Biology

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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:

- MATH 1120 Precalculus 4 SH
  or one semester of calculus with a grade of C or better.

Acceptance into the major is 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:

- BIOL 1101 Principles of Biology 1 4 SH
  with BIOL 1102 Lab for BIOL 1101 1 SH
- and BIOL 1103 Principles of Biology 2 4 SH
  with BIOL 1104 Lab for BIOL 1103 1 SH
- BIOL 2301 Genetics and Molecular Biology 4 SH
  with BIOL 2302 Lab for BIOL 2301 1 SH
- CHEM 1211 General Chemistry 1 4 SH
  with CHEM 1212 Lab for CHEM 1211 1 SH
- and CHEM 1214 General Chemistry 2 4 SH
  with CHEM 1215 Lab for CHEM 1214 1 SH
- CHEM 2311 Organic Chemistry 1 4 SH
  with CHEM 2312 Lab for CHEM 2311 1 SH
- and CHEM 2313 Organic Chemistry 2 4 SH
  with CHEM 2314 Lab for CHEM 2313 1 SH
- MATH 1251 Calculus and Differential Equations 4 SH
  for Biology 1
  and MATH 1252 Calculus and Differential Equations 4 SH
  for Biology 2

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 26 for requirement list.

Breadth Courses for Biology

Mathematics

Complete the following two courses:

- MATH 1251 Calculus and Differential Equations 4 SH
  for Biology 1
- MATH 1252 Calculus and Differential Equations 4 SH
  for Biology 2
**Chemistry**
Complete the following four courses with corresponding labs:

- CHEM 1211 General Chemistry 1 4 SH
  with CHEM 1212 Lab for CHEM 1211 1 SH
- CHEM 1214 General Chemistry 2 4 SH
  with CHEM 1215 Lab for CHEM 1214 1 SH
- CHEM 2311 Organic Chemistry 1 4 SH
  with CHEM 2312 Lab for CHEM 2311 1 SH
- CHEM 2313 Organic Chemistry 2 4 SH
  with CHEM 2314 Lab for CHEM 2313 1 SH

**Physics**
Complete a lecture/lab set for Physics 1 and Physics 2
(PHYS 1145 and PHYS 1147 are recommended):

- PHYS 1145 Physics for Life Sciences 1 4 SH
  with PHYS 1146 Lab for PHYS 1145 1 SH
- PHYS 1151 Physics for Engineering 1 4 SH
  with PHYS 1152 Lab for PHYS 1151 1 SH
- PHYS 1161 Physics 1 4 SH
  with PHYS 1162 Lab for PHYS 1161 1 SH
- PHYS 1147 Physics for Life Sciences 2 4 SH
  with PHYS 1148 Lab for PHYS 1147 1 SH
- PHYS 1155 Physics for Engineering 2 4 SH
  with PHYS 1156 Lab for PHYS 1155 1 SH
- PHYS 1165 Physics 2 4 SH
  with PHYS 1166 Lab for PHYS 1165 1 SH

**Intermediate or Advanced Science**
Complete one intermediate or advanced science course from the following list:

- BIOL 2311 to BIOL 5999
- CHEM 2321 Analytical Chemistry 4 SH
- CHEM 2341 to CHEM 5999
- ENVR 2000 to ENVR 4989
- MATH 2280 to MATH 4989
- PHYS 2303 to PHYS 5999
- PSYC 3458 Psychobiology 4 SH
- PSYC 3510 Psychopharmacology 4 SH
- PSYC 4608 Laboratory in Animal Behavior Research

**BIOLOGY MAJOR REQUIREMENTS**

**Required Biology**
Complete the following three courses with corresponding labs:

- BIOLOGY 1
  - BIOL 1101 Principles of Biology 1 4 SH
  with BIOL 1102 Lab for BIOL 1101 1 SH
  or BIOL 1111 General Biology 1 4 SH
  with BIOL 1112 Lab for BIOL 1111 1 SH

**Optional requirements**

- PHYSICS 1
  - PHYS 1145 Physics for Life Sciences 1 4 SH
  - PHYS 1151 Physics for Engineering 1 4 SH
  - PHYS 1161 Physics 1 4 SH
  - PHYS 1147 Physics for Life Sciences 2 4 SH
  - PHYS 1155 Physics for Engineering 2 4 SH
  - PHYS 1165 Physics 2 4 SH

