Biological Sciences (BA)

The NC State Bachelor of Arts degree in Biological Sciences is designed for students who want to combine studies in the life sciences with studies in a secondary discipline(s) of interest (chosen from outside of the life sciences). Students in the Biological Sciences B.A. choose exactly which life science courses they want to use to fulfill the biological component of their degree. They are required to take just as much biology (through these Life Science Electives) as students in the B.S. in Biological Sciences, but requirements in the supporting sciences (chemistry, physics, and calculus) are reduced. Instead, Biological Sciences B.A. students identify coursework from fields outside the life sciences to contribute to an interdisciplinary framework for their biology study (e.g., psychology, social work, communication, international studies, political science, anthropology, gender studies, education, mathematics, statistics, and many more). These "Cross Discipline Elective" courses are designed by the student in consultation with their academic advisor. This proposed interdisciplinary course plan is sent to the program director for approval.

At the end of their undergraduate studies, students in this degree program complete a Senior Capstone Project through which they draw on both the life sciences (or a sub-discipline within the life sciences) and their chosen Cross Disciplines to identify and propose a solution to a problem or challenge based on existing research. Experiential learning (related to their academic and/or career interests) is also required of all students in this program.

Students who graduate with a B.A. in Biological Sciences will benefit from training in scientific thinking and from gaining a broader perspective through their Cross Disciplinary studies. In choosing courses, students are encouraged to consider the course pre-requisites of graduate or professional programs to which they are interested in applying. Depending on their course choices, students will be prepared for a wide range of careers or further studies. Biological Sciences B.A. graduates are employed or pursuing advanced study in bioethics, bioinformatics, law, health analytics, health care (nursing, physician assistant, physical therapy), clinical research, public health, science communication and informal education, neurobiology and psychology.

Plan Requirements

- Students should check with their adviser before electing to take any course with S/U grading if it is normally graded A-F. Up to 12 hours of Free Electives can be taken S/U.
- Students cannot use the same course both as a Cross Discipline Elective and to meet a GEP requirement (with the exception of Global Knowledge and US Diversity).
- Student are responsible for determining the pre-requisites for any course they are interested in taking.
- Students interested in graduate school or professional school should check the courses required for admission to the programs to which they plan to apply.
- The B.A. in Biological Sciences cannot be used as a second major for many students already in a degree program in the life sciences – students interested in a second major should first check with the coordinator of their desired second major.

Code	Title	Hours
Exploring the Life Sciences		
LSC 103	Exploring Opportunities in the Life Sciences	1
	LSC 103 deals with transition-to-college issues while exploring degree program options within the life sciences. If a student transfers into the B.A. in Biological Sciences after taking a similar course in another program, that course can be substituted for LSC 103 on the degree audit, an action initiated by the academic advisor.	
Communication and Writing		
Communication and Writing Electives (p. 2)		6
Foundational Sciences		
LSC 101	Critical and Creative Thinking in the Life Sciences [1]	2
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity [1]	4
BIO 183	Introductory Biology: Cellular and Molecular Biology [1]	4
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory [1]	4
Select one of the following Organic Chemistry course sets:		4
CH 220 & CH 222	Introductory Organic Chemistry and Organic Chemistry I Lab	
CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab	
Select one of the following Calculus courses:		3
MA 121	Elements of Calculus	
MA 131	Calculus for Life and Management Sciences A	
MA 141	Calculus I	
PY 131	Conceptual Physics	4
Select one of the following Quantitative Elective courses:		3
BUS 350	Economics and Business Statistics	
ST 311	Introduction to Statistics	
ST 350	Economics and Business Statistics	
Major Electives [2,5]		
Life Science Electives 300/400 level (p. 2)		18
Life Science Electives (p. 4)		6
Cross Discipline Electives 300/400 lvl		15
Cross Discipline Electives		6
Experiential Learning [2]		3
Experiential Learning opportunities can take many forms, but should be relevant to a possible career path or other academic interest for the student. The out-of-class experience to be undertaken to meet this requirement must be approved in advance by the adviser and program director. It is the responsibility of the student to identify an opportunity, to make arrangements with a supervisor to pursue that opportunity, and to complete the contract necessary for credit to be awarded for the experience.		
BSC 492	Professional Experience	
BSC 493	Research Experience	
BSC 494	Teaching Experience	
BIO 481	Senior Capstone Project	1
GEP Courses		
ENG 101	Academic Writing and Research	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 Elective (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	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 (12 Hr S/U Lmt) [2]	12
These electives cannot be taken at an elementary level after you have taken comparable coursework at a more advanced level.	
Total Hours	**120**

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

[2] Students who wish to take two semesters of organic chemistry should NOT start with CH 220, but should take CH 221/222 and CH 223/224.

