

# Biological Sciences (BS)

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

There are five different avenues to earning a B.S. in Biological Sciences at NC State. Students studying for a degree in Biological Sciences can opt for a general curriculum (BLS) or can choose to focus in a particular area by selecting one of four areas of concentration: Molecular, Cellular, and Developmental Biology (MCD), Integrative Physiology and Neurobiology (IPN), Human Biology (HB), or Ecology, Evolution and Conservation Biology (EEC). All new first-year students interested in the B.S. in Biological Sciences start their studies in the NC State Life Sciences First Year Program.

The MCD curriculum offers students in-depth studies of the molecular and cellular basis of life and the development of multicellular organisms.

The IPN curriculum provides a comprehensive grounding in basic principles of physiology and neuroscience, as well as in-depth exposure to the application of these principles in understanding whole-organism function and the ways in which animals (including humans) cope with challenges presented by their environments.

The HB curriculum allows some flexibility for students to study the biology of humans as well as relevant aspects of the humanities and social sciences, while also requiring those science courses most often required by medical schools. It is designed to provide students with a solid education in the scientific and humanistic concepts that underlie modern health sciences and related areas of scientific research.

The EEC curriculum offers students in-depth studies in areas of biology at the level of the organism, populations and ecosystems. It is designed for students who have an interest in whole organisms and their biodiversity — what maintains it, what environmental changes affect it, and how to protect it in the face of various challenges.

## Plan Requirements

Code	Title	Hours	Counts towards
<b>Exploring the Life Sciences</b>			
LSC 103	Exploring Opportunities in the Life Sciences	1	
<b>Writing</b>			
	Advanced Writing Requirement Elective (p. 2) <sup>1</sup>	3	
<b>Biological Sciences</b>			
LSC 101	Critical and Creative Thinking in the Life Sciences <sup>1</sup>	2	
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity <sup>1</sup>	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology <sup>1</sup>	4	

BIO 270	Introduction to Evolution	3
GN 311	Principles of Genetics <sup>1</sup>	4
GN 312	Elementary Genetics Laboratory <sup>1</sup>	1
MB 351	General Microbiology <sup>1</sup>	3
MB 352	General Microbiology Laboratory <sup>1</sup>	1
	or MB 354 Inquiry-Guided Microbiology Lab	
	Physiology Requirement Elective (p. 3) <sup>1</sup>	3
<b>Physical &amp; Mathematical Sciences</b>		
MA 131	Calculus for Life and Management Sciences A <sup>1</sup>	3
	or MA 141 Calculus I	
MA 231	Calculus for Life and Management Sciences B <sup>1</sup>	3
	or MA 241 Calculus II	
CH 101	Chemistry - A Molecular Science <sup>1</sup>	3
CH 102	General Chemistry Laboratory <sup>1</sup>	1
CH 201	Chemistry - A Quantitative Science <sup>1</sup>	3
CH 202	Quantitative Chemistry Laboratory <sup>1</sup>	1
CH 221	Organic Chemistry I <sup>1</sup>	3
CH 222	Organic Chemistry I Lab <sup>1</sup>	1
CH 223	Organic Chemistry II <sup>1</sup>	3
CH 224	Organic Chemistry II Lab <sup>1</sup>	1
	Select one of the following: <sup>1</sup>	4
	PY 211 College Physics I	
	PY 205 & PY 206 Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory	
	Select one of the following: <sup>1</sup>	4

PY 212	College Physics II
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory

**Major Electives**

Select one of the following Learning Experience Electives:	3
BIO 269	Research in the Life Sciences II: Guided Research
BIO 499	Honors Project Part 2
BSC 492	Professional Experience
BSC 493	Research Experience
BSC 498	Biological Sciences Honors Project Part 2
Life Science Electives (p. 3)	14
Additional Science & Math Elelectives (p. 4)	10

**GEP Courses**

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> )		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> )		6
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 Additional Breadth ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> ) (Humanities/Social Sciences/Visual and Performing Arts)		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> )		3
GEP U.S. Diversity ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/</a> ) (verify requirement)		

GEP Global Knowledge (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/>) (verify requirement)

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

**Free Electives**

Free Electives (12 Hr S/U Lmt) <sup>2</sup>	10
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These electives cannot be remedial nor can they be taken at an elementary level after you have taken comparable coursework at a more advanced level. ST 311 is recommended as a Free Elective. Students interested in graduate school or professional school should check the courses required for admission to the programs to which they plan to apply.

<b>Total Hours</b>	<b>120</b>
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<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.

**Advanced Writing Requirement Elective**

Code	Title	Hours	Counts towards
BIO 267	Research in the Life Sciences I: Research Skills		
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 the Rhetorical Tradition	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

## Physiology Requirement Electives

Code	Title	Hours	Counts towards
BIO 240	Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems	4	
BIO 245	Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems	4	
PB 321	Introduction to Whole Plant Physiology	3	
PB 421	Plant Physiology	3	
ZO 250	Animal Anatomy and Physiology	4	

## Life Science Electives

Code	Title	Hours	Counts towards
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Select one option from each of the following four Groups for a total of at least 14 credit hours.