**Intermediate or Advanced Science**
Complete one intermediate or advanced science course from the following list:

- BIOL 2311 to BIOL 5999
- CHEM 2321 Microbiology 4 SH
  with CHEM 2322 Lab for CHEM 2321 1 SH
- CHEM 2323 Biochemistry 4 SH
  with CHEM 2324 Lab for CHEM 2323 1 SH

**Experiential Education**
Complete the following course:

- BIOL 1106 Introduction to Experiential Education 1 SH
BIOLOGY MAJOR CREDIT/GPA REQUIREMENTS
Complete 85 semester hours in 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 26 for requirement list.

BREADTH COURSES FOR BIOLOGY (MARINE BIOLOGY CONCENTRATION)

Mathematics
Complete the following two courses:
MATH 1251 Calculus and Differential Equations 4 SH
for Biology 1
MATH 1252 Calculus and Differential Equations 4 SH
for Biology 2

Chemistry
Complete the following four courses with corresponding labs:
CHEM 1211 General Chemistry 1 4 SH
with CHEM 1212 Lab for CHEM 1211 1 SH
CHEM 1214 General Chemistry 2 4 SH
with CHEM 1215 Lab for CHEM 1214 1 SH
CHEM 2311 Organic Chemistry 1 4 SH
with CHEM 2312 Lab for CHEM 2311 1 SH
CHEM 2313 Organic Chemistry 2 4 SH
with CHEM 2314 Lab for CHEM 2313 1 SH

Physics
Complete a lecture/lab set for Physics 1 and for Physics 2
(PHYS 1145 and PHYS 1147 are recommended):
PHYSICS 1
PHYS 1145 Physics for Life Sciences 1 4 SH
with PHYS 1146 Lab for PHYS 1145 1 SH
PHYS 1151 Physics for Engineering 1 4 SH
with PHYS 1152 Lab for PHYS 1151 1 SH
PHYS 1161 Physics 1 4 SH
with PHYS 1162 Lab for PHYS 1161 1 SH

PHYSICS 2
PHYS 1147 Physics for Life Sciences 2 4 SH
with PHYS 1148 Lab for PHYS 1147 1 SH
PHYS 1155 Physics for Engineering 2 4 SH
with PHYS 1156 Lab for PHYS 1155 1 SH
PHYS 1165 Physics 2 4 SH
with PHYS 1166 Lab for PHYS 1165 1 SH

BIOLOGY MAJOR REQUIREMENTS (MARINE BIOLOGY CONCENTRATION)

Required Biology
Complete the following three courses with corresponding labs:
BIOL 1101 Principles of Biology 1 4 SH
with BIOL 1102 Lab for BIOL 1101 1 SH
or BIOL 1111 General Biology 1 4 SH
with BIOL 1112 Lab for BIOL 1111 1 SH
BIOL 1103 Principles of Biology 2 4 SH
with BIOL 1104 Lab for BIOL 1103 1 SH
or BIOL 1113 General Biology 2 4 SH
with BIOL 1114 Lab for BIOL 1113 1 SH
BIOL 2301 Genetics and Molecular Biology 4 SH
with BIOL 2302 Lab for BIOL 2301 1 SH

Experiential Education Introduction
Complete the following course:
BIOL 1106 Introduction to Experiential Education 1 SH

Cellular and Molecular Biology
Complete one course with corresponding lab from the following list:
BIOL 2319 Regulatory Cell Biology 4 SH
with BIOL 2320 Lab for BIOL 2319 1 SH
or BIOL 2321 Microbiology 4 SH
with BIOL 2322 Lab for BIOL 2321 1 SH
or BIOL 2323 Biochemistry 4 SH
with BIOL 2324 Lab for BIOL 2323 1 SH

Organismal and Population Biology
Complete the following course with corresponding lab:
BIOL 2311 Ecology 4 SH
with BIOL 2312 Lab for BIOL 2311 1 SH

Marine Biology Courses
Complete four marine biology electives within the course range below for a minimum of 16 semester hours:
BIOL 5501 to BIOL 5531

Marine Biology Research
Complete 4 semester hours of directed study/research:
BIOL 4991 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:
BIOL 4701 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.mynreu.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.mynreu.neu.edu), click on the “Self-Service” tab, then on “My Degree Audit.”

