

BIOLOGY MAJOR, B.S.– QUANTITATIVE BIOLOGY TRACK

Contact Information

Department of Biology

Visit Program Website (<http://bio.unc.edu>)
Coker Hall, 120 South Road, CB# 3280
(919) 962-3390

Kerry Bloom, Chair

Gidi Shemer, Departmental Advisor, Abbey Fellow
bishemer@email.unc.edu

Jason W. Reed, Director of Undergraduate Studies
jreed@email.unc.edu

Alain Laederach, Biology Study Abroad
alain@unc.edu

Mara Evans, Career Advising
mara1@email.unc.edu

Summer Montgomery, Assistant for Undergraduate Services
sundance@unc.edu

Biology is the study of life from both basic and applied perspectives across a broad range of analytical levels, from the molecule and cell to the organism and ecosystem.

This program is designed for students with a strong interest in a multidisciplinary approach to biological problems in preparation for graduate study in biological or health sciences.

Department Programs

Majors

- Biology Major, B.S. (<http://catalog.unc.edu/undergraduate/programs-study/biology-major-bs/>)
- Biology Major, B.S.–Quantitative Biology Track (p. 1)
- Biology Major, B.A. (<http://catalog.unc.edu/undergraduate/programs-study/biology-major-ba/>)

Minor

- Biology Minor (<http://catalog.unc.edu/undergraduate/programs-study/biology-minor/>)

Graduate Programs

- M.A. in Biology (<http://catalog.unc.edu/graduate/schools-departments/biology/>)
- M.S. in Biology (<http://catalog.unc.edu/graduate/schools-departments/biology/>)
- Ph.D. in Biology (<http://catalog.unc.edu/graduate/schools-departments/biology/>)

Student Learning Outcomes

Upon completion of the biology (B.A., B.S.) program, students should be able to:

- Knowledge Base: Demonstrate knowledge of major concepts, theoretical perspectives, empirical findings, and historical trends in the broad field of Biology
- Research Methods: Apply basic research methods in the biological sciences, including research design, data analysis, and data interpretation
- Critical Thinking Skills: Demonstrate the use of critical and creative thinking skills in upper-level biology courses and in their approach to undergraduate research
- Application of Knowledge, Research Methods, and Critical Thinking: Apply knowledge of the field of biology, research skills, and critical thinking skills to undertake a course-based, field, or laboratory research project

Requirements

In addition to the program requirements, students must

- attain a final cumulative GPA of at least 2.0
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (<http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext>).

Code	Title	Hours
Gateway Course		
BIOL 101 & 101L	Principles of Biology and Introductory Biology Laboratory ^{1,H}	4
Core Requirements		
Core Courses:		
BIOL 201	Ecology and Evolution ^H	4
BIOL 202	Molecular Biology and Genetics ^H	4
BIOL 205	Cellular and Developmental Biology ^{2,H}	4
Two laboratory courses ³		8
A choice of three biology electives (each of three or more credits, not including BIOL 213, BIOL 253, BIOL 291, BIOL 292, BIOL 293, BIOL 294, BIOL 296, BIOL 353, and BIOL 495), of which at least two quantitative electives must be chosen from: ⁴		9-12
BIOL 214H	Mathematics of Evolutionary Processes	
BIOL 224H	The Mathematics of Life ⁵	
BIOL 226	Mathematical Methods for Quantitative Biology ⁵	
BIOL 431	Biological Physics	
BIOL 454	Evolutionary Genetics	
BIOL 465	Global Biodiversity and Macroecology	
BIOL 525	Analysis and Interpretation of Sequence-Based Functional Genomics Experiments ⁵	
BIOL 526	Computational Genetics ^{5,H}	
BIOL 527	Seminar in Quantitative Biology ⁵	

