By majoring in biology, students are exposed to the organization and the processes of life, from molecules and cells through organs and organ systems to populations, species, ecosystems, and evolution. The major offers the mathematical, chemical, and physical background necessary for understanding biology and the practical scientific skills associated with each of these areas. It allows students to begin to specialize in a subdiscipline of biology such as animal physiology, cell biology, ecology, marine biology, microbiology, molecular biology, plant biology, zoology, and so forth. Numerous opportunities for relevant positions are available through Northeastern’s program of cooperative education.

There are several interdisciplinary opportunities involving biology: BS in biochemistry; BS in behavioral neuroscience; BS in computer science and biology; BS in biology and geology; BS in biology and environmental geology; BS in biology/MS in biotechnology; and BS in biochemistry/MS in biotechnology. A marine biology concentration, designed to provide biology majors with a strong foundation in marine biology and related disciplines, is offered through the Northeastern University Marine Science Center in Nahant.

The undergraduate biology major seeks to prepare students for careers in the life sciences, including medical, dental, and other health-related fields. Students may find employment in federal, state, industrial, hospital, or university laboratories or in industries involved in the manufacture and distribution of pharmaceuticals, biological products, food, or scientific equipment. Biologists also work in fisheries, forestry services, county and state agencies, museums, aquariums, research vessels, and marine stations. Graduate study culminating in a master’s or doctoral degree can lead to careers in upper-level teaching or research in any of the life sciences.

Premedical, predental, and other preprofessional students are urged to consult with the preprofessional advisory committee early in their careers at Northeastern.

The Biology department strongly encourages undergraduate research by providing opportunities and support through a number of departmental programs, including research co-ops and internships, course credit for research in faculty labs, honors theses, and work-study research positions. Undergraduates are encouraged to present their findings at Northeastern’s annual Scholarship and Technology Expo, as well as at external research conferences and in scholarly journals.

Transferring to the Major

Students transferring to biology must have a minimum cumulative GPA of 2.000 and have completed the following course:

MTH U121 Precalculus 4 SH

or one semester of calculus with a grade of C or better. Acceptance into the major will be based on students’ meeting the department’s criteria for admission and availability of space in the programs.

Academic Progression Standards

After four semesters in the major, students must have a GPA of at least 2.000 in all science and math courses and have completed at least six of the following courses:

- BIO U101 Principles of Biology 1 4 SH
- with BIO U102 Lab for BIO U101 1 SH
- and BIO U103 Principles of Biology 2 4 SH
- with BIO U104 Lab for BIO U103 1 SH
- BIO U301 Genetics and Molecular Biology 4 SH
- with BIO U302 Lab for BIO U301 1 SH
- CHM U211 General Chemistry 1 4 SH
- with CHM U212 Lab for CHM U211 1 SH
- and CHM U214 General Chemistry 2 4 SH
- with CHM U215 Lab for CHM U214 1 SH
- CHM U311 Organic Chemistry 1 4 SH
- with CHM U312 Lab for CHM U311 1 SH
- and CHM U313 Organic Chemistry 2 4 SH
- with CHM U314 Lab for CHM U313 1 SH
- MTH U151 Calculus and Differential Equations for Biology 1 4 SH
- and MTH U152 Calculus and Differential Equations for Biology 2 4 SH

Students who transfer into the biology major will be allowed two semesters after entering the major to meet the minimum standards for their class. Students who fail to meet the above standards will be placed on departmental probation. Two consecutive semesters on departmental probation will result in dismissal from the major.

To graduate with a major in biology, a student must have a cumulative GPA of 2.000 for all science and mathematics courses required for the major. No double majors are offered in biology and biochemistry or in biology and behavioral neuroscience due to similarity in course curricula.

BS in Biology

NU CORE REQUIREMENTS

See page 42 for requirement list.
BREADTH COURSES FOR BIOLOGY

**Mathematics**
Complete the following two courses:
- MTH U151 Calculus and Differential Equations (4 SH) for Biology 1
- MTH U152 Calculus and Differential Equations (4 SH) for Biology 2

**Chemistry**
Complete the following four courses with corresponding labs:
- CHM U211 General Chemistry 1 (4 SH) with CHM U212 Lab for CHM U211 (1 SH)
- CHM U214 General Chemistry 2 (4 SH) with CHM U215 Lab for CHM U214 (1 SH)
- CHM U311 Organic Chemistry 1 (4 SH) with CHM U312 Lab for CHM U311 (1 SH)
- CHM U313 Organic Chemistry 2 (4 SH) with CHM U314 Lab for CHM U313 (1 SH)

