Zoology (BS): Applied Zoology

The Applied Zoology concentration provides a greater focus on the human dimensions of zoology and broad exposure to other science disciplines. It allows students the flexibility to pair their disciplinary coursework with classes in fields such as science education and communication, environmental policy and history, natural resource conservation, and non-profit operations. This concentration is ideal for students interested in more interdisciplinary careers in zoos, parks, museums, aquariums, schools, and other public, private, and non-profit sectors.

Core courses provide a foundation for all students in writing and communication, math and statistical sciences, natural sciences, natural history, and the human dimensions of conservation and natural resource management. Zoology electives are chosen with guidance from professional and faculty advisors. These electives in combination with additional science and math electives allow students to explore more advanced topics ranging from behavior, ecology, and climate science to data science and geographic information systems. The program prioritizes giving students the opportunity to shape their degree to fit their interests and goals.

All Zoology majors must complete an Experiential Learning Experience. This high-impact experience gives students real world experience through internships, volunteering, research, or teaching positions.

Plan Requirements

Code	Title	Hours
Exploring the Life Sciences		
LSC 103	Exploring Opportunities in the Life Sciences	1
or ENV 100	Student Success in Environmental First Year	
Communication [1]		
Communication Requirement Elective (p.)		3
Advanced Writing Requirement Elective (p. 2)		3
Math & Statistical Sciences [1]		
ST 311	Introduction to Statistics	3
Select one of the following:		3
MA 131	Calculus for Life and Management Sciences A	
MA 141	Calculus I	
MA 121	Elements of Calculus	
Natural Sciences [1]		
LSC 101	Critical and Creative Thinking in the Life Sciences	2
or ENV 101	Exploring the Environment	
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
BIO 183	Introductory Biology: Cellular and Molecular Biology	4
ZO 250	Animal Anatomy and Physiology	4
AEC/PB 360	Ecology	4
CH 101	Chemistry - A Molecular Science	3
CH 102	General Chemistry Laboratory	1
CH 220	Introductory Organic Chemistry	3
or CH 221	Organic Chemistry I	
CH 222	Organic Chemistry I Lab	1
Core Electives [1]		
Select two of the following:		6
MB 251	General Microbiology	
GN 311	Principles of Genetics	
or GN 301	Genetics in Human Affairs	
BIO 270	Introduction to Evolution	
BIO 310	Quantitative Approaches to Biological Problems	
Physics Elective [1]		
Select one of the following:		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	
Applied Conservation and Natural Resource Management (p. 2)		3
Human Dimensions (p. 2)		3
Environmental Science and Marine, Earth, and Atmospheric Sciences (MEAS)		
Select two of the following:		7
ES 100	Introduction to Environmental Sciences	
ES 150	Water and the Environment	
ES 200	Climate Change and Sustainability	
MEA 101 & MEA 110	Geology I: Physical and Geology I Laboratory	
MEA 200 & MEA 210	Introduction to Oceanography and Oceanography Lab	
MEA 215	Introduction to Atmospheric Sciences	
MEA 320	Fundamentals of Air Pollution	
MEA 415	Climate Dynamics	
Major Electives		
Zoology Electives (p. 3) [1]		9
Natural History Electives (p. 3) [1]		7
Additional Science & Math Electives (p. 3)		9
Experiential Learning Elective		**3**
BSC 492	Professional Experience	
BSC 493	Research Experience	
BSC 494	Teaching Experience	
BSC 497	Biological Sciences Honors Project Part 1	
BSC 498	Biological Sciences Honors Project Part 2	
GEP Courses		
ENG 101	Academic Writing and Research [1]	4
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		6
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		6
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		2
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		3

GEP Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)	
GEP Foundations of American Democracy (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-fad/) (verify requirement)	
World Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/) (verify requirement)	
Free Electives	
Free Electives (12 Hr S/U Lmt)	6
Total Hours	**120**

[1] A grade of C- or higher is required.

Communication Requirement Electives

Code	Title	Hours
COM 201	Introduction to Persuasion Theory	3
COM 202	Small Group Communication	3
COM 110	Public Speaking	3
COM 112	Interpersonal Communication	3
COM 211	Argumentation and Advocacy	3
COM 226	Introduction to Public Relations	3
COM 289	Science Communication and Public Engagement	3
COM 436	Environmental Communication	3
COM 479	Climate Change Communication	3
THE 203	Theory and Practice of Acting	3

Advanced Writing Requirement Electives

Code	Title	Hours
BIO 267	Research in the Life Sciences I: Research Skills	3
COM 211	Argumentation and Advocacy	3
ENG 214	Introduction to Editing	3
ENG 232	Literature and Medicine	3
ENG 287	Explorations in Creative Writing	3
ENG 288	Fiction Writing	3
ENG 289	Poetry Writing	3
ENG 292	Writing About Film	3
ENG 316	Introduction to News and Article Writing	3
ENG 323	Writing in Rhetorical Traditions	3
ENG 331	Communication for Engineering and Technology	3
ENG 332	Communication for Business and Management	3
ENG 333	Communication for Science and Research	3
ENG 381	Creative Nonfiction Writing Workshop	3
ENG 388	Intermediate Fiction Writing Workshop	3
ENG 389	Intermediate Poetry Writing Workshop	3
ENG 416	Advanced News and Article Writing	3
ENG 417	Editorial and Opinion Writing	3
ENG 422	Writing Theory and the Writing Process	3
ENG 425	Analysis of Scientific and Technical Writing	3
ENG 426	Analyzing Style	3