BIOL 528	Quantitative Personalized Genomics ⁵	
BIOL 534	Mathematical Modeling in the Life Sciences	
BIOL 542	Light Microscopy for the Biological Sciences	
BIOL 551	Comparative Biomechanics	
BIOL 553	Mathematical and Computational Models in Biology ⁵	
BIOL 554	Introduction to Computational Neuroscience	
BIOL 562	Statistics for Environmental Scientists	
BIOL 563	Statistical Analysis in Ecology and Evolution	
BIOL 642	Advanced Studies of Cell Division	
COMP 555	Bioalgorithms	
PHYS 405	Biological Physics	
MATH 553 & 553L	Mathematical and Computational Models in Biology and Mathematical and Computational Models in Biology Laboratory	
MATH 564	Mathematical Modeling in the Life Sciences	
Additional Requirements		
BIOS 600	Principles of Statistical Inference	3
or STOR 155	Introduction to Data Models and Inference	
CHEM 101 & 101L	General Descriptive Chemistry I and Quantitative Chemistry Laboratory I ⁶	4
CHEM 102 & 102L	General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{6,H}	4
CHEM 261	Introduction to Organic Chemistry I ^H	3
Select one of the following:		3
COMP 110	Introduction to Programming ^H	
COMP 116	Introduction to Scientific Programming	
COMP 401	Foundation of Programming ^H	
MATH 231	Calculus of Functions of One Variable I ^H	4
MATH 232	Calculus of Functions of One Variable II ^H	4
MATH 233	Calculus of Functions of Several Variables ^H	4
One of the following:		4
PHYS 104	General Physics I	
PHYS 114	General Physics I: For Students of the Life Sciences	
PHYS 116	Mechanics ^H	
PHYS 118	Introductory Calculus-based Mechanics and Relativity	
One of the following:		4
PHYS 105	General Physics II	
PHYS 115	General Physics II: For Students of the Life Sciences	
PHYS 117	Electromagnetism and Optics ^H	
PHYS 119	Introductory Calculus-based Electromagnetism and Quanta	
A choice of two additional allied sciences electives selected from the 6-9 course list below ⁷		
Enough general education (http://catalog.unc.edu/undergraduate/varies-general-education-curriculum-degree-requirements/) and free electives to accumulate 127 academic hours		
Total Hours		127

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

¹ With a C grade or better in BIOL 101

² Minimum of C- in BIOL 202 required for enrollment

³ One must be a quantitative laboratory chosen from BIOL 224H/BIOL 224L, BIOL 226/BIOL 226L, BIOL 525/BIOL 525L, BIOL 526, BIOL 527/BIOL 527L, BIOL 528/BIOL 528L, or BIOL 553/BIOL 553L. The other can be any biology laboratory course, including two semesters of BIOL 395.

⁴ A total of six hours from BIOL 295 (inactive fall 2017), BIOL 395, and/or BIOL 692H count as a laboratory course requirement. One additional elective may consist of a total of three hours of courses numbered above 600 (not including BIOL 692H).

⁵ Courses cannot count as both a quantitative laboratory and a quantitative elective

⁶ A grade of C or better in CHEM 101 or CHEM 102 is required for BIOL 201 and BIOL 202.

⁷ Premedical students are encouraged to take CHEM 241/CHEM 241L and CHEM 262/CHEM 262L.

Allied Science Electives

All allied science elective courses need to have a minimum of three credit hours.

Code	Title	Hours
ANTH 143	Human Evolution and Adaptation	3
ANTH 148	Human Origins	3
ANTH 298	Biological Anthropology Theory and Practice	3
ANTH 315	Human Genetics and Evolution	3
ANTH 317	Evolutionary Perspectives on Human Adaptation and Behavior	3
ANTH 318	Human Growth and Development	3
ANTH 412	Paleoanthropology	3
ANTH 414	Laboratory Methods: Human Osteology	3
ANTH 415	Laboratory Methods: Zooarchaeology	3
ANTH 416	Bioarchaeology	3
ANTH 470	Medicine and Anthropology	3
ANTH 623	Human Disease Ecology	3
ASTR --	Any ASTR course above 99	3
BIOL --	Any BIOL course above 101, except BIOL 213, BIOL 291, BIOL 292, BIOL 294, BIOL 296, and BIOL 495	3
BIOS --	Any BIOS course	3
BMME 335	Biomaterials	3
CHEM --	Any CHEM course above 101	3
COMP --	Any COMP course above 100, except COMP 380	3
ENEC 202	Introduction to the Environmental Sciences	4
ENEC 256	Mountain Biodiversity	4
ENEC 403	Environmental Chemistry Processes	3
ENEC 406	Atmospheric Processes II	4
ENEC 410	Earth Processes in Environmental Systems	4
ENEC 411	Oceanic Processes in Environmental Systems	4
ENEC 415	Environmental Systems Modeling	3
ENEC 471	Human Impacts on Estuarine Ecosystems	4