**BS in Biology and Mathematics**

**NU CORE REQUIREMENTS**
See page 26 for requirement list.

**BIOLOGY MAJOR REQUIREMENTS**

**Required Biology**
Complete the following three courses with corresponding labs:

<table>
<thead>
<tr>
<th>Biology</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 1101</td>
<td>Principles of Biology 1</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>or BIOL 1111</td>
<td>General Biology 1</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 1102</td>
<td>Lab for BIOL 1101</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>or BIOL 1112</td>
<td>Lab for BIOL 1111</td>
<td>1 SH</td>
<td></td>
</tr>
</tbody>
</table>

**BIOL 2301** Genetics and Molecular Biology 4 SH
with BIOL 2302 Lab for BIOL 2301 1 SH

**Chemistry Courses**
Complete the following four courses with corresponding labs:

<table>
<thead>
<tr>
<th>Chemistry</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1211</td>
<td>General Chemistry 1</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with CHEM 1212</td>
<td>Lab for CHEM 1211</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>CHEM 1214</td>
<td>General Chemistry 2</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with CHEM 1215</td>
<td>Lab for CHEM 1214</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>CHEM 2311</td>
<td>Organic Chemistry 1</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with CHEM 2312</td>
<td>Lab for CHEM 2311</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>CHEM 2313</td>
<td>Organic Chemistry 2</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with CHEM 2314</td>
<td>Lab for CHEM 2313</td>
<td>1 SH</td>
<td></td>
</tr>
</tbody>
</table>

**Cellular and Molecular Biology**
Complete one course with corresponding lab from the following list:

<table>
<thead>
<tr>
<th>Biology</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 2319</td>
<td>Regulatory Cell Biology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2320</td>
<td>Lab for BIOL 2319</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>BIOL 2321</td>
<td>Microbiology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2322</td>
<td>Lab for BIOL 2321</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>BIOL 2323</td>
<td>Biochemistry</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2324</td>
<td>Lab for BIOL 2323</td>
<td>1 SH</td>
<td></td>
</tr>
</tbody>
</table>

**Organismal and Population Biology**
Complete one course with corresponding lab from the following list:

<table>
<thead>
<tr>
<th>Biology</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 2311</td>
<td>Ecology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2312</td>
<td>Lab for BIOL 2311</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>BIOL 2313</td>
<td>Plant Biology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2314</td>
<td>Lab for BIOL 2313</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>BIOL 2315</td>
<td>Invertebrate Zoology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2316</td>
<td>Lab for BIOL 2315</td>
<td>1 SH</td>
<td></td>
</tr>
<tr>
<td>BIOL 2317</td>
<td>Vertebrate Zoology</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>with BIOL 2318</td>
<td>Lab for BIOL 2317</td>
<td>1 SH</td>
<td></td>
</tr>
</tbody>
</table>

**MATHEMATICS MAJOR REQUIREMENTS**

**Programming Skills**
Complete the following course:

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 2250</td>
<td>Programming Skills for Mathematics</td>
<td>2 SH</td>
<td></td>
</tr>
</tbody>
</table>

**Calculus 1**
Complete one of the following courses:

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1251</td>
<td>Calculus and Differential Equations for Biology 1</td>
<td>4 SH</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1341</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4 SH</td>
<td></td>
</tr>
</tbody>
</table>

**Calculus 2 and Calculus 3**
Complete the following two courses:

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1342</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>or MATH 1251</td>
<td>Calculus and Differential Equations for Biology 1</td>
<td>4 SH</td>
<td></td>
</tr>
<tr>
<td>MATH 2321</td>
<td>Calculus 3 for Science and Engineering</td>
<td>4 SH</td>
<td></td>
</tr>
</tbody>
</table>
Physics
Complete the following course with corresponding lab:
PHYS 1161 Physics 1  4 SH
with PHYS 1162  Lab for PHYS 1161  1 SH

Required Mathematics Courses
Complete the following three courses:
MATH 1365  Introduction to Mathematical Reasoning  4 SH
MATH 2351  Ordinary Differential Equations  4 SH
MATH 3081  Probability and Statistics  4 SH

Mathematics Electives
Complete three mathematics courses from the following list:
MATH 2331  Linear Algebra  4 SH
MATH 2351  Ordinary Differential Equations  4 SH
MATH 3081  Probability and Statistics  4 SH
MATH 3000 to MATH 4899