Applied Conservation and Natural Resource Management Electives

Code	Title	Hours
AEC 245	Practicing Conservation Ecology	3
ES 300	Energy and Environment	3
ES 400	Analysis of Environmental Issues	3
FW 221	Conservation of Natural Resources	3
FW 353	Wildlife Management	3
FW 333	Conservation Biology in Practice	3
FW 403	Urban Wildlife Management	3
FW 404	Wildlife Habitat Management	3
FOR 353	GIS and Remote Sensing for Environmental Analysis and Assessment	3
NR 300	Natural Resource Measurements	4
NR 406	Conservation of Biological Diversity	3
NR 460	Renewable Natural Resource Management and Policy	3
NR 484	Environmental Impact Assessment	4
GIS 205	Spatial Thinking with GIS	3
GIS 280	Introduction to GIS	3

Human Dimensions

Code	Title	Hours
MEA 260	Human Dimensions of Climate Change	3
FW 411	Human Dimensions of Wildlife and Fisheries	3
PRT 152	Introduction to Parks, Recreation, Tourism, and Event Management	3
PRT/IDS/NR 203	Humans and the Environment	3
PRT 238	Principles of Community Engagement	3
PRT 319	Sustainable Tourism	3
PRT 342	Recreation and Park Interpretive Services	3
PRT 485	Environmental Education in Practice	3
PRT 510	Active Recreation and Community Health	3
PRT 550	Human Behavior and the Environment	3
EMS 450	Teaching Environmental Education	3
AEE 325	Planning and Delivering Non-Formal Education	3
PRT 230	Foundations of Outdoor Recreation Management	3
PRT 415	Principles and Practices of Outdoor Leadership	3
EMS 205	Introduction to Teaching Science	2
EMS 350	Teaching Environmental Education	3
ED 204	Introduction to Teaching in Today's Schools	2
ARE 201	Introduction to Agricultural & Resource Economics	3
ARE 309	Environmental Law & Economic Policy	3
ARE 336	Introduction to Resource and Environmental Economics	3
COM 289	Science Communication and Public Engagement	3
COM 436	Environmental Communication	3
COM 479	Climate Change Communication	3
PS 320	U.S. Environmental Law and Politics	3
PS 336	Global Environmental Politics	3
PS 202	State and Local Government	3
STS/REL 471	Darwinism and Christianity	3

HI 380	History of Nonprofits, Philanthropy, and Social Change	3
NPS 340	Fundamentals of Grant Development for Nonprofits	3
ENG/WGS 308	Contemporary Issues in Ecofeminism	3
HI 323	Science, American Style	3
HI 322	Rise of Modern Science	3
HI 342	Global Environmental History	3
HI 344	Dinomania: Dinosaurs in Culture and Science	3
HI 386	Introduction to Museum Studies	3
IS 200	Introduction to International Studies	3

Zoology Electives

Code	Title	Hours
AEC 370	Parasite and Disease Ecology	3
AEC 371	Parasite and Disease Ecology Lab	1
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy	3
AEC 384	Tropical Ecology in a Changing World	3
AEC 390	Community Ecology	3
AEC 400	Applied Ecology	3
AEC 419	Freshwater Ecology	4
AEC 441	Biology of Fishes	3
AEC 442	Biology of Fishes Laboratory	1
AEC 460	Field Ecology and Methods	4
AEC 470	Urban Ecology	3
AEC 501	Avian Ecology	4
AEC 509	Ecology and Conservation of Freshwater Invertebrates	4
AEC 515	Fish Physiology	3
AEC 519	Freshwater Ecology	4
AEC 761	Conservation and Climate Science	3
BIO 270	Introduction to Evolution	3
BIO 315	General Parasitology	3
BIO 323	Paleoecology	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 444	The Biology of Love and Sex	3
BIO 555	Creative Media Production for Scientists	3
BSC 492	Professional Experience	1-3
BSC 493	Research Experience	1-3
BSC 494	Teaching Experience	1-3
BSC 497	Biological Sciences Honors Project Part 1	3
BSC 498	Biological Sciences Honors Project Part 2	3
ENT 402	Forest Entomology	3
ENT 425	General Entomology	3
ENT 509	Ecology and Conservation of Freshwater Invertebrates	3
ENT 582	Medical and Veterinary Entomology	3
FOR 402	Forest Entomology	3
FW 444	Mammalogy	3
MB 435	Bacterial Pathogenesis	3
MB 470	Emerging and Re-emerging Infectious Diseases	3
MB 535	Bacterial Pathogenesis	3
MEA 220	Marine Biology	3
PHY 524	Comparative Endocrinology	3
PO 524	Comparative Endocrinology	3
ZO 317	Primate Ecology and Evolution	3
ZO 333	Captive Animal Biology	3
ZO 410	Introduction to Animal Behavior	3
ZO 486	Capstone Course in Zoology	3
ZO 582	Medical and Veterinary Entomology	3

