Biology - B.S.

To address the breadth and depth essential to educating biologists, the biology major is structured to include both a broad foundation through core courses and opportunity for specialization within a biological subfield through biology electives. The major is designed to prepare the student for a post-baccalaureate profession in biology, for advanced professional training in the health sciences, or for graduate study in basic and applied areas of the biological sciences.

120 hours (minimum)

Any student earning a Bachelor of Science (BS) degree must complete a minimum of 60 hours in natural, physical, mathematical, and computer science. A complete description of College requirements for a Bachelor of Science degree, including a specific listing of courses applicable to the 60-hour requirement, is in the Arts and Sciences section of the 2018-2019 Undergraduate Bulletin.

UK Core Requirements

See the UK Core section of the 2018-2019 Undergraduate Bulletin for the complete UK Core requirements. The courses listed below are (a) recommended by the college, or (b) required courses that also fulfill UK Core areas. Students should work closely with their advisor to complete the UK Core requirements.

I. Intellectual Inquiry in Arts and Creativity
Choose one course from approved list ......................................................... 3

II. Intellectual Inquiry in the Humanities
Choose one course from approved list ......................................................... 3

III. Intellectual Inquiry in the Social Sciences
Choose one course from approved list ......................................................... 3

IV. Intellectual Inquiry in the Natural, Physical, and Mathematical Science
CHE 105 General College Chemistry I ......................................................... 4
CHE 111 General Chemistry I Laboratory .................................................... 1

V. Composition and Communication I
CIS/WRD 110 Composition and Communication I ......................................... 3

VI. Composition and Communication II
CIS/WRD 111 Composition and Communication II ......................................... 3

VII. Quantitative Foundations
MA 113 Calculus I
or
MA 137 Calculus I With Life Science Applications .......................................... 4

VIII. Statistical Inferential Reasoning
STA 296 Statistical Methods and Motivations .............................................. 3

IX. Community, Culture and Citizenship in the USA
Choose one course from approved list ......................................................... 3

X. Global Dynamics
Choose one course from approved list ......................................................... 3

UK Core hours: ......................................................................................... 32-33

Graduation Composition and Communication Requirement (GCCR)
Choose one of three options:
1. BIO 425 Biology Seminar (Subtitle required)
   and
   BIO 350 Animal Physiology ................................................................. 5
2. BIO 425 Biology Seminar (Subtitle required)
   and
   BIO 430G Plant Physiology ................................................................. 5
3. WRD 204 Technical Writing ................................................................. 3

Graduation Composition and Communication Requirement hours (GCCR) ......................................................... 3-5

College Requirements

Humanities – one course ........................................................................... 3
Social Science – one course ....................................................................... 3
Third and fourth semesters of language ..................................................... 6
Free Electives ............................................................................................ 6
Lab or Field Experience – satisfied by major
Graduation Writing Requirement (choose any GWR Humanities 300-level course; this will also count as one of the two Humanities courses in the College Requirements)

General Education and College hours: ................................................... 49 (39)

Premajor Requirements

BIO 148 Introductory Biology I ................................................................. 3
BIO 152 Principles of Biology II ............................................................... 3
BIO 155 Laboratory for Introductory Biology I
or
BIO 198 Scholars Biology Research ......................................................... 1-2
†CHE 105 General College Chemistry I ................................................... 4
*CHE 111 General Chemistry I Laboratory ............................................. 1
CHE 107 General College Chemistry II ................................................... 3
CHE 113 General Chemistry II Laboratory .............................................. 2
MA 137/138 Calculus I/II With Life Science Applications
or
MA 113/114 Calculus I/II ......................................................................... 8

Premajor hours: ....................................................................................... 25-26
*The CHE 105 requirement can be satisfied with CHE 109 and CHE 110.

Major Requirements

Minimum major requirement for graduation is 56 credit hours in courses not open to freshmen. The minimum GPA of all major and premajor courses must be at least 2.0.

Major Core

First Tier Core
BIO 303 Introduction to Evolution ............................................................ 4
BIO 304 Principles of Genetics ................................................................. 4

--- CONTINUED ---
### Biology (B.S.) • 2

#### Second Tier Core
To be taken after completion of First Tier Core.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 315</td>
<td>Introduction to Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 325</td>
<td>Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 350</td>
<td>Animal Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 430G</td>
<td>Plant Physiology</td>
<td>4</td>
</tr>
<tr>
<td>STA 296</td>
<td>Statistical Methods and Motivations</td>
<td>3</td>
</tr>
<tr>
<td>BIO 425</td>
<td>Seminar (Subtitle required)</td>
<td>1</td>
</tr>
<tr>
<td>BIO 499</td>
<td>Research Seminar</td>
<td>2</td>
</tr>
</tbody>
</table>

**Core hours:** ................................................................. 24

#### Other Course Work Required for the Major

**From Outside the Major Department**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 230</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 231</td>
<td>Organic Chemistry Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>CHE 232</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>PHY 211</td>
<td>General Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 231/241</td>
<td>General University Physics/Laboratory</td>
<td>10</td>
</tr>
</tbody>
</table>

**Other Course Work Required for the Major**

**Tracks**

Complete one of the following tracks. If an alternative track is not declared, the default track will be General Biology.