ADDITIONAL REQUIREMENTS

Biology/Mathematics Integrative Courses
Complete two integrative courses with corresponding labs, as indicated, from the following list:
BIOL 3405  Neurobiology  4 SH
BIOL 5551  Principles of Animal Physiology  4 SH
with BIOL 5552  Lab for BIOL 5551  1 SH
BIOL 5581  Biological Imaging  4 SH
BIOL 6308  Bio IT Methods 1—Genome and Proteome Analysis  4 SH
BIOL 6309  Bio IT Methods 2—Protein Structure and Systems  4 SH
CS 2500  Fundamentals of Computer Science  4 SH
with CS 2501  Lab for CS 2500  1 SH
CS 2510  Fundamentals of Computer Science 2  4 SH
with CS 2511  Lab for CS 2510  1 SH
MATH 4581  Statistics and Stochastic Processes  4 SH
MATH 7343  Applied Statistics  4 SH

Experiential Education Introduction
Complete the following two courses:
BIOL 1106  Introduction to Experiential Education  1 SH
MATH 3000  Co-op and Experiential Learning  1 SH
or MATH 4000  Co-op and Experiential Learning  1 SH
Reflection Seminar 1
Reflection Seminar 2

Writing-Intensive in the Major
Complete one of the following courses:
BIOL 2311  Ecology  4 SH
with BIOL 2312  Lab for BIOL 2311  1 SH
BIOL 2313  Plant Biology  4 SH
with BIOL 2314  Lab for BIOL 2313  1 SH
BIOL 2315  Invertebrate Zoology  4 SH
with BIOL 2316  Lab for BIOL 2315  1 SH
BIOL 2317  Vertebrate Zoology  4 SH
with BIOL 2318  Lab for BIOL 2317  1 SH
BIOL 2319  Regulatory Cell Biology  4 SH
with BIOL 2320  Lab for BIOL 2319  1 SH
BIOL 2321  Microbiology  4 SH
with BIOL 2322  Lab for BIOL 2321  1 SH
BIOL 2323  Biochemistry  4 SH
with BIOL 2324  Lab for BIOL 2323  1 SH
BIOL 2325  Marine Biology  4 SH
with BIOL 2326  Lab for BIOL 2325  1 SH
MATH 3150  Real Analysis  4 SH

Advanced Writing in the Disciplines
Complete one of the following courses:
ENGL 3301  Advanced Writing in the Disciplines  4 SH
ENGL 3307  Advanced Writing in the Sciences  4 SH

Capstone
Complete one of the following capstone courses:
BIOL 4701  Biology Capstone  4 SH
MATH 4025  Applied Mathematics Capstone  4 SH

BIOLOGY AND MATHEMATICS DUAL-MAJOR CREDIT/GPA REQUIREMENTS
Complete 93 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
143 total semester hours required
Minimum 2.000 GPA required

BS in Computer Science and Biology
See page 281.

BS in Biology/MS in 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 26 for requirement list.

BREADTH COURSES FOR BIOLOGY

Mathematics
Complete the following two courses:
MATH 1251  Calculus and Differential Equations  4 SH
for Biology 1
MATH 1252  Calculus and Differential Equations  4 SH
for Biology 2

Chemistry
Complete the following four courses with corresponding labs:
CHEM 1211  General Chemistry 1  4 SH
with CHEM 1212  Lab for CHEM 1211  1 SH
CHEM 1214  General Chemistry 2  4 SH
with CHEM 1215  Lab for CHEM 1214  1 SH

NORTHEASTERN UNIVERSITY
CHEM 2311  Organic Chemistry 1 4 SH  
with CHEM 2312  Lab for CHEM 2311 1 SH  
CHEM 2313  Organic Chemistry 2 4 SH  
with CHEM 2314  Lab for CHEM 2313 1 SH  

**Physics**

Complete a lecture/lab set for Physics 1 and Physics 2 (PHYS 1145 and PHYS 1147 are recommended):

**PHYSICS 1**
- PHYS 1145  Physics for Life Sciences 1 4 SH  
  with PHYS 1146  Lab for PHYS 1145 1 SH  
- PHYS 1151  Physics for Engineering 1 4 SH  
  with PHYS 1152  Lab for PHYS 1151 1 SH  
- PHYS 1161  Physics 1 4 SH  
  with PHYS 1162  Lab for PHYS 1161 1 SH  