Natural History Electives

Code	Title	Hours
ZO 350	Animal Phylogeny and Diversity	4
ZO 402	Invertebrate Biology	4
BIO 227	Understanding Structural Diversity through Biological Illustration	3
BIO 230	The Science of Studying Dinosaurs	3
BIO 270	Introduction to Evolution	3
BIO 323	Paleoecology	3
BIO 370	Developmental Anatomy of the Vertebrates	3
BIO 375	Developmental Anatomy Laboratory	2
AEC 441 & AEC 442	Biology of Fishes and Biology of Fishes Laboratory	4
AEC 501	Avian Ecology	4
FW 444	Mammalogy	3
ENT 402	Forest Entomology	3
ENT 425	General Entomology	3
MEA 220	Marine Biology	3
MEA 252	Biology of Marine Mammals	3
MEA 350	Marine Conservation Biology	3
MEA 369	Life on Earth: Principles of Paleontology	3
MEA 370	Invertebrate Paleontology	3
MEA 449	Principles of Biological Oceanography	3
MEA 469	Ecology of Coastal Resources	3

Additional Science & Math Electives

Code	Title	Hours
Science and Math		
Take any course from the following list OR any course at the 200-level or higher from the following prefixes: BIO, DSC, ZO		
AEC 245	Practicing Conservation Ecology	3
AEC 370	Parasite and Disease Ecology	3
AEC 371	Parasite and Disease Ecology Lab	1
AEC 384	Tropical Ecology in a Changing World	3
AEC 390	Community Ecology	3
AEC 400	Applied Ecology	3
AEC 419	Freshwater Ecology	4
AEC 424	Marine Fisheries Ecology	3
AEC 437	Gut Microbial Ecology	3
BIO 323	Paleoecology	3
AEC 441	Biology of Fishes	3

AEC 442	Biology of Fishes Laboratory	1
AEC 450	Conservation Genetics	3
AEC 458	Environmental Issues in Aquatic Ecology	3
AEC 460	Field Ecology and Methods	4
AEC 470	Urban Ecology	3
AEC 480	Applied Science Communication	3
ANS 220 & ANS 221	Reproductive Physiology and Reproductive Physiology Lab	4
ANS 225	Principles of Animal Nutrition	3
ANS 230 & ANS 231	Animal Nutrition and Animal Nutrition Lab	4
ANS 330	Laboratory Animal Science	3
ANS 415/515/ NTR 415/515/ PO 415/515	Comparative Nutrition	3
ANS 452/552	Comparative Reproductive Physiology and Biotechnology	3
ANS 453/553	Physiology and Genetics of Growth and Development	3
ANS 454/554/ NTR 454	Lactation, Milk and Nutrition	3
ANS/NTR 561	Equine Nutrition	3
ANS/BCH 571	Regulation of Metabolism	3
FS/NTR 301	Introduction to Human Nutrition	3
NTR 419	Human Nutrition and Chronic Disease	3
Science and Math (ANT)		
ANT 251	Introduction to Biological Anthropology	3
ANT 370	Introduction to Forensic Anthropology	3
ANT 371	Human Variation	3
ANT 421/521	Human Osteology	3
ANT 424/524	Bioarchaeology	3
ANT 475/575	Environmental Archaeology	3
ANT 483/583	Theories of Archaeological Research	3
ANT 529	Advanced Methods in Forensic Anthropology	4
ANT 585	Skeletal Biology in Anthropology	3
Science and Math (BCH)		
ANS/BCH 571	Regulation of Metabolism	3
BCH 220	Role of Biotechnology in Society	3
BCH 351	General Biochemistry	3
BCH 451 & BCH 452	Principles of Biochemistry and Introductory Biochemistry Laboratory	6
BCH 453/553	Biochemistry of Gene Expression	3
BCH 454	Advanced Biochemistry Laboratory	4
BCH 455/555	Proteins and Molecular Mechanisms	3
BCH 552	Experimental Biochemistry	3
Science and Math (BIT)		
BEC 463/563/ CHE 463/563	Fermentation of Recombinant Microorganisms	2
BIO 572	Proteomics	3
BIT/MB 210	Phage Hunters	3
BIT/MB 211	Phage Genomics	2
BIT 410	Manipulation of Recombinant DNA	4
BIT 463/563	Fermentation of Recombinant Microorganisms	2
BIT 464/564	Protein Purification	2
BIT 466/566/ PO 466/566	Animal Cell Culture Techniques	2
BIT 467/567	PCR and DNA Fingerprinting	2
BIT 471/571	RNA Interference and Model Organisms	2
BIT 473/573	Protein Interactions	2
BIT 474/574	Plant Genetic Engineering	2
BIT 476	Applied Bioinformatics	2
BIT 477/577	Metagenomics	2
BIT/PB 481	Plant Tissue Culture and Transformation	2
BIT 510	Core Technologies in Molecular and Cellular Biology	4
BIT/CH 572	Proteomics	3
Science and Math (MA)		
BIO/BMA 560	Population Ecology	3
BMA 567	Modeling of Biological Systems	4
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3
Science and Math (CBS)		
CBS 565	Fundamentals of Biomedical Sciences	3
CBS 570	Methods in Biomedical Sciences	1
CBS 580	Epidemiology I	3
Science and Math (CH)		
CH 201	Chemistry - A Quantitative Science	3
CH 202	Quantitative Chemistry Laboratory	1
CH 223	Organic Chemistry II	3
CH 224	Organic Chemistry II Lab	1
CH 230	Computational Chemistry Lab I	1
CH 232	Computational Chemistry Lab II	1
CH 315	Quantitative Analysis	3
CH 331	Introductory Physical Chemistry	4
CH 401	Systematic Inorganic Chemistry I	3
CH 403	Systematic Inorganic Chemistry II	3
CH 431	Physical Chemistry I	3
CH 433	Physical Chemistry II	3
CH 435	Introduction to Quantum Chemistry	3
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 463/563	Molecular Origins of Life	3
Science and Math (ENT)		
AEC 409/509	Ecology and Conservation of Freshwater Invertebrates	4
ENT 207	Insects and Human Disease	3
ENT 305	Introduction to Forensic Entomology	3
ENT/FOR 402	Forest Entomology	3
ENT 425	General Entomology	3
ENT 502	Insect Diversity	4
ENT 503	Insect Morphology and Physiology	3
ENT/GES 506	Principles of Genetic Pest Management	3
ENT 526	Organic Agriculture: Principles and Practices	3