[3] Students interested in taking more than one semester of calculus should start with either MA 131 or MA 141, because MA 121 does not serve as a pre-requisite for either MA 231 or MA 241. Additional semesters of calculus can be used toward Life Science Electives requirements. MA 121 Elements of Calculus MA 131 Calculus for Life and Management Sciences A (first of two-semester series) MA 141 Calculus I (first of three-semester series)

[4] Students should consult their academic advisors to determine how to complete these requirements. With advisor approval, students can use a total of up to 3 hours of learning experience towards Life Science Electives or toward Cross-Discipline Electives - whichever category the experience appropriately fits. Some experimental courses (295, 495, 592) and graduate (500-level) courses may also be used with advisor and departmental approval. Students should check the prerequisites and restrictions on courses in which they are interested.

[5] Students in the B.A. in Biological Sciences will identify a second discipline of interest in which to also focus their studies. These 21 credit hours will be planned by the student in consultation with their advisor and must be approved by the advisor and by the program. This second disciplinary focal area can be selected from a wide range of fields outside of the life sciences (see examples below). At least 15 of these hours must be at the 300 level or higher and the rest must be at the 200 level or higher. With adviser approval, students can use a total of up to 3 hours of learning experience (e.g., BSC 492, 493, 494) or honors research experience toward 7Life Science Electives or toward Cross Discipline Electives – whichever category the experience appropriately fits. Some experimental courses (295, 495, and 592) and graduate (500-) level courses may also be used as Cross Discipline Electives, with adviser and program approval. Students should check the prerequisites and restrictions on courses in which they are interested. For example, most ELM courses are restricted to Elementary Education majors and therefore would be appropriate only to those with a second major in Elementary Education. Courses used to meet GEP requirements cannot also be used to meet Cross Discipline Electives requirements.

Communication and Writing Electives

Code	Title	Hours
Communication Courses		
COM 110	Public Speaking	3
COM 112	Interpersonal Communication	3
COM 201	Introduction to Persuasion Theory	3
COM 202	Small Group Communication	3
COM 211	Argumentation and Advocacy	3
COM 226	Introduction to Public Relations	3
COM 240	Communication Inquiry	3
THE 203	Theory and Practice of Acting	3
Writing Courses		
BIO 267	Research in the Life Sciences I: Research Skills	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 333	Communication for Science and Research	3
ENG 381	Creative Nonfiction Writing Workshop	3
ENG 422	Writing Theory and the Writing Process	3

Life Science Electives 300/400 Level

Code	Title	Hours
AEC 360	Ecology	4
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy	3
AEC 400	Applied Ecology	3
AEC 419/519	Freshwater Ecology	4
AEC 420	Introduction to Fisheries Science	3
AEC 423	Introduction to Fisheries Sciences Laboratory	1
AEC 441	Biology of Fishes	3
AEC 442	Biology of Fishes Laboratory	1
AEC 460	Field Ecology and Methods	4
ANS 330	Laboratory Animal Science	3
ANS 415	Comparative Nutrition	3
ANS 554	Lactation, Milk and Nutrition	3
ANT 371	Human Variation	3
BCH 351	General Biochemistry	3
BCH 452	Introductory Biochemistry Laboratory	2
BCH 453/553	Biochemistry of Gene Expression	3
BCH 454	Advanced Biochemistry Laboratory	4