**PHYSICS 2**
- PHYS 1147  Physics for Life Sciences 2 4 SH  
  with PHYS 1148  Lab for PHYS 1147 1 SH  
- PHYS 1155  Physics for Engineering 2 4 SH  
  with PHYS 1156  Lab for PHYS 1155 1 SH  
- PHYS 1165  Physics 2 4 SH  
  with PHYS 1166  Lab for PHYS 1165 1 SH  

**Intermediate or Advanced Science**

Complete one intermediate or advanced science course from the following list:

- BIOL 2311 to BIOL 5999  
- CHEM 2321  Analytical Chemistry 4 SH  
- CHEM 2341 to CHEM 5999  
- ENVR 2000 to ENVR 4989  
- MATH 2280 to MATH 4989  
- PHYS 2303 to PHYS 5999  
- PSYC 3458  Psychobiology 4 SH  
- PSYC 4510  Psychopharmacology 4 SH  
- PSYC 4608  Laboratory in Animal Behavior Research 4 SH  

**BIOLOGY MAJOR REQUIREMENTS**

**Required Biology**

Complete the following three courses with corresponding labs:

**BIOLOGY 1**
- BIOL 1101  Principles of Biology 1 4 SH  
  with BIOL 1102  Lab for BIOL 1101 1 SH  
  or BIOL 1111  General Biology 1 4 SH  
  with BIOL 1112  Lab for BIOL 1111 1 SH  

**BIOLOGY 2**
- BIOL 1103  Principles of Biology 2 4 SH  
  with BIOL 1104  Lab for BIOL 1103 1 SH  
  or BIOL 1113  General Biology 2 4 SH  
  with BIOL 1114  Lab for BIOL 1113 1 SH  

**GENETICS**
- BIOL 2301  Genetics and Molecular Biology 4 SH  
  with BIOL 2302  Lab for BIOL 2301 1 SH  

**Experiential Education Introduction**

Complete the following course:
- BIOL 1106  Introduction to Experiential Education 1 SH  

**BIOLOGY MAJOR ELECTIVES**

**Cellular and Molecular Biology**

Complete the following course with corresponding lab:
- BIOL 2323  Biochemistry 4 SH  
  with BIOL 2324  Lab for BIOL 2323 1 SH  

**Organismal and Population Biology**

Complete one course with corresponding lab from the following list:
- BIOL 2311  Ecology 4 SH  
  with BIOL 2312  Lab for BIOL 2311 1 SH  
- BIOL 2313  Plant Biology 4 SH  
  with BIOL 2314  Lab for BIOL 2313 1 SH  
- BIOL 2315  Invertebrate Zoology 4 SH  
  with BIOL 2316  Lab for BIOL 2315 1 SH  
- BIOL 2317  Vertebrate Zoology 4 SH  
  with BIOL 2318  Lab for BIOL 2317 1 SH  

**Biology Capstone**

Complete the following course:
- BIOL 4701  Biology Capstone 4 SH  

**BIOTECHNOLOGY REQUIREMENTS—GRADUATE COURSES TAKEN AS AN UNDERGRADUATE**

**Required Courses**

Complete the following five courses for graduate credit:
- BIOL 5579  Biochemistry/Molecular Biology Experimental Approaches 5 SH  
- BIOL 6301  Molecular Cell Biology 4 SH  
- IDSC 5120  Introduction to Biotechnology Laboratory 2 SH  
- IDSC 7245  Biotechnology Applications Laboratory 2 SH  
- PHSC 5100  Concepts in Pharmaceutical Science 2 SH  

**Elective Course Work**

Complete one additional graduate-level biology elective course.