**Physics**
Complete a lecture/lab set for Physics 1 and Physics 2 (PHY U145 and PHY U147 are recommended):
- PHYSICS 1
  - PHY U145 Physics for Life Sciences 1 (4 SH) with PHY U146 Lab for PHY U145 (1 SH)
  - PHY U151 Physics for Engineering 1 (4 SH) with PHY U152 Lab for PHY U151 (1 SH)
  - PHY U161 Physics 1 (4 SH) with PHY U162 Lab for PHY U161 (1 SH)
- PHYSICS 2
  - PHY U147 Physics for Life Sciences 2 (4 SH) with PHY U148 Lab for PHY U147 (1 SH)
  - PHY U155 Physics for Engineering 2 (4 SH) with PHY U156 Lab for PHY U155 (1 SH)
  - PHY U165 Physics 2 (4 SH) with PHY U166 Lab for PHY U165 (1 SH)

**Intermediate or Advanced Science**
Complete one intermediate or advanced science course from the following list:
- BIO U311 to BIO U699
- CHM U321 Analytical Chemistry (4 SH)
- CHM U331 to CHM U699
- ENV U300 to ENV U699
- MTH U280 to MTH U699
- PHY U303 to PHY U699
- PSY U202 Biological Basis of Mental Illness (4 SH)
- PSY U458 Psychobiology (4 SH)
- PSY U510 Psychopharmacology (4 SH)
- PSY U608 Laboratory in Animal Behavior Research (4 SH)

**BIOLOGY MAJOR REQUIREMENTS**

**Required Biology**
Complete the following three courses with corresponding labs:
- BIOLOGY 1
  - BIO U101 Principles of Biology 1 (4 SH)
  - with BIO U102 Lab for BIO U101 (1 SH)
  - or BIO U111 General Biology 1 (4 SH)
  - with BIO U112 Lab for BIO U111 (1 SH)
- BIOLOGY 2
  - BIO U103 Principles of Biology 2 (4 SH)
  - with BIO U104 Lab for BIO U103 (1 SH)
  - or BIO U113 General Biology 2 (4 SH)
  - with BIO U114 Lab for BIO U113 (1 SH)
- GENETICS
  - BIO U301 Genetics and Molecular Biology (4 SH)
  - with BIO U302 Lab for BIO U301 (1 SH)

**Experiential Education Introduction**
Complete the following course:
- BIO U106 Introduction to Experiential Education (1 SH)

**BIOLOGY MAJOR ELECTIVES**

**Cellular and Molecular Biology**
Complete one course with corresponding lab from the following list:
- BIO U319 Regulatory Cell Biology (4 SH)
  - with BIO U320 Lab for BIO U319 (1 SH)
- BIO U321 Microbiology (4 SH)
  - with BIO U322 Lab for BIO U321 (1 SH)
- BIO U323 Biochemistry (4 SH)
  - with BIO U324 Lab for BIO U323 (1 SH)

**Organismal and Population Biology**
Complete one course with corresponding lab from the following list:
- BIO U311 Ecology (4 SH)
  - with BIO U312 Lab for BIO U311 (1 SH)
- BIO U313 Plant Biology (4 SH)
  - with BIO U314 Lab for BIO U313 (1 SH)
- BIO U315 Invertebrate Zoology (4 SH)
  - with BIO U316 Lab for BIO U315 (1 SH)
- BIO U317 Vertebrate Zoology (4 SH)
  - with BIO U318 Lab for BIO U317 (1 SH)

**Intermediate and Advanced Biology**
Complete three biology courses (at least 13 semester hours) at level 311 and above from the following list. Up to 4 semester hours may be research in a faculty lab.
- BIO U311 to BIO U699

**Research**
- BIO U921 Directed Study (1 SH)
- BIO U922 Directed Study (2 SH)
- BIO U923 Directed Study (3 SH)
- BIO U924 Directed Study (4 SH)
- BIO U964 Research (4 SH)
- BIO U970 Junior/Senior Honors Project 1 (4 SH)
HNR U921 Directed Study 1 SH
HNR U922 Directed Study 2 SH
HNR U923 Directed Study 3 SH
HNR U924 Directed Study 4 SH

**Experiential Education**
An activity related to biology and approved by the experiential education advisor must be completed before the capstone. Among the possibilities are co-op experience, junior/senior honors thesis, research project in a faculty lab, study abroad with submission of a paper, 120 hours of supervised volunteer work in a biology-related area, participation in the Three Seas Program with submission of a project paper, or other approved experiences.