ENT/ZO 582	Medical and Veterinary Entomology	3
Science and Math (ES)		
ES 300	Energy and Environment	3
ES 400	Analysis of Environmental Issues	3
Science and Math (FOR)		
AEC 423	Introduction to Fisheries Sciences Laboratory	1
ENT 402	Forest Entomology	3
FOR 252	Introduction to Forest Science	3
FOR 260	Forest Ecology	4
FOR 261	Forest Communities	2
FOR 264	Forest Wildlife	1
FOR 265	Fire Management	1
FOR 303	Silvics and Forest Tree Physiology	3
FOR 304	Theory of Silviculture	4
FOR 318	Forest Pathology	3
FOR 330	North Carolina Forests	3
FOR 402	Forest Entomology	3
FOR 401	Dendrology	4
FOR 405	Forest Management	4
FOR 411	Forest Genetics	3
FOR 414	World Forestry	3
FOR 415	World Forestry Study Tour	1
FOR 420	Watershed and Wetlands Hydrology	4
FOR 505	Forest Management	4
FOR 507	Silviculture Mini Course	1
FOR 510	Introduction to GPS	1
FOR 513	Silviculture for Intensively Managed Plantations	3
FOR 520	Watershed and Wetlands Hydrology	4
FOR 540	Advanced Dendrology	3
FOR 562	Forest Communities of the Southern Appalachians	1
FOR 575	Advanced Terrestrial Ecosystem Ecology	3
FOR 583	Tropical Forestry	3
FW 221	Conservation of Natural Resources	3
FW 404	Wildlife Habitat Management	3
NR 420/520	Watershed and Wetlands Hydrology	4
PP 318	Forest Pathology	3
Science and Math (FW)		
AEC 420	Introduction to Fisheries Science	3
AEC 515	Fish Physiology	3
FW 221	Conservation of Natural Resources	3
FW 333	Conservation Biology in Practice	3
FW 353	Wildlife Management	3
FW 403	Urban Wildlife Management	3
FW 404	Wildlife Habitat Management	3
FW 444	Mammalogy	3
FW 453	Principles of Wildlife Science	4
Science and Math (GN)		
GN 301	Genetics in Human Affairs	3
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 427	Introductory Bioinformatics	3
GN 434	Genes and Development	3
GN 441	Human and Biomedical Genetics	3
GN 450	Conservation Genetics	3
GN 451	Genome Science	3
GN 453	Personal Genomics	3
GN 461	Advanced Bioinformatics	3
GN 521	Molecular Genetics	3
GN 541	Human and Biomedical Genetics	3
GN 550	Conservation Genetics	3
Science and Math (MA)		
BAE 455	R Coding for Data Management and Analysis	3
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3
CSC 416	Introduction to Combinatorics	3
CSC 427	Introduction to Numerical Analysis I	3
CSC 428	Introduction to Numerical Analysis II	3
CSC 565	Graph Theory	3
CSC 580	Numerical Analysis I	3
CSC 583	Introduction to Parallel Computing	3
E 531	Dynamic Systems and Multivariable Control I	3
FIM 547	Stochastic Calculus for Finance	3
ISE 505	Linear Programming	3
LOG 335	Symbolic Logic	3
MA 225	Foundations of Advanced Mathematics	3
MA 231	Calculus for Life and Management Sciences B	3
MA 241	Calculus II	4
MA 242	Calculus III	4
MA 302	Numerical Applications to Differential Equations	1
MA 303	Linear Analysis	3
MA 305	Introductory Linear Algebra and Matrices	3
MA 315	Mathematics Methods in Atmospheric Sciences	4
MA 325	Introduction to Applied Mathematics	3
MA 331	Differential Equations for the Life Sciences	3
MA 335	Symbolic Logic	3
MA 341	Applied Differential Equations I	3
MA 351	Introduction to Discrete Mathematical Models	3
MA 401	Applied Differential Equations II	3
MA 402	Mathematics of Scientific Computing	3
MA 403	Introduction to Modern Algebra	3
MA 405	Introduction to Linear Algebra	3
MA 408	Foundations of Euclidean Geometry	3
MA 410	Theory of Numbers	3
MA 413	Short-Term Actuarial Models	3
MA 416	Introduction to Combinatorics	3
MA 421	Introduction to Probability	3
MA 425	Mathematical Analysis I	3
MA 426	Mathematical Analysis II	3
MA 427	Introduction to Numerical Analysis I	3
MA 428	Introduction to Numerical Analysis II	3

