstream Biomanufacturing Laboratory	2
BEC 483	Tissue Engineering Technologies	2
BEC 526	Upstream Biomanufacturing Laboratory	2
BEC 583	Tissue Engineering Technologies	2
BME 375	Biomedical Microcontroller Applications	3
BME 444	Orthopaedic Biomechanics	3
BME 451	BME Senior Design: Product Development	3
BME 452	BME Senior Design: Product Implementation and Strategy	3
BME 466	Polymeric Biomaterials Engineering	3
BME 467	Mechanics of Tissues & Implants Requirements	3
BME 483	Tissue Engineering Technologies	2
BME 484	Fundamentals of Tissue Engineering	3
BME 544	Orthopaedic Biomechanics	3
BME 566	Polymeric Biomaterials Engineering	3
BME 583	Tissue Engineering Technologies	2
BME 584	Fundamentals of Tissue Engineering	3
CS 200	Introduction to Turfgrass Management	4

CS 210	Lawns and Sports Turf	3	FM 425	Feed Manufacturing Technology	3
CS 213	Crop Science	3	FM 460	Feed Mill Operations and Leadership	3
CS 216	Southern Row Crop Production - Cotton, Peanuts, and Tobacco	3	FM 480	Feed Quality Assurance & Formulation	3
CS 218	Southern Row Crop Production - Corn, Small Grains and Soybeans	3	FM 490	Feed Science Seminar	1
CS 230	Introduction to Agroecology	3	FM 525	Feed Manufacturing Technology	3
CS 312		3	FOR 318	Forest Pathology	3
CS 400	Turf Cultural Systems	3	FOR 420	Watershed and Wetlands Hydrology	4
CS 411	Crop Ecology	3	FOR 472	Forest Soils	4
CS 413	Plant Breeding	2	FOR 520	Watershed and Wetlands Hydrology	4
CS 414	Weed Science	4	FS 201	Introduction to Food Science	3
CS 415	Integrated Pest Management	3	FS 290	Careers in Food and Bioprocessing Sciences	1
CS 424	Seed Physiology	3	FS 322	Muscle Foods and Eggs	3
CS 430	Advanced Agroecology	4	FS 324	Milk and Dairy Products	3
CS 465	Turf Management Systems and Environmental Quality	3	FS 330	Science of Food Preparation	3
CS 524	Seed Physiology	3	FS 352	Introduction to Microbiological Food Safety Hazards	3
CS 565	Turf Management Systems and Environmental Quality	3	FS 354	Food Sanitation	3
CSSC 490	Senior Seminar in Crop Science and Soil Science	1	FS 416	Quality Control in Food and Bioprocessing	3
ECL 424	Student Teaching in Modern Foreign Languages	12	FS 421	Food Preservation	3
ENT 203	An Introduction to the Honey Bee and Beekeeping	3	FS 426	Upstream Biomanufacturing Laboratory	2
ENT 401	Honey Bee Biology and Management	3	FS 435	Food Safety Management Systems	3
ES 100	Introduction to Environmental Sciences	3	FS 453	Food Laws and Regulations	3
ES 200	Climate Change and Sustainability	3	FS 462	Postharvest Physiology	3
ES 300	Energy and Environment	3			
ES 400	Analysis of Environmental Issues	3			

FS 475	Problems and Design in Food and Bioprocessing Science	3	FW 565	African Ecology and Conservation	4
FS 516	Quality Control in Food and Bioprocessing	3	GPH 201	Fundamentals of Global Public Health	3
FS 521	Food Preservation	3	HS 432	Introduction to Permaculture	3
FS 526	Upstream Biomanufacturing Laboratory	2	HS 462	Postharvest Physiology	3
FS 535	Food Safety Management Systems	3	HS 532	Introduction to Permaculture	3
FS 553	Food Laws and Regulations	3	HS 562	Postharvest Physiology	3
FS 562	Postharvest Physiology	3	IDS 303	Humans and the Environment	3
FW 221	Conservation of Natural Resources	3	NR 303	Humans and the Environment	3
FW 311	Piedmont Wildlife Ecology and Management	3	NR 350	International Sustainable Resource Use	4
FW 312	Fisheries Techniques and Management	1	NR 406	Conservation of Biological Diversity	3
FW 313	Mountain Wildlife Ecology and Management	1	NR 420	Watershed and Wetlands Hydrology	4
FW 314	Coastal Ecology and Management	1	NR 460	Renewable Natural Resource Management and Policy	3
FW 353	Wildlife Management	3	NR 520	Watershed and Wetlands Hydrology	4
FW 403	Urban Wildlife Management	3	NR 560	Renewable Natural Resource Management and Policy	3
FW 411	Human Dimensions of Wildlife and Fisheries	3	NTR 425	Feed Manufacturing Technology	3
FW 453	Principles of Wildlife Science	4	NTR 525	Feed Manufacturing Technology	3
FW 460	International Wildlife Management and Conservation	3	PO 322	Muscle Foods and Eggs	3
FW 465	African Ecology and Conservation	4	PO 424	Poultry Meat Production	3
FW 511	Human Dimensions of Wildlife and Fisheries	3	PO 425	Feed Manufacturing Technology	3
FW 560	International Wildlife Management and Conservation	3	PO 435	Poultry Incubation & Breeding	4
			PO 525	Feed Manufacturing Technology	3
			PP 318	Forest Pathology	3

SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3	BME 398	Biomedical Engineering Design and Manufacturing II	2
SSC 462	Soil-Crop Management Systems	3	CS 470	Advanced Turfgrass Pest Management	2
SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3	CSSC 490	Senior Seminar in Crop Science and Soil Science	1
TE 466	Polymeric Biomaterials Engineering	3	ENT 470	Advanced Turfgrass Pest Management	2
TE 467	Mechanics of Tissues & Implants Requirements	3	FM 425	Feed Manufacturing Technology	3
TE 566	Polymeric Biomaterials Engineering	3	FM 525	Feed Manufacturing Technology	3
VMP 401	Poultry Diseases	4	FOR 318	Forest Pathology	3
VMP 420	Disease of Farm Animals	3	FOR 420	Watershed and Wetlands Hydrology	4
<b>Group C - Applied Sci &amp; Tech</b>			FOR 472	Forest Soils	4
AEC 419	Freshwater Ecology	4	FOR 520	Watershed and Wetlands Hydrology	4
AEC 423	Introduction to Fisheries Sciences Laboratory	1	FS 322	Muscle Foods and Eggs	3
AEC 519	Freshwater Ecology	4	FS 435	Food Safety Management Systems	3
BAET 323	Water Management	3	FS 462	Postharvest Physiology	3
ANS 322	Muscle Foods and Eggs	3	FS 535	Food Safety Management Systems	3
ANS 425	Feed Manufacturing Technology	3	FS 562	Postharvest Physiology	3
ANS 525	Feed Manufacturing Technology	3	FW 221	Conservation of Natural Resources	3
BIO 227	Understanding Structural Diversity through Biological Illustration	3	FW 404	Wildlife Habitat Management	3
BME 204		3	FW 460	International Wildlife Management and Conservation	3
BME 217	Biomedical Electronics Laboratory	1	FW 560	International Wildlife Management and Conservation	3
BME 298	Biomedical Engineering Design and Manufacturing I	2	HS 200	Home Horticulture	3
			HS 201	The World of Horticulture: Principles and Practices	3

HS 203	Home Plant Propagation	3	HS 523	Viticulture	3
HS 242	Introduction to Small Scale Landscape Design	3	HS 562	Postharvest Physiology	3
HS 250	Home Landscape Design: Creating Garden Spaces	3	IDS 303	Humans and the Environment	3
HS 252	Landscape Graphic Communication	2	NR 300	Natural Resource Measurements	4
HS 272	Landscape Design/Build	6	NR 303	Humans and the Environment	3
HS 290	Horticulture: Careers and Opportunities	1	NR 400	Natural Resource Management	4
HS 301	Plant Propagation	4	NR 420	Watershed and Wetlands Hydrology	4
HS 302	Gardening with Herbaceous Perennials	3	NR 421	Wetland Science and Management	3
HS 303	Ornamental Plant Identification I	3	NR 460	Renewable Natural Resource Management and Policy	3
HS 304	Ornamental Plant Identification II	3	NR 484	Environmental Impact Assessment	4
HS 357	Landscape Grading and Drainage	4	NR 500	Natural Resource Management	4
HS 400	Residential Landscaping	6	NR 520	Watershed and Wetlands Hydrology	4
HS 411	Nursery Management	3	NR 521	Wetland Science and Management	3
HS 416	Planting Design	4	NR 560	Renewable Natural Resource Management and Policy	3
HS 421	Temperate-Zone Tree Fruits: Physiology and Culture	3	NTR 420		3
HS 422	Small Fruit Production	3	NTR 425	Feed Manufacturing Technology	3
HS 423	Viticulture	3	NTR 525	Feed Manufacturing Technology	3
HS 431	Vegetable Production	4	PO 201	Poultry Science and Production	3
HS 440	Greenhouse Management	3	PO 201A	Poultry Science and Production	3
HS 442	Floriculture Crop Production	3	PO 202	Poultry Science and Production Laboratory	1
HS 462	Postharvest Physiology	3	PO 202A	Poultry Science and Production Laboratory	1
HS 471	Landscape Ecosystem Management	4	PO 290	Poultry Seminar	1
HS 516	Planting Design	4	PO 322	Muscle Foods and Eggs	3
HS 521	Temperate-Zone Tree Fruits: Physiology and Culture	3			