ENEC 489	Ecological Processes in Environmental Systems	4
EXSS 175	Human Anatomy	3
EXSS 276	Human Physiology	3
GEOG 110	The Blue Planet: An Introduction to Earth's Environmental Systems ^H	3
GEOG 111	Weather and Climate	3
GEOG 212	Environmental Conservation and Global Change	3
GEOG 222	Health and Medical Geography	3
GEOG 253	Introduction to Atmospheric Processes	4
GEOL ---	Any GEOL course above 100	3
MASC ---	Any MASC course above 100	3
MATH ---	Any MATH course above 110, except MATH 129P	3
MCRO 251	Introductory Medical Microbiology	4
NSCI 175	Introduction to Neuroscience	3
NSCI 222	Learning ^H	3
NSCI 225	Sensation and Perception ^H	3
NSCI 401	Animal Behavior	3
NSCI 403	Advanced Biopsychology Laboratory ^H	3
NUTR 240	Introduction to Human Nutrition	3
PHIL 155	Truth and Proof: Introduction to Mathematical Logic ^H	3
PHYI 292		5
PHYS ---	Any PHYS course above 99, except PHYS 132	
PSYC 101	General Psychology	3
PSYC 210	Statistical Principles of Psychological Research ^H	4
PSYC 220	Biopsychology ^H	3
PSYC 230	Cognitive Psychology ^H	3
STOR ---	Any STOR course above 151	3
SPHS 570	Anatomy and Physiology of the Speech, Language, and Hearing Mechanisms	3

^H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term.

Suggested Program of Study for the Quantitative Track

First Year	Hours
BIOL 101 Principles of Biology & 101L and Introductory Biology Laboratory ^H	4
CHEM 101 General Descriptive Chemistry I & 101L and Quantitative Chemistry Laboratory I	4
CHEM 102 General Descriptive Chemistry II & 102L and Quantitative Chemistry Laboratory II ^H	4

ENGL 105	English Composition and Rhetoric	3
Language levels 2 and 3		6
MATH 231	Calculus of Functions of One Variable I ^H	4
MATH 232	Calculus of Functions of One Variable II ^H	4
Lifetime fitness		1
Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) (one course)		3
Hours		33

Sophomore Year

Select two of three biology core courses:		8
BIOL 201	Ecology and Evolution ^H	
BIOL 202	Molecular Biology and Genetics ^H	
BIOL 205	Cellular and Developmental Biology ^H	
BIOS 600	Principles of Statistical Inference or Introduction to Data Models and Inference	3
STOR 155		
CHEM 261	Introduction to Organic Chemistry I ^H	3
CHEM 262	Introduction to Organic Chemistry II & 262L and Laboratory in Organic Chemistry (if premed) ^H	4
Select one of the following:		3
COMP 110	Introduction to Programming ^H	
COMP 116	Introduction to Scientific Programming	
COMP 401	Foundation of Programming ^H	
MATH 233	Calculus of Functions of Several Variables ^H	4
Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) (two courses)		6
Elective		3
Hours		34

Junior Year

Remaining biology core course		4
Biology electives including one quantitative laboratory (three courses)		10
PHYS 114	General Physics I: For Students of the Life Sciences or PHYS 118 or Introductory Calculus-based Mechanics and Relativity	4
PHYS 115	General Physics II: For Students of the Life Sciences or PHYS 119 or Introductory Calculus-based Electromagnetism and Quanta	4
Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) and Connections (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) (three courses)		9
Hours		31

Senior Year

Second laboratory course		4
Biology electives (two courses)		6
Allied sciences electives (CHEM 241/CHEM 241L if premed)		3
Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/) and Connections (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/)		6

Electives to accumulate 127 academic hours	10
Hours	29
Total Hours	127

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Biology Major, NUS Joint Degree

Biology B.S. majors may wish to consider applying for the Joint Degree Program, an innovative joint undergraduate degree program between the University of North Carolina at Chapel Hill and the National University of Singapore. UNC–Chapel Hill undergraduates spend anywhere from two to four semesters at the National University of Singapore and receive a joint bachelor of science degree from both institutions. For further information, contact the Study Abroad Office.