**Biology Capstone**
Complete the following course:
BIO U701 Biology Capstone 4 SH

**BIOLOGY MAJOR CREDIT/GPA REQUIREMENTS**
Complete 85 semester hours for the major with a cumulative GPA of 2.000.

Due to overlap in course content, double majoring in biology and biochemistry or biology and behavioral neuroscience is not permitted.

**GENERAL ELECTIVES**
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

**COOPERATIVE EDUCATION**
If elected

**UNIVERSITY-WIDE REQUIREMENTS**
136 total semester hours required
Minimum 2.000 GPA required

**BS in Biology with Concentration in Marine Biology**

**NU CORE REQUIREMENTS**
See page 42 for requirement list.

**BREADTH COURSES FOR BIOLOGY (MARINE BIOLOGY CONCENTRATION)**

**Mathematics**
Complete the following two courses:
MTH U151 Calculus and Differential Equations for Biology 1 4 SH
MTH U152 Calculus and Differential Equations for Biology 2 4 SH

**Chemistry**
Complete the following four courses with corresponding labs:
CHM U211 General Chemistry 1 4 SH
with CHM U212 Lab for CHM U211 1 SH
CHM U214 General Chemistry 2 4 SH
with CHM U215 Lab for CHM U214 1 SH
CHM U311 Organic Chemistry 1 4 SH
with CHM U312 Lab for CHM U311 1 SH

CHM U313 Organic Chemistry 2 4 SH
with CHM U314 Lab for CHM U313 1 SH

**Physics**
Complete a lecture/lab set for Physics 1 and for Physics 2 (PHY U145 and PHY U147 are recommended):

PHYSICS 1
PHY U145 Physics for Life Sciences 1 4 SH
with PHY U146 Lab for PHY U145 1 SH
PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
PHY U161 Physics 1 4 SH
with PHY U162 Lab for PHY U161 1 SH

PHYSICS 2
PHY U147 Physics for Life Sciences 2 4 SH
with PHY U148 Lab for PHY U147 1 SH
PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH
PHY U165 Physics 2 4 SH
with PHY U166 Lab for PHY U165 1 SH

**BIOLOGY MAJOR REQUIREMENTS (MARINE BIOLOGY CONCENTRATION)**

**Required Biology**
Complete the following three courses with corresponding labs:
BIO U101 Principles of Biology 1 4 SH
with BIO U102 Lab for BIO U101 1 SH
or BIO U111 General Biology 1 4 SH
with BIO U112 Lab for BIO U111 1 SH
BIO U103 Principles of Biology 2 4 SH
with BIO U104 Lab for BIO U103 1 SH
or BIO U113 General Biology 2 4 SH
with BIO U114 Lab for BIO U113 1 SH
BIO U301 Genetics and Molecular Biology 4 SH
with BIO U302 Lab for BIO U301 1 SH

**Experiential Education Introduction**
Complete the following course:
BIO U106 Introduction to Experiential Education 1 SH

**Cellular and Molecular Biology**
Complete one course with corresponding lab from the following list:
BIO U319 Regulatory Cell Biology 4 SH
with BIO U320 Lab for BIO U319 1 SH
or BIO U321 Microbiology 4 SH
with BIO U322 Lab for BIO U321 1 SH
or BIO U323 Biochemistry 4 SH
with BIO U324 Lab for BIO U323 1 SH

**Organismal and Population Biology**
Complete the following course with corresponding lab:
BIO U311 Ecology 4 SH
with BIO U312 Lab for BIO U311 1 SH
Marine Biology Courses
Complete four marine biology electives within the course range below for a minimum of 16 semester hours:
BIO U501 to BIO U531

Marine Biology Research
Complete 4 semester hours of directed study/research:
BIO U964 Research 4 SH
or consult advisor for additional courses.

Experiential Education
An activity related to biology and approved by the experiential education advisor must be completed before the capstone. Among the possibilities are co-op experience, junior/senior honors thesis, research project in a faculty lab, study abroad with submission of a paper, 120 hours of supervised volunteer work in a biology-related area, participation in the Three Seas Program with submission of a project paper, or other approved experiences.

Biology Capstone
Complete the following course:
BIO U701 Biology Capstone 4 SH

BIOLOGY MAJOR CREDIT/GPA REQUIREMENTS
(MARINE BIOLOGY CONCENTRATION)
Complete 85 semester hours in the major with a cumulative GPA of 2.000.