PO 340	Live Poultry and Poultry Product Evaluation, Grading, and Inspection	3
PO 410	Production and Management of Game Birds in Confinement	3
PO 411	Agrosecurity	3
PO 421	Commercial Egg Production	3
PO 425	Feed Manufacturing Technology	3
PO 433	Poultry Processing and Products	3
PO 525	Feed Manufacturing Technology	3
PO 533	Poultry Processing and Products	3
PP 315	Principles of Plant Pathology	4
PP 318	Forest Pathology	3
PP 470	Advanced Turfgrass Pest Management	2
SSC 185	Land and Life	3
SSC 341	Soil Fertility and Nutrient Management	3
SSC 342	Soil and Plant Nutrient Analysis	1
SSC 421	Role of Soils in Environmental Management	3
SSC 440	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 442	Soil and Environmental Biogeochemistry	3
SSC 452	Soil Classification	4
SSC 461	Soil Physical Properties and Plant Growth	3
SSC 462	Soil-Crop Management Systems	3
SSC 470	Wetland Soils	3

SSC 540	Geographic Information Systems (GIS) in Soil Science and Agriculture	3
SSC 570	Wetland Soils	3
TOX 201	Poisons, People and the Environment	3
TOX 401	Principles of Toxicology	4
TOX 415	Environmental Toxicology and Chemistry	4
TOX 501	Principles of Toxicology	4

## Semester Sequence

This is a sample.

### First Year

Fall Semester		Hours
ALS 103	Freshman Transitions and Diversity in Agriculture & Life Sciences <sup>1</sup>	1
ANS 150	Introduction to Animal Science <sup>2</sup>	3
ANS 151	Introduction to Animal Science Lab	1
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
ENG 101	Academic Writing and Research <sup>2</sup>	4
MA 107	Precalculus I <sup>2</sup>	3
<b>Hours</b>		<b>16</b>

### Spring Semester

CH 101	Chemistry - A Molecular Science <sup>2</sup>	3
CH 102	General Chemistry Laboratory	1
Animal Science Course (p. 4)		3
MA 121 or MA 131	Elements of Calculus or Calculus for Life and Management Sciences A	3
BIO 183	Introductory Biology: Cellular and Molecular Biology	4
<b>Hours</b>		<b>14</b>

### Second Year

Fall Semester		Hours
ANS 205	Physiology of Domestic Animals	3
ANS 206	Anatomy of Domestic Animals Lab	1
Select one of the following:		3
ANS 215	Agricultural Genetics	
CALS Group A, B, or C Elective (p. 6)		
Economics Course (p. 1)		3
CH 221	Organic Chemistry I	3
CH 222	Organic Chemistry I Lab	1
Communications Course (p. 1) <sup>6</sup>		3
<b>Hours</b>		<b>17</b>

### Spring Semester

ANS 220	Reproductive Physiology	3
---------	-------------------------	---

ANS 221	Reproductive Physiology Lab	1
CH 223	Organic Chemistry II	3
CH 224	Organic Chemistry II Lab	1
ST 311	Introduction to Statistics	3
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1

**Hours 15**

**Third Year**

**Fall Semester**

ANS 230	Animal Nutrition	3
ANS 231	Animal Nutrition Lab	1
CH 201	Chemistry - A Quantitative Science	3
CH 202	Quantitative Chemistry Laboratory	1
MB 351 or MB 360	General Microbiology or Scientific Inquiry in Microbiology: At the Bench	3
PY 211 or PY 131	College Physics I or Conceptual Physics	4

**Hours 15**

**Spring Semester**

Select one of the following		4
GN 311	Principles of Genetics	
CALS Group A, B, or C Elective (p. 6)		
CALS Group A, B, or C Elective (p. 6)	<sup>4,5</sup>	4
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )		3
ANS Animal Management Elective (p. 1)		3

**Hours 15**

**Fourth Year**

**Fall Semester**

ANS Discipline Course Elective (p. 3)		3
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )		3
GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> )		6
Free Elective <sup>4</sup>		3

**Hours 15**

**Spring Semester**

ANS Discipline Course Elective (p. 3)		3
Animal Science Course (p. 4)		2
GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )		3
Free Elective <sup>4</sup>		5

**Hours 13**

**Total Hours 120**

- <sup>1</sup> Use of animals and animal specimens is critical to our educational program. To obtain full credit for Animal Science courses, students are required to participate in laboratory procedures involving animals and animal specimens. All activities with live animals are IACUC (Institutional Animal Care and Use Committee) approved. Many lectures also incorporate animals or animal specimens into the course.
- <sup>2</sup> ANS 150 Introduction to Animal Science, MA 107 Precalculus I, ENG 101 Academic Writing and Research, and CH 101 Chemistry - A Molecular Science must be completed with a grade of C-minus or higher, and the student should repeat the course in the semester following the initial attempt if less than a C-minus is earned.
- <sup>3</sup> Pre-vet students: this course also meets a vet school requirement.
- <sup>4</sup> Students are encouraged to take an Ethics course as part of their Humanities, Additional Breadth, Interdisciplinary Perspectives, or Free Electives.