BCH 455 & BCH 555	Proteins and Molecular Mechanisms and Proteins and Molecular Mechanisms	6
BIO 315	General Parasitology	3
BIO 330	Evolutionary Biology	3
BIO 361	Developmental Biology	3
BIO 370	Developmental Anatomy of the Vertebrates	3
BIO 405	Functional Histology	3
BIO 414	Cell Biology	3
BIO 424	Endocrinology	3
BIO 432	Evolutionary Medicine	3
BIO 434	Hormones and Behavior	3
BIO 440	The Human Animal: An Evolutionary Perspective	3
BIO 444	The Biology of Love and Sex	3
BIO 488/588	Neurobiology	3
BIT 410	Manipulation of Recombinant DNA	4
BIT 462/562		
BIT 464/564	Protein Purification	2
BIT 465/565	Real-time PCR Techniques	2
BIT 466/566	Animal Cell Culture Techniques	2
BIT 467/567	PCR and DNA Fingerprinting	2
BIT 468/568		
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 481	Plant Tissue Culture and Transformation	2
BSC 478	Research Fundamentals in Biological Sciences	3
COM 436	Environmental Communication	3
ENT 305	Introduction to Forensic Entomology	3
ENT 402	Forest Entomology	3
ENT 425	General Entomology	3
ES 300	Energy and Environment	3
ES 400	Analysis of Environmental Issues	3
FOR 402	Forest Entomology	3
FS 301	Introduction to Human Nutrition	3
FS 401/501	Advanced Nutrition and Metabolism	3
FS 405 & FS 406	Food Microbiology and Food Microbiology Lab	5
FS 505 & FS 506	Food Microbiology and Food Microbiology Lab	5
FW 444/FS 544	Mammalogy	3
FW 465/FS 565	African Ecology and Conservation	4
GN 301	Genetics in Human Affairs	3
GN 311 & GN 312	Principles of Genetics and Elementary Genetics Laboratory	5
GN 421/521	Molecular Genetics	3
GN 423	Population, Quantitative and Evolutionary Genetics	3
GN 425	Advanced Genetics Laboratory	2
GN 427	Introductory Bioinformatics	3
GN 434	Genes and Development	3
GN 441/541	Human and Biomedical Genetics	3
GN 451	Genome Science	3
IDS 303	Humans and the Environment	3
MA 331	Differential Equations for the Life Sciences	3
MA 432	Mathematical Models in Life Sciences	3
MB 351 & MB 352	General Microbiology and General Microbiology Laboratory	4
MB 354	Inquiry-Guided Microbiology Lab	1
MB 360	Scientific Inquiry in Microbiology: At the Bench	3
MB 405 & MB 406	Food Microbiology and Food Microbiology Lab	5
MB 411 & MB 412	Medical Microbiology and Medical Microbiology Laboratory	4
MB 414	Microbial Metabolic Regulation	3
MB 420/520	Fundamentals of Microbial Cell Biotransformations	2
MB 435/535	Bacterial Pathogenesis	3
MB 441	Immunology	3
MB 451 & MB 452	Microbial Diversity and Microbial Diversity Lab	5
MB 455	Microbial Biotechnology	3
MB 461	Molecular Virology	3
MB 470	Emerging and Re-emerging Infectious Diseases	3
MB 505 & MB 506	Food Microbiology and Food Microbiology Lab	5
MEA 300	Environmental Geology	4
MEA 369	Life on Earth: Principles of Paleontology	3
NR 303	Humans and the Environment	3
NR 406	Conservation of Biological Diversity	3
NTR 301	Introduction to Human Nutrition	3
NTR 401/501	Advanced Nutrition and Metabolism	3
NTR 410/510	Maternal and Infant Nutrition	3
NTR 415/515	Comparative Nutrition	3
NTR 419	Human Nutrition and Chronic Disease	3
NTR 421/521		
NTR 454	Lactation, Milk and Nutrition	3
PB 321	Introduction to Whole Plant Physiology	3
PB 360	Ecology	4
PB 403/503	Systematic Botany	4
PB 421	Plant Physiology	3
PB 480/580	Introduction to Plant Biotechnology	3
PB 481	Plant Tissue Culture and Transformation	2
PO 404/504	Avian Anatomy and Physiology	4
PO 415/515	Comparative Nutrition	3
PO 466/566	Animal Cell Culture Techniques	2
PP 315	Principles of Plant Pathology	4
SSC 332	Environmental Soil Microbiology	3
TOX 401/501	Principles of Toxicology	4
TOX 415	Ecotoxicology	4
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

Life Sciences Electives

Code	Title	Hours
Any course from the Life Sciences Electives 300/400 level list (p. 2)		
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 225	Principles of Animal Nutrition	3
ANS 230 & ANS 231	Animal Nutrition and Animal Nutrition Lab	4
BCH 220	Role of Biotechnology in Society	3
BIO 240	Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems	3
BIO 242	Human Anatomy and Physiology Laboratory	2
BIO 245	Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems	3
BIO 267	Research in the Life Sciences I: Research Skills	3
BIO 269	Research in the Life Sciences II: Guided Research	3
BIT 200	Early Research in Biotechnology	4
BIT 210	Phage Hunters	3
BIT 211	Phage Genomics	2
CH 223 & CH 224	Organic Chemistry II and Organic Chemistry II Lab	4
CS 230	Introduction to Agroecology	3
ENT 201	Insects and People	3
ENT 207	Insects and Human Disease	3
ENT 212	Basic Entomology	1
ES 200	Climate Change and Sustainability	3
FOR 261	Forest Communities	2
MB 200	The Fourth Horseman: Plagues that Changed the World	3
MB 210	Phage Hunters	3
MB 211	Phage Genomics	2
MEA 200	Introduction to Oceanography	3
MEA 210	Oceanography Lab	1
MEA 220	Marine Biology	3
MEA 250 & MEA 251	Introduction to Coastal Environments and Introduction to Coastal Environments Laboratory	4
PB 200	Plant Life	4
PB 215	Medicinal Plants	3
PB 219	Plants in Folklore, Myth, and religion	3
PB 220	Local Flora	3
PB 277	Space Biology	3
PY 212	College Physics II	4
SSC 201	Soil Science Laboratory	1
TOX 201	Poisons, People and the Environment	3
ZO 250	Animal Anatomy and Physiology	4

Semester Sequence

This is a sample.