**BIOTECHNOLOGY REQUIREMENTS—GRADUATE COURSES TAKEN AS A GRADUATE STUDENT**

**Track**

Complete either the molecular track or the pharmaceutical track:

**MOLECULAR TRACK**

Complete the following five courses:
- BIOL 7382  Research Problem Solving 2 SH  
- CHEM 5611  Analytical Separations 3 SH  
- CHEM 5612  Principles of Mass Spectrometry 3 SH  
- CHEM 5660  Analytical Biochemistry 3 SH  
- MGMT 6219  The Business of Biotechnology 3 SH  

**PHARMACEUTICAL TRACK**

Complete the following seven courses:
- MGMT 6219  The Business of Biotechnology 3 SH  
- PHSC 6210  Drug Design, Evaluation, and Development 2 SH
PHSC 6214  Experimental Design and Biometrics  2 SH
PHSC 6216  Human Physiology and Pathophysiology  2 SH
PHSC 6218  Biomedical Chemical Analysis  2 SH
PMST 6252  Pharmacokinetics and Drug Metabolism  3 SH
PMST 6254  Advanced Drug Delivery System  3 SH

**Elective Course Work**
Complete 2 semester hours of graduate electives chosen in consultation with your advisor.

**Graduate-Level Co-op**
Complete one graduate-level co-op assignment, preferably in the biotechnology industry.

**UNDERGRADUATE BIOLOGY MAJOR CREDIT/GPA REQUIREMENTS**
Complete 85 semester hours in the undergraduate 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**

**UNIVERSITY-WIDE REQUIREMENTS**
136 total semester hours required in the undergraduate program
Minimum 2.000 GPA required for undergraduate courses
Minimum 3.000 GPA required for graduate courses

**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 for a total of at least 23 semester hours. At least three courses must be intermediate or advanced (BIOL 2301 to BIOL 5999). Three of the five courses must contain a lab corequisite.

**BREADTH COURSE**
To provide breadth of knowledge, complete one additional science course with the BIOL, CHEM, ENVR, or PHYS subject code or from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYC 3458</td>
<td>Psychobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSYC 3510</td>
<td>Psychopharmacology</td>
<td>4</td>
</tr>
</tbody>
</table>

**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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
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</thead>
<tbody>
<tr>
<td>BIOL 1101</td>
<td>Principles of Biology 1</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 1102</td>
<td>Lab for BIOL 1101</td>
<td>1</td>
</tr>
<tr>
<td>or BIOL 1111</td>
<td>General Biology 1</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 1112</td>
<td>Lab for BIOL 1111</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 1103</td>
<td>Principles of Biology 2</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 1104</td>
<td>Lab for BIOL 1103</td>
<td>1</td>
</tr>
<tr>
<td>or BIOL 1113</td>
<td>General Biology 2</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 1114</td>
<td>Lab for BIOL 1113</td>
<td>1</td>
</tr>
</tbody>
</table>

**ELECTIVE COURSES**
Complete three courses from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL 2315</td>
<td>Invertebrate Zoology</td>
<td>4</td>
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<tr>
<td>with BIOL 2316</td>
<td>Lab for BIOL 2315</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 2325</td>
<td>Marine Biology</td>
<td>4</td>
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<tr>
<td>with BIOL 2326</td>
<td>Lab for BIOL 2325</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 5501</td>
<td>Marine Botany</td>
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<tr>
<td>with BIOL 5502</td>
<td>Lab for BIOL 5501</td>
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</tr>
<tr>
<td>BIOL 5503</td>
<td>Marine Invertebrate Zoology</td>
<td>4</td>
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<tr>
<td>with BIOL 5504</td>
<td>Lab for BIOL 5503</td>
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<tr>
<td>BIOL 5505</td>
<td>Biology of Corals</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 5507</td>
<td>Biology and Ecology of Fishes</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 5509</td>
<td>Marine Birds and Mammals</td>
<td>2</td>
</tr>
<tr>
<td>with BIOL 5510</td>
<td>Lab for BIOL 5509</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 5515</td>
<td>Marine Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 5517</td>
<td>Oceanography</td>
<td>2</td>
</tr>
<tr>
<td>with BIOL 5518</td>
<td>Lab for BIOL 5517</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 5519</td>
<td>Ocean and Coastal Processes</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 5521</td>
<td>Experimental Design Marine Ecology</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 5522</td>
<td>Lab for BIOL 5521</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 5523</td>
<td>Molecular Marine Biology</td>
<td>3</td>
</tr>
<tr>
<td>with BIOL 5526</td>
<td>Lab for BIOL 5525</td>
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</tr>
<tr>
<td>BIOL 5527</td>
<td>Marine Conservation Biology</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 5529</td>
<td>Physiological and Molecular Marine Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 5589</td>
<td>Diving Research Methods</td>
<td>2</td>
</tr>
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**BREADTH COURSE**
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**GPA REQUIREMENT**
2.000 GPA required in the minor