#### Cellular, Molecular, and Developmental Biology Track
The Cellular, Molecular, and Developmental Track provides a broad background in biology, with a focus on the molecular, cellular, and integrative mechanisms by which organisms regulate life processes. Students will learn about the molecular and cellular mechanisms that provide the basis for biological structure, growth, evolution, embryonic development, and genetic inheritance. Students will understand how eukaryotic cells process information from their environment and initiate programs of gene expression leading to growth, development, and functional specification.

A degree in biology with an emphasis in Cellular, Molecular, and Developmental will prepare students for a career in academic or industrial research, biotechnology, genetic engineering, or any of the health professions.

12 upper-level guided elective hours out of the required 13-15 hours of guided electives must be completed from the courses listed below. Of those 12 hours, a maximum of 3 hours can be independent research (BIO 394/395/397). The remaining 1-3 credit hours may come from the list of approved electives for the general biology track, which may include an additional 3 hours of independent research (BIO 394/395/397). A maximum of 6 credit hours of independent research can be counted toward the Biology degree. Of the 13-15 hours of total upper-level electives required, 9 credit hours must have a BIO prefix.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 308</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 309</td>
<td>Microbiology Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIO 429</td>
<td>Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 494C</td>
<td>Immunobiology</td>
<td>1</td>
</tr>
<tr>
<td>BIO 394/395/397</td>
<td>Research in Neuroscience/Biology/Microbiology (maximum 3 credits toward track)</td>
<td>1-3</td>
</tr>
<tr>
<td>BIO 495G</td>
<td>Bacterial Pathogenesis</td>
<td>3</td>
</tr>
<tr>
<td>BIO 502</td>
<td>Systems, Cellular and Molecular Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 510</td>
<td>Recombinant DNA Techniques Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIO 520</td>
<td>Bioinformatics</td>
<td>3</td>
</tr>
</tbody>
</table>

**Courses from outside the Biology department:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 401G</td>
<td>Fundamentals of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHE 233</td>
<td>Organic Chemistry Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>CHE 533</td>
<td>Advanced Organic Chemistry Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CHE 550</td>
<td>Biological Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 552</td>
<td>Biological Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHE 532</td>
<td>Spectrometric Identification of Organic Molecules</td>
<td>3</td>
</tr>
</tbody>
</table>

**Other courses can be accepted by the Director of Undergraduate Studies in Biology on a case by case basis.**

*Only for students who do not use the course to fulfill the 2nd Tier Core.

**Subtitle must be approved by Director of Undergraduate Studies.**

#### Ecology and Evolutionary Biology Track
The Ecology and Evolutionary Biology Track focuses on the diversity of life on Earth, including diversity in genes, physiology, and behaviors. Students will learn about how this diversity emerged, as plants, animals, and microbes became adapted to the environment and to each other. A wide variety of scientific disciplines are integrated within the track, including ecology, organismal biology, physiology, genetics, evolution, conservation biology, and behavior. A degree in biology with an emphasis in Ecology and Evolution will prepare students for a career in the life sciences, whether they are interested in having a deep understanding of evolutionary process, or are interested in the interactions between organisms and their environment. This can help prepare students for careers in areas such as: 1. conservation and restoration biology – addressing the impacts of climate change, developing plans for habitat conservation and wildlife protection, or other issues critical to maintaining a healthy planet; 2. working as a doctor or veterinarian; 3. science education – educating students and the public on the history and diversity of life on earth and the need to conserve it; 4. basic research in biology – helping to expand the frontiers of knowledge by studying the evolution of organisms and their ecosystems.

12 upper-level guided elective hours out of the required 13-15 hours of guided electives must be completed from the courses listed below. Of those 12 hours, a maximum of 3 hours can be independent research (BIO 394/395/397). The remaining 1-3 credit hours may come from the list of approved electives for the general biology track, which may include an additional 3 hours of independent research (BIO 394/395/397). A maximum of 6 credit hours of independent research can be counted toward the Biology degree. Of the 13-15 hours of total upper-level electives required, 9 credit hours must have a BIO prefix.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 300</td>
<td>General Entomology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 337</td>
<td>Mathematical Modeling in the Life Sciences</td>
<td>3</td>
</tr>
<tr>
<td>BIO 351</td>
<td>Plant Kingdom</td>
<td>3</td>
</tr>
<tr>
<td>BIO 375</td>
<td>Behavioral Ecology and Sociobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 395</td>
<td>Research in Biology (maximum 3 credits toward track)</td>
<td>1-3</td>
</tr>
<tr>
<td>BIO 430G</td>
<td>Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 440</td>
<td>Comparative and Functional Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIO 445</td>
<td>The Biology of Sex</td>
<td>3</td>
</tr>
<tr>
<td>BIO 461</td>
<td>Introduction to Population Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 508</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIO 418</td>
<td>Ecological Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 520</td>
<td>Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 525</td>
<td>Advanced Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 530</td>
<td>Biogeography and Conservation</td>
<td>3</td>
</tr>
<tr>
<td>BIO 555</td>
<td>Vertebrate Endocrinology</td>
<td>5</td>
</tr>
<tr>
<td>BIO 559</td>
<td>Ornithology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 568</td>
<td>Insect Behavior</td>
<td>3</td>
</tr>
</tbody>
</table>

**Subtitle must be approved by Director of Undergraduate Studies.**
General Biology Track

This is the default option for students who do not declare another track.