MA 430	Mathematical Models in the Physical Sciences	3
MA 432	Mathematical Models in Life Sciences	3
MA 437	Applications of Algebra	3
MA 444	Problem Solving Strategies for Competitions	1
MA 501	Advanced Mathematics for Engineers and Scientists I	3
MA 502	Advanced Mathematics for Engineers and Scientists II	3
MA 504	Introduction to Mathematical Programming	3
MA 505	Linear Programming	3
MA 511	Advanced Calculus I	3
MA 513	Introduction To Complex Variables	3
MA 515	Analysis I	3
MA 518	Geometry of Curves and Surfaces	3
MA 520	Linear Algebra	3
MA 521	Abstract Algebra I	3
MA 522	Computer Algebra	3
MA 523	Linear Transformations and Matrix Theory	3
MA 524	Combinatorics I	3
MA 531	Dynamic Systems and Multivariable Control I	3
MA 532	Ordinary Differential Equations I	3
MA 534	Introduction To Partial Differential Equations	3
MA 537	Nonlinear Dynamics and Chaos	3
MA 544	Computer Experiments In Mathematical Probability	3
MA 546	Probability and Stochastic Processes I	3
MA 547	Stochastic Calculus for Finance	3
MA 551	Introduction to Topology	3
MA 555	Introduction to Manifold Theory	3
MA 561	Set Theory and Foundations Of Mathematics	3
MA 573	Mathematical Modeling of Physical and Biological Processes I	3
MA 574	Mathematical Modeling of Physical and Biological Processes II	3
MA 580	Numerical Analysis I	3
MA 583	Introduction to Parallel Computing	3
MA 584	Numerical Solution of Partial Differential Equations--Finite Difference Methods	3
MA 587	Numerical Solution of Partial Differential Equations--Finite Element Method	3
MEA 315	Mathematics Methods in Atmospheric Sciences	4
OR 504	Introduction to Mathematical Programming	3
OR 505	Linear Programming	3
OR 531	Dynamic Systems and Multivariable Control I	3
OR 565	Graph Theory	3
ST 412	Long-Term Actuarial Models	3
ST 413	Short-Term Actuarial Models	3
ST 546	Probability and Stochastic Processes I	3
Science and Math (MB)		
BIT 210	Phage Hunters	3
BIT 211	Phage Genomics	2
FS 405/505	Food Microbiology	3
FS 406/506	Food Microbiology Lab	2
MB 200	The Fourth Horseman: Plagues that Changed the World	3
MB 211	Phage Genomics	2
MB 351	General Microbiology	3
MB 352	General Microbiology Laboratory	1
MB 354	Inquiry-Guided Microbiology Lab	1
MB 360	Scientific Inquiry in Microbiology: At the Bench	3
MB 405	Food Microbiology	3
MB 406	Food Microbiology Lab	2
MB 411	Medical Microbiology	3
MB 412	Medical Microbiology Laboratory	1
MB 414	Microbial Metabolic Regulation	3
MB 420	Fundamentals of Microbial Cell Biotransformations	2
MB 435	Bacterial Pathogenesis	3
MB 441	Immunology	3
MB 451	Microbial Diversity	3
MB 452	Microbial Diversity Lab	2
MB 455	Microbial Biotechnology	3
MB 461	Molecular Virology	3
MB 470	Emerging and Re-emerging Infectious Diseases	3
MB 501	Biology of Plant Pathogens	3
MB 505	Food Microbiology	3
MB 506	Food Microbiology Lab	2
MB 520	Fundamentals of Microbial Cell Biotransformations	2
MB 532	Soil Microbiology	3
MB 535	Bacterial Pathogenesis	3
MB 555	Microbial Biotechnology	3
MB 575	Introduction to Mycology	4
PB 501	Biology of Plant Pathogens	3
PB 575	Introduction to Mycology	4
PP 501	Biology of Plant Pathogens	3
PP 575	Introduction to Mycology	4
SSC 532	Soil Microbiology	3
Science and Math (MEA)		
CE 435	Engineering Geology	3
CE 479	Air Quality	3
CE 581	Fluid Mechanics in Natural Environments	3
ET 320	Fundamentals of Air Pollution	3
GIS 582	Geospatial Modeling	3
MA 315	Mathematics Methods in Atmospheric Sciences	4
MEA 200	Introduction to Oceanography	3
MEA 202	Geology II: Historical	3
MEA 210	Oceanography Lab	1
MEA 211	Geology II Laboratory	1
MEA 220	Marine Biology	3
MEA 250	Introduction to Coastal Environments	3
MEA 251	Introduction to Coastal Environments Laboratory	1
MEA 300	Environmental Geology	4
MEA 312	Atmospheric Thermodynamics	4
MEA 315	Mathematics Methods in Atmospheric Sciences	4
MEA 320	Fundamentals of Air Pollution	3
MEA 321	Fundamentals of Air Quality and Climate Change	3