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COOPERATIVE EDUCATION
If elected

UNIVERSITY-WIDE REQUIREMENTS
136 total semester hours required
Minimum 2.000 GPA required

BS in Biology and Environmental Geology
For degree requirements, please visit the myNEU Web Portal (www.myneu.neu.edu), click on the “Self-Service” tab, then on “My Degree Audit.”

BS in Biology and Geology
For degree requirements, please visit the myNEU Web Portal (www.myneu.neu.edu), click on the “Self-Service” tab, then on “My Degree Audit.”

BS in Computer Science and Biology
See page 272.

BS in Biology/MS Biotechnology

APPLICATION PROCEDURES
Students should apply for the BS/MS program during their fifth academic semester. Before applying, students must have completed 80 semester hours and one co-op experience.

NU CORE REQUIREMENTS
See page 42 for requirement list.

BREADTH COURSES FOR BIOLOGY

Mathematics
Complete the following two courses:
MTH U151 Calculus and Differential Equations for Biology 1 4 SH
MTH U152 Calculus and Differential Equations for Biology 2 4 SH

Chemistry
Complete the following four courses with corresponding labs:
CHM U211 General Chemistry 1 4 SH
with CHM U212 Lab for CHM U211 1 SH
CHM U214 General Chemistry 2 4 SH
with CHM U215 Lab for CHM U214 1 SH
CHM U311 Organic Chemistry 1 4 SH
with CHM U312 Lab for CHM U311 1 SH
CHM U313 Organic Chemistry 2 4 SH
with CHM U314 Lab for CHM U313 1 SH

Physics
Complete a lecture/lab set for Physics 1 and for Physics 2
(PHY U145 and PHY U147 are recommended):
PHY U145 Physics for Life Sciences 1 4 SH
with PHY U146 Lab for PHY U145 1 SH
or PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
or PHY U161 Physics 1 4 SH
with PHY U162 Lab for PHY U161 1 SH

PHYSICS 2
PHY U147 Physics for Life Sciences 2 4 SH
with PHY U148 Lab for PHY U147 1 SH
or PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH
or PHY U165 Physics 2 4 SH
with PHY U166 Lab for PHY U165 1 SH

Intermediate or Advanced Science
Complete one intermediate or advanced science course from
the following list:
BIO U311 to BIO U699
CHM U321 Analytical Chemistry 4 SH
CHM U331 to CHM U699
ENV U300 to ENV U699
MTH U280 to MTH U699
PHY U303 to PHY U699
PSY U202 Biological Basis of Mental Illness 4 SH
PSY U458 Psychobiology 4 SH
PSY U510 Psychopharmacology 4 SH
PSY U608 Laboratory in Animal Behavior Research 4 SH

BIOLOGY MAJOR REQUIREMENTS

Required Biology
Complete the following three courses with corresponding labs:

BIOLOGY 1
BIO U101 Principles of Biology 1 4 SH
with BIO U102 Lab for BIO U101 1 SH
or BIO U111 General Biology 1 4 SH
with BIO U112 Lab for BIO U111 1 SH

BIOLOGY 2
BIO U103 Principles of Biology 2 4 SH
with BIO U104 Lab for BIO U103 1 SH
or BIO U113 General Biology 2 4 SH
with BIO U114 Lab for BIO U113 1 SH

GENETICS
BIO U301 Genetics and Molecular Biology 4 SH
with BIO U302 Lab for BIO U301 1 SH

Experiential Education Introduction
Complete the following course:
BIO U106 Introduction to Experiential Education 1 SH

BIOLOGY MAJOR ELECTIVES

Cellular and Molecular Biology
Complete the following course with corresponding lab:
BIO U323 Biochemistry 4 SH
with BIO U324 Lab for BIO U323 1 SH

Organismal and Population Biology
Complete one course with corresponding lab from the following list:
BIO U311 Ecology 4 SH
with BIO U312 Lab for BIO U311 1 SH
BIO U313 Plant Biology 4 SH
with BIO U314 Lab for BIO U313 1 SH
BIO U315 Invertebrate Zoology 4 SH
with BIO U316 Lab for BIO U315 1 SH
BIO U317 Vertebrate Zoology 4 SH
with BIO U318 Lab for BIO U317 1 SH

Biology Capstone
Complete the following course:
BIO U701 Biology Capstone 4 SH

GRADUATE COURSES TAKEN
AS AN UNDERGRADUATE

Required Courses
Complete the following five courses for graduate credit:
BIO G279 Biochemistry/Molecular Biology Experimental Approaches 5 SH
BIO G301 Molecular Cell Biology 4 SH
INT G120 Introduction to Biotechnology 2 SH
INT G245 Biotechnology Applications Laboratory 2 SH
PSC G100 Concepts in Pharmaceutical Science 2 SH

Elective Course Work
Complete two additional advanced graduate biology elective courses.