First Year		
Fall Semester		**Hours**
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
LSC 101	Critical and Creative Thinking in the Life Sciences [1]	2
Calculus (p. 1)		3
LSC 103	Exploring Opportunities in the Life Sciences [1]	1
	Hours	**14**
Spring Semester		
BIO 183	Introductory Biology: Cellular and Molecular Biology [1]	4
Organic Chemistry and Lab (p. 1)		4
ENG 101	Academic Writing and Research [1]	4
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
	Hours	**16**
Second Year		
Fall Semester		
Statistics (p. 1)		3
Communication Requirement (p.)		3
Life Science (p. 4)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Free Elective		3
	Hours	**15**
Spring Semester		
Life Science Elective (p. 2)		3
Life Science Elective (p. 4)		3
Cross Discipline Elective (Advised) (p. 1)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Free Elective		3
	Hours	**15**
Third Year		
Fall Semester		
PY 131	Conceptual Physics	4
Experiential Learning Requirement (p. 1)		3
Cross Discipline Elective (Advised) (p. 1)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Free Elective		3
	Hours	**16**
Spring Semester		
Life Science Elective (p. 2)		3
Life Science Elective (p. 2)		3
Cross Discipline Elective (Advised) (p. 1)		3

Writing (p. 2)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Fourth Year		
Fall Semester		
Life Science Elective (p. 2)		3
Life Science Elective (p. 2)		3
Cross Discipline Elective (Advised) (p. 1)		3
Cross Discipline Elective (Advised) (p. 1)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
	Hours	**15**
Spring Semester		
Life Science Elective (p. 2)		3
Cross Discipline Elective (Advised) (p. 1)		3
Free Elective		3
Cross Discipline Elective (Advised) (p. 1)		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
BIO 481	Senior Capstone Project	1
	Hours	**14**
	Total Hours	**120**

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

Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship. Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

Career Titles

- Agricultural Sciences Professor
- Agronomist
- Allergists and Immunologists
- Anesthesiologist (MD)
- Anesthesiologist Assistants
- Animal Breeder
- Animal Scientist
- Aquaculture Specialist
- Aquarium Curator
- Biochemist
- Biological Technician
- Biologist
- Biology Professor
- Biomedical Engineer
- Biophysicist
- Biopsychologist
- Botanist
- Cardiologist (MD)
- Clinical Dietitian
- Dentist (DDS)
- Dietitian and Nutritionist
- Environmental Disease Analyst
- Environmental Engineer
- Environmental Research Analyst
- Epidemiologists
- Family Practitioner (MD)
- Fish and Game Warden
- Fish Hatchery Specialist
- Food & Drug Inspector
- Food Science Technicians
- Food Technologist
- Forensic Science Technicians
- General Internists (MD)
- Genetic Counselors
- Geneticist
- Gynecologist (MD)
- Hazardous Waste Management Analyst
- Horticulturist
- Hospitalists
- Industrial Hygienist
- Industrial Waste Inspector
- Low Vision Therapists, Orientation and Mobility Specialists, and Vision Rehabilitation Therapists
- Marine and Aquatic Biologist
- Medical and Scientific Illustrator
- Medical Equipment Technician
- Medical Technologist
- Microbiologist
- Obstetrician (MD)

- Occupational Health and Safety Technicians
- Occupational Physician (MD)
- Oceanographer
- Optometrist
- Park Naturalist
- Pathologist (MD)
- Pediatrician (MD)
- Pharmacist
- Pharmacologist
- Phlebotomist
- Physical Medicine and Rehabilitation Physicians
- Physician Assistant (PA)
- Radiologist (MD)
- Sales Representative (Chemicals & Drugs)
- Soil Conservationist
- Soil Scientist
- Sports Physician (Orthopedist)
- Surgeons (MD)
- Toxicologist
- Urologists
- Veterinarian (VMD)
- Water Pollution Control Inspector
- Wildlife Biologist
- Wildlife Control Agent
- Winemaker / Vinter
- Zoologist

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.

Bio Careers (http://biocareers.weebly.com/)
American Institute of Biological Sciences (https://www.aibs.org/)
Federation of American Societies for Experimental Biology (https://www.faseb.org/)