Special Opportunities in Biology

Students are encouraged to speak with their advisor about opportunities to serve as peer advisors in the Health Professions Advising Office, or to join Tri-Beta, the National Biological Sciences Honor Society.

Honors in Biology

Candidates for honors or highest honors must secure approval from the departmental honors advisor. They must have three hours of BIOL 395, take BIOL 692H, and maintain a grade point average of 3.3, both overall and in biology courses (exclusive of BIOL 692H and including only one semester of BIOL 395), calculated at the end of the semester preceding the semester in which they graduate. Other requirements are detailed on the department Web site (<http://bio.unc.edu/undergraduate/honors-info/>).

Experiential Education

After completing BIOL 201 or BIOL 202, students are encouraged to consider how they plan to meet the experiential education requirement. BIOL 293 and BIOL 395 fulfill this requirement and also connect students' academic coursework to current biological research and inquiry.

UNC–BEST

The UNC Baccalaureate Education in Science and Teaching (UNC–BEST) Program is a collaboration between the School of Education and the College of Arts and Sciences and is designed to allow undergraduate science majors interested in teaching high school science the opportunity to earn their science degree and obtain licensure as a North Carolina high school science teacher in four years. UNC–BEST students meet all the degree requirements for their biology degree using BIOL 410 as one of their upper-level biology courses.

Code	Title	Hours
BIOL 410	Principles and Methods of Teaching Biology	4
EDUC 689	Foundations of Special Education (may substitute EDUC 516)	3
EDUC 532	Human Development and Learning (may substitute EDUC 403)	3
EDUC 615	Schools and Community Collaboration (may substitute EDUC 533)	3
EDUC 593	Internship/Student Teaching	12

EDUC 601	Education Workshops	1
Total Hours		26

For more details on admission requirements, application deadlines, and submitting an online application, visit the program's Web site (<http://soe.unc.edu/academics/uncbest/>) or catalog description (<http://catalog.unc.edu/undergraduate/schools-college/education/#licensuretext>).

Laboratory Teaching Apprenticeships and Assistantships

Opportunities exist for assisting graduate instructors (and for instruction in undergraduate laboratories). Interested students should contact the instructor of the course or obtain approval from either the departmental director of undergraduate studies or the department chair.

Undergraduate Awards

All awards include a personal plaque, a monetary gift, and a place on Coker Hall's list of department honorees. The awards include

- The Stephen G. Brantley Award in honor of Henry Van Peters Wilson, given annually to a senior biology major for excellence in research in molecular and cellular biology.
- The Robert Ervin Coker Award, given annually to a senior biology major for excellence in research in organismal biology and ecology.
- The John N. Couch Award, given annually to a senior biology major with interests in plant biology who has demonstrated the highest ideals of scholarship and research.
- The Irvine R. Hagadorn Award, given annually to the junior biology major based on academic and research excellence. This award is also recognized by the UNC–Chapel Hill chancellor at the Annual Chancellor's Awards Ceremony.
- The Francis J. LeClair Award, given annually to a senior biology major for academic excellence in biology with an emphasis in plant sciences.

Undergraduate Research

An undergraduate research experience is extremely valuable to a student who intends to pursue postgraduate work in the biological sciences. Undergraduates may participate directly in the research of faculty in the Department of Biology. This research opportunity allows students to put their knowledge of biology into practice through participation in a biological research program and is encouraged by faculty. Students' participation in research can begin as early as their second year by registration in BIOL 395.

Undergraduates with a 2.0 grade point average or higher in biology courses are encouraged to enroll in BIOL 395. Information concerning the procedure for enrolling in a research course can be obtained from the chair of the department's undergraduate honors research program. Additional information can be found on the department's Web site (<http://bio.unc.edu/undergraduate/research/>).