<b>Group I: Animals</b>		<b>4</b>	
AEC 441	Biology of Fishes		

AEC 442	Biology of Fishes Laboratory		
AEC 501	Avian Ecology		
BIO 315	General Parasitology		
BIO 361	Developmental Biology		
BIO 370 & BIO 375	Developmental Anatomy of the Vertebrates and Developmental Anatomy Laboratory	0	
ENT/FOR 402	Forest Entomology		
ENT 425	General Entomology		
FW 444/544	Mammalogy		
ZO 333	Captive Animal Biology		
ZO 350	Animal Phylogeny and Diversity		
ZO 402	Invertebrate Biology		
ZO 542	Herpetology		
<b>Group II: Plants</b>		<b>4</b>	
PB 200	Plant Life		
PB 250	Plant Biology		
PB 400	Plant Diversity and Evolution		
PB 403/503	Systematic Botany		
<b>Group III: Organismal Function</b>		<b>4</b>	
ANS 225	Principles of Animal Nutrition		
ANS 230	Animal Nutrition		
ANS 415/515	Comparative Nutrition		
BIO 240	Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems		
BIO 245	Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems		
BIO 414	Cell Biology		
BIO 424	Endocrinology		

BIO 488/588	Neurobiology	
BIT 410	Manipulation of Recombinant DNA	
BIT 481	Plant Tissue Culture and Transformation	
MB 441	Immunology	
NTR 415/515	Comparative Nutrition	
NTR 419	Human Nutrition and Chronic Disease	
PB 321	Introduction to Whole Plant Physiology	
PB 421	Plant Physiology	
PB 480/580	Introduction to Plant Biotechnology	
PB 481	Plant Tissue Culture and Transformation	
PHY/PO/ZO 524	Comparative Endocrinology	
PO 404/504	Avian Anatomy and Physiology	
PO 415/515	Comparative Nutrition	
ZO 250	Animal Anatomy and Physiology	
<b>Group IV: Ecology &amp; Evolution</b>		<b>4</b>
AEC/PB 360	Ecology	
AEC 419/519	Freshwater Ecology	
AEC 460	Field Ecology and Methods	
BIO 323	Paleoecology	
BIO 330	Evolutionary Biology	
BIO 440	The Human Animal: An Evolutionary Perspective	
CS 230	Introduction to Agroecology	
FOR 260	Forest Ecology	
MEA 250 & MEA 251	Introduction to Coastal Environments and Introduction to Coastal Environments Laboratory	0
ZO 410	Introduction to Animal Behavior	

## Additional Science and Math Elective

Code	Title	Hours	Counts towards
AEC/GN 450	Conservation Genetics		
BEC/BIT 463	Fermentation of Recombinant Microorganisms		
BIO 230	The Science of Studying Dinosaurs		
BIO 240	Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems		
BIO 245	Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems		
BIO 310	Quantitative Approaches to Biological Problems		
BIO 416	Cancer Cell Biology		
BIO 418	Cell Biology Research Lab		
BIO 432	Evolutionary Medicine		
BIT 477	Metagenomics		
GN 428	Introduction to Machine Learning in Biology		
GN 453	Personal Genomics		
MA 331	Differential Equations for the Life Sciences		
MB 470	Emerging and Re-emerging Infectious Diseases		
PB 205	Our Green World		
ZO 334	Captive Animal Biology Field Laboratory		
ZO 486	Capstone Course in Zoology		

## Semester Sequence

This is a sample.

### First Year

Fall Semester		Hours
LSC 101	Critical and Creative Thinking in the Life Sciences <sup>1</sup>	2
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory	4
MA 131	Calculus for Life and Management Sciences A <sup>1</sup>	3
LSC 103	Exploring Opportunities in the Life Sciences	1
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
<b>Hours</b>		<b>15</b>

### Spring Semester

BIO 183	Introductory Biology: Cellular and Molecular Biology <sup>1</sup>	4
CH 221 & CH 222	Organic Chemistry I and Organic Chemistry I Lab	4
ENG 101	Academic Writing and Research <sup>1</sup>	4
MA 231	Calculus for Life and Management Sciences B <sup>1</sup>	3
<b>Hours</b>		<b>15</b>

### Second Year

Fall Semester		Hours
Physiology Requirement (p. 3)		3
CH 223 & CH 224	Organic Chemistry II and Organic Chemistry II Lab <sup>1</sup>	4
BIO 270	Introduction to Evolution	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 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
<b>Hours</b>		<b>14</b>

### Spring Semester

Science and Math Elective (p. 4)		4
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory <sup>1</sup>	4
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> )		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
<b>Hours</b>		<b>14</b>

### Third Year

Fall Semester		Hours
PY 211	College Physics I <sup>1</sup>	4
MB 351 & MB 352	General Microbiology and General Microbiology Laboratory <sup>1</sup>	4

Advanced Writing Requirement (p. 2) <sup>1</sup>		3
Learning Experience Elective (p. 1)		3
<b>Hours</b>		<b>14</b>

### Spring Semester

PY 212	College Physics II <sup>1</sup>	4
Life Science Elective (p. 3) <sup>1</sup>		4
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
GN 311 & GN 312	Principles of Genetics and Elementary Genetics Laboratory	5
<b>Hours</b>		<b>16</b>

### Fourth Year

Fall Semester		Hours
Life Science Elective (p. 3) <sup>1</sup>		3
Life Science Elective (p. 3) <sup>1</sup>		3
Science and Math Elective (p. 4)		3
Free Elective		3
Free Elective		4
<b>Hours</b>		<b>16</b>

### Spring Semester

Life Science Elective (p. 3) <sup>1</sup>		4
Science and Math Elective (p. 4)		3
Free Elective		3
GEP Additional Breadth ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> ) (Humanities/Social Sciences/Visual and Performing Arts)		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
<b>Hours</b>		<b>16</b>
<b>Total Hours</b>		<b>120</b>

<sup>1</sup> 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.