MEA 323	Geochemistry of Natural Waters	3
MEA 369	Life on Earth: Principles of Paleontology	3
MEA 410	Introduction to Mineralogy	3
MEA 411	Marine Sediment Transport	3
MEA 412	Atmospheric Physics	3
MEA 415	Climate Dynamics	3
MEA 421	Atmospheric Dynamics I	3
MEA 422	Atmospheric Dynamics II	3
MEA 425	Introduction to Atmospheric Chemistry	3
MEA 440	Igneous and Metamorphic Petrology	3
MEA 443	Synoptic Weather Analysis and Forecasting	4
MEA 444	Mesoscale Analysis and Forecasting	4
MEA 449	Principles of Biological Oceanography	3
MEA 450	Introductory Sedimentology and Stratigraphy	4
MEA 451	Structural Geology	4
MEA 454	Marine Physical-Biological Interactions	3
MEA 455	Micrometeorology	3
MEA 459	Field Investigation of Coastal Processes	5
MEA 462	Observational Methods and Data Analysis in Marine Physics	3
MEA 463	Fluid Physics	3
MEA 464	Ocean Circulation Systems	3
MEA 465	Geologic Field Camp	4
MEA 467	Marine Meteorology	3
MEA 469	Ecology of Coastal Resources	3
MEA 470	Introduction to Geophysics	3
MEA 471	Exploration and Engineering Geophysics	3
MEA 473	Principles of Chemical Oceanography	3
MEA 476	Worldwide River and Delta Systems: Their Evolution and Human Impacts	3
MEA 479	Air Quality	3
MEA 481	Geomorphology: Earth's Dynamic Surface	3
MEA 485	Introduction to Hydrogeology	3
MEA 510	Air Pollution Meteorology	3
MEA 511	Introduction to Meteorological Remote Sensing	3
MEA 514	Advanced Physical Meteorology	3
MEA 515	Climate Dynamics	3
MEA 525	Introduction to Atmospheric Chemistry	3
MEA 540	Principles of Physical Oceanography	3
MEA 549	Principles of Biological Oceanography	3
MEA 554	Marine Physical-Biological Interactions	3
MEA 562	Marine Sediment Transport	3
MEA 570	Geological Oceanography	3
MEA 573	Principles of Chemical Oceanography	3
MEA 574	Advanced Igneous Petrology	3
MEA 577	Electron Microprobe Analysis of Geologic Material	2
MEA 579	Principles of Air Quality Engineering	3
MEA 580	Air Quality Modeling and Forecasting	4
MEA 581	Fluid Mechanics in Natural Environments	3
MEA 582	Geospatial Modeling	3
MEA 585	Physical Hydrogeology	3
MEA 599	Regional Geology of North America	1-6