GRADUATE COURSES TAKEN
AS A GRADUATE STUDENT

Required Courses
Complete the following five courses:
BIO G382 Research Problem Solving 2 SH
CHM G211 Analytical Separations 3 SH
CHM G212 Principles of Mass Spectrometry 3 SH
CHM G316 Analytical Biochemistry 3 SH
MGT G219 The Business of Biotechnology 3 SH

Elective Course Work
Complete 2 semester hours of graduate electives.

COOPERATIVE EDUCATION

Required Co-op
Complete three co-op assignments.

BIOLOGY/BIOTECHNOLOGY MAJOR CREDIT/GPA REQUIREMENTS

Complete 107 semester hours in the major with a cumulative GPA of 2.000.

GENERAL ELECTIVES

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

UNIVERSITY-WIDE REQUIREMENTS

156 total semester hours required
Minimum 3.000 GPA required

Minor in Biology
This minor is not available for students who major in biology, biochemistry, behavioral neuroscience, or any dual major that involves biology.

REQUIRED BIOLOGY COURSES

Complete five biology courses from the following list for a total of at least 23 semester hours. At least three courses must be intermediate or advanced. Three of the five courses must contain a lab corequisite.
**Introductory**

BIO U101 to BIO U299

**Intermediate to Advanced**

BIO U301 to BIO U599

**BREADTH COURSE**

To provide breadth of knowledge, complete one additional science course from the BIO, CHM, ENV, or PHY departments or any course from the following list:

- PSY U202 Biological Basis of Mental Illness 4 SH
- PSY U458 Psychobiology 4 SH
- PSY U510 Psychopharmacology 4 SH

**GPA REQUIREMENT**

2.000 GPA required in the minor

**Minor in Marine Biology**

This minor is not available for students who major in biology or any dual major that involves biology. Biology majors interested in marine biology should consider the concentration in marine biology.

**REQUIRED COURSES**

Complete the following two courses with labs:

- BIO U101 Principles of Biology 1 4 SH
  - with BIO U102 Lab for BIO U101 1 SH
  - or BIO U111 General Biology 1 4 SH
  - with BIO U112 Lab for BIO U111 1 SH
- BIO U103 Principles of Biology 2 4 SH
  - with BIO U104 Lab for BIO U103 1 SH
  - or BIO U113 General Biology 2 4 SH
  - with BIO U114 Lab for BIO U113 1 SH

**ELECTIVE COURSES**

Complete three courses from the following list:

- BIO U151 Introduction to Marine Biology 4 SH
- BIO U315 Invertebrate Zoology 4 SH
- BIO U501 Marine Botany 4 SH
  - with BIO U502 Lab for BIO U501 1 SH
- BIO U503 Marine Invertebrate Zoology 4 SH
  - with BIO U504 Lab for BIO U503 1 SH
- BIO U505 Biology of Corals 3 SH
- BIO U507 Biology and Ecology of Fishes 3 SH
- BIO U509 Marine Birds and Mammals 2 SH
  - with BIO U510 Lab for BIO U509 1 SH
- BIO U511 Adaptations of Aquatic Organisms 3 SH
- BIO U515 Marine Ecology 4 SH
- BIO U517 Oceanography 2 SH
  - with BIO U518 Lab for BIO U517 1 SH
- BIO U519 Ocean and Coastal Processes 2 SH
- BIO U521 Experimental Design Marine Ecology 4 SH
  - with BIO U522 Lab for BIO U521 1 SH
- BIO U523 Molecular Marine Biology 3 SH
- BIO U525 Marine Microbial Ecology 2 SH
  - with BIO U526 Lab for BIO U525 1 SH
- BIO U527 Marine Conservation Biology 3 SH
- BIO U529 Physiological and Molecular Marine Ecology 3 SH
- BIO U589 Diving Research Methods 2 SH

**BREADTH COURSE**

To provide breadth of knowledge, complete one additional science course from the BIO, CHM, ENV, or PHY departments or any course from the following list:

- PSY U202 Biological Basis of Mental Illness 4 SH
- PSY U458 Psychobiology 4 SH
- PSY U510 Psychopharmacology 4 SH

**GPA REQUIREMENT**

2.000 GPA required in the minor