Choose 13-15 credit hours from the upper-level electives listed below.

Biology

BIO 3XX, BIO 4XX, BIO 5XX, BIO 6XX

Anthropology

ANT 332 Human Evolution

Chemistry

CHE 226 Analytical Chemistry
CHE 233 Organic Chemistry Laboratory II
CHE 440G Introductory Physical Chemistry
CHE 441G Physical Chemistry Laboratory
CHE 446G Physical Chemistry for Engineers
CHE 532 Spectrometric Identification of Organic Molecules
CHE 533 Advanced Organic Chemistry Laboratory
CHE 550 Biological Chemistry I
CHE 552 Biological Chemistry II
CHE 558 Hormone Receptors and Cell Signals
CHE 565 Environmental Chemistry

Geology

EES 401G Invertebrate Paleobiology and Evolution

Psychology

PSY 459 Neuropharmacology: Drugs and Behavior

Statistics

(Biology usually accepts only one of the following for each student)
STA 570 Basic Statistical Analysis
STA 580 Biostatistics I

Other STA courses may be accepted at the discretion of your advisor.

College of Agriculture, Food and Environment

ABT/AGR/ASC/ENT 460 Introduction to Molecular Genetics
ASC 364 Reproductive Physiology of Farm Animals
ASC 378 Animal Nutrition and Feeding
ENT 310 Insect Pests of Field Crops
ENT 320 Horticultural Entomology
ENT/ABT 460 Introduction to Molecular Genetics
ENT/FOR 502 Forest Entomology
ENT 561 Insects Affecting Human and Animal Health
ENT 564 Insect Taxonomy
ENT 568 Insect Behavior
FOR 340 Forest Ecology
FOR 370 Wildlife Biology and Management
FOR 435 Conservation Biology
FOR/ENT 502 Forest Entomology
FOR 530 Freshwater Ecology

For 510 Herpetology
FSC 530 Food Microbiology
NRE 420G Taxonomy of Vascular Plants
NRE 450G Biogeography
PLS 320 Woody Horticultural Plants
PLS 330 Herbaceous Horticultural Plants
PLS 332 Herbaceous Horticultural Plants II
PLS 366 Fundamentals of Soil Science
PLS 450G Biogeography
PLS 502 Ecology of Economic Plants
PLS 566 Soil Microbiology
PLS 567 Methods in Soil Microbiology
PPA 406G Principles of Plant Pathology

College of Medicine

ANA 410G Neurobiology of Brain and Spinal Cord Disorders
ANA 442 Molecular and Cellular Neurobiology
ANA 511 Introduction to Human Anatomy
ANA 512 Microscopy and Ultrastructure
ANA 516 Selected Topics in Advanced Neuroscience

Some other anatomy courses at the 500-level are acceptable, but they are usually restricted to professional students.

BCH 401G Fundamentals of Biochemistry
MI/BIO 494G Immunobiology
MI 595 Immunobiology Laboratory
M/PAT 598 Clinical Microbiology
PGY 412G Principles of Human Physiology Lectures
PGY 412G is acceptable as an elective for upper level biology credit ONLY IF a student DOES NOT complete BIO 350. IT DOES NOT substitute for BIO 350 or BIO 430.
PGY 431 Introduction to Neuroendocrinology
PGY 417 Genomics and Epigenetics
PGY 512 Evolutionary Medicine
PGY 560 Pathophysiology: Integrative Study in Physiology and Medicine
PGY 502 Systems, Cellular and Molecular Physiology
TOX 509 Environmental and Regulatory Toxicology

Unacceptable courses often mistakenly thought to be acceptable. These courses are not acceptable electives for Biology majors:
ANA 209 Principles of Human Anatomy
PGY 206 Elementary Physiology

Other courses may be accepted at the discretion of the Director of Undergraduate Studies in the Department of Biology.

Genetics, Genomics, and Bioinformatics Track

The Genetics, Genomics, and Bioinformatics Track will provide guidance and structure to students with a desire to specialize in the study of inheritance and will formally recognize their chosen area of specialization in the description of their degree. The selected course offerings span the spectrum of studies within the area of inheritance, allowing students to select broadly from courses that provide sophisticated insight into genetic information and genetic analysis. The selected courses also allow students to dive deeply into different realms of genetics, including: emphasis on microbes (BIO 308, 309 and 510); emphasis on animals (BIO 404, 405, 429, 527); and emphasis on analytical technology (BIO 337, 404, 461, 510, 520, STA 579, STA 580, ABT 460); emphasis on development (BIO 404, 405, 429, 445, 527, PGY 417); and emphasis on evolution (BIO 461, 508, 518).

Students selecting this track will be able to demonstrate a clear understanding of the most important and fundamental theories and ideas in contemporary biology from a perspective that emphasizes inheritance