Science and Math (MT)		
MT 323	Introduction to Theory and Practice of Medical Fiber and Yarn Formation	3
MT 366	Biotextile Product Development	3
MT 432	Evaluation of Biotextiles	3
MT/PCC 471	Chemistry of Biopolymers	3
Science and Math (NTR)		
ANS 415	Comparative Nutrition	3
ANS 454/554/FS 554	Lactation, Milk and Nutrition	3
ANS 550	Applied Ruminant Nutrition	3
ANS 561	Equine Nutrition	3
FS 301	Introduction to Human Nutrition	3
FS 401	Advanced Nutrition and Metabolism	3
FS 555	Exercise Nutrition	3
FS 557	Nutraceuticals and Functional Foods	3
NTR 301	Introduction to Human Nutrition	3
NTR 401	Advanced Nutrition and Metabolism	3
NTR 415	Comparative Nutrition	3
NTR 419	Human Nutrition and Chronic Disease	3
NTR 500	Principles of Human Nutrition	3
NTR 501	Advanced Nutrition and Metabolism	3
NTR 515	Comparative Nutrition	3
NTR 550	Applied Ruminant Nutrition	3
NTR 555	Exercise Nutrition	3
NTR 557	Nutraceuticals and Functional Foods	3
NTR 561	Equine Nutrition	3
PO 415/515	Comparative Nutrition	3
Science and Math (PB)		
AEC 360	Ecology	4
BIO 330	Evolutionary Biology	3
BIO 414	Cell Biology	3
BIT 476	Applied Bioinformatics	2
BIT 481	Plant Tissue Culture and Transformation	2
FOR 565	Plant Community Ecology	4
MB 501	Biology of Plant Pathogens	3
MB 575	Introduction to Mycology	4
PB 205	Our Green World	3
PB 215	Medicinal Plants	3
PB 219	Plants in Folklore, Myth, and religion	3
PB 220	Local Flora	3
PB 250	Plant Biology	4
PB 321	Introduction to Whole Plant Physiology	3
PB 360	Ecology	4
PB 400	Plant Diversity and Evolution	4
PB 403	Systematic Botany	4
PB 421	Plant Physiology	3
PB 445	Paleobotany	4
PB 464	Rare Plants of North Carolina	3
PB 480	Introduction to Plant Biotechnology	3
PB 481	Plant Tissue Culture and Transformation	2
PB 501	Biology of Plant Pathogens	3

PB 503	Systematic Botany	4
PB 513	Plant Anatomy	2
PB 545	Paleobotany	4
PB 564	Rare Plants of North Carolina	3
PB 570	Plant Functional Ecology	3
PB 580	Introduction to Plant Biotechnology	3
PP 501	Biology of Plant Pathogens	3
PP 575	Introduction to Mycology	4
Science and Math (PHY)		
PHY 503	General Physiology I	3
PHY 504	General Physiology II	3
PHY 524	Comparative Endocrinology	3
PO 524	Comparative Endocrinology	3
Science and Math (PP)		
CS 502	Plant Disease: Methods & Diagnosis	2
FOR 318	Forest Pathology	3
HS 502	Plant Disease: Methods & Diagnosis	2
MB 501	Biology of Plant Pathogens	3
MB 575	Introduction to Mycology	4
PB 501	Biology of Plant Pathogens	3
PB 575	Introduction to Mycology	4
PP 315	Principles of Plant Pathology	4
PP 318	Forest Pathology	3
PP 501	Biology of Plant Pathogens	3
PP 502	Plant Disease: Methods & Diagnosis	2
PP 575	Introduction to Mycology	4
Science and Math (PY)		
PY 202	University Physics II	4
PY 208	Physics for Engineers and Scientists II	3
PY 209	Physics for Engineers and Scientists II Laboratory	1
PY 212	College Physics II	4
PY 252	Instrumental and Data Analysis for Physics	2
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
Science and Math (SSC)		
MB 352	General Microbiology Laboratory	1
SSC 200	Soil Science	3
SSC 201	Soil Science Laboratory	1
SSC 332	Environmental Soil Microbiology	3
SSC 341	Soil Fertility and Nutrient Management	3
SSC 342	Soil and Plant Nutrient Analysis	1
SSC 427	Biological Approaches to Sustainable Soil Systems	3
SSC 442	Soil and Environmental Biogeochemistry	3
SSC 452	Soil Classification	4
SSC 461	Soil Physical Properties and Plant Growth	3
SSC 470	Wetland Soils	3
SSC 511	Soil Physics	4
SSC 521	Soil Chemistry	3
SSC 532	Soil Microbiology	3
SSC 541	Soil Fertility	3
SSC 551	Soil Morphology, Genesis and Classification	3
SSC 562	Environmental Applications Of Soil Science	3
SSC 570	Wetland Soils	3
Science and Math (ST)		
BUS 350	Economics and Business Statistics	3
EC 351	Econometrics I	3
ECG 561	Applied Econometrics I	3
MA 412	Long-Term Actuarial Models	3
MA 413	Short-Term Actuarial Models	3
MA 546	Probability and Stochastic Processes I	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
ST 311	Introduction to Statistics	3
ST 312	Introduction to Statistics II	3
ST 350	Economics and Business Statistics	3
ST 371	Introduction to Probability and Distribution Theory	3
ST 372	Introduction to Statistical Inference and Regression	3
ST 401	Experiences in Data Analysis	4
ST 412	Long-Term Actuarial Models	3
ST 413	Short-Term Actuarial Models	3
ST 421	Introduction to Mathematical Statistics I	3
ST 422	Introduction to Mathematical Statistics II	3
ST 430	Introduction to Regression Analysis	3
ST 431	Introduction to Experimental Design	3
ST 432	Introduction to Survey Sampling	3
ST 435	Statistical Methods for Quality and Productivity Improvement	3
ST 445	Introduction to Statistical Computing and Data Management	3
ST 505	Applied Nonparametric Statistics	3
ST 511	Statistical Methods For Researchers I	3
ST 512	Statistical Methods For Researchers II	3
ST 520	Statistical Principles of Clinical Trials	3
ST 535	Statistical Methods for Quality and Productivity Improvement	3
ST 546	Probability and Stochastic Processes I	3
ST 561	Applied Econometrics I	3
Science and Math (TOX)		
TOX 401	Principles of Toxicology	4
TOX 415	Ecotoxicology	4
TOX 501	Principles of Toxicology	4
TOX 515	Environmental Toxicology	4
Science and Math (ZO)		
AEC 409	Ecology and Conservation of Freshwater Invertebrates	4
AEC 501	Avian Ecology	4
AEC 509	Ecology and Conservation of Freshwater Invertebrates	4
AEC 515	Fish Physiology	3

ENT 582	Medical and Veterinary Entomology	3
MEA 449	Principles of Biological Oceanography	3
MEA 549	Principles of Biological Oceanography	3
PHY 503	General Physiology I	3
PHY 504	General Physiology II	3
PHY 524	Comparative Endocrinology	3
PO 524	Comparative Endocrinology	3
ZO 334	Captive Animal Biology Field Laboratory	2
ZO 350	Animal Phylogeny and Diversity	4
ZO 582	Medical and Veterinary Entomology	3

First Year

Fall Semester		**Hours**
LSC 101 or ENV 101	Critical and Creative Thinking in the Life Sciences [1] or Exploring the Environment	2
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity [1]	4
CH 101	Chemistry - A Molecular Science [1]	3
CH 102	General Chemistry Laboratory [1]	1
MA 121 or MA 131 or MA 141	Elements of Calculus [1] or Calculus for Life and Management Sciences A or Calculus I	3
LSC 103 or ENV 100	Exploring Opportunities in the Life Sciences or Student Success in Environmental First Year	1
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**15**

Spring Semester		
BIO 183	Introductory Biology: Cellular and Molecular Biology [1]	4
CH 220 or CH 221	Introductory Organic Chemistry [1] or Organic Chemistry I	3
CH 222	Organic Chemistry I Lab [1]	1
ENG 101	Academic Writing and Research [1]	4
Human Dimensions (p. 2) [1]		3
	Hours	**15**

Second Year

Fall Semester		
Communication Requirement Elective (p.) [1]		3
Core Electives (p. 1) [1]		3
ZO 250	Animal Anatomy and Physiology [1]	4
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**14**

Spring Semester		
Ecology Requirement (p. 1) [1]		4
Applied Conservation and Natural Resource Management (p. 2) [1]		3
Core Electives (p. 1) [1]		3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		3
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
	Hours	**16**

Third Year

Fall Semester		
Natural History Requirement (p. 1) [1]		3
Free Elective		3
Environmental Science and MEAS Requirement (p. 1)		3
Physics Requirement (p. 1)		4
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
	Hours	**16**

Spring Semester		
ST 311	Introduction to Statistics [1]	3
Advanced Writing Requirement (p. 2) [1]		3
Environmental Science and MEAS Requirement (p. 1) [1]		4
Natural History Requirement (p. 1) [1]		4
	Hours	**14**

Fourth Year

Fall Semester		
Zoology Elective (p. 3) [1]		3
Zoology Elective (p. 3) [1]		3
Experiential Learning Requirement (p. 1)		3
Science & Math Elective (p. 3)		3
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
	Hours	**15**

Spring Semester		
Zoology Elective (p. 3) [1]		3
Science & Math Elective (p. 3)		3
Science & Math Elective (p. 3)		3
Free Elective		3
GEP Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
	Total Hours	**120**

[1] A grade of C- or higher is required.

Students who graduate from the Department of Biological Sciences with a Zoology degree with an Applied Concentration are well prepared for employment in various government agencies and private industries. Post graduation, students can gain employment in environmental education, parks and recreation, animal husbandry, natural resources, ecotourism, conservation, veterinary medicine and biomedical research. Graduates may choose to continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Students who plan to seek certification for pre-

college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education. Those hoping to work in the non-profit sector may want to pursue a Non-Profit Management certificate or a minor in Non-Profit Studies.

Learn More About Careers

NCcareers.org (https://nccareers.org/)
Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (https://www.bls.gov/ooh/)
Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (https://www.careeronestop.org/)
View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (https://careers.dasa.ncsu.edu/explore-careers/career-assessments/) (NC State student email address required)
This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (https://careers.dasa.ncsu.edu/about/hours-appointments/) to discuss the results.

Focus 2 Apply Assessment (https://www.focus2career.com/Portal/Register.cfm?SID=1929) (Available to prospective students)
A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

Zoological Association of America (https://zaa.org/)
Association of Zoos & Aquariums (https://www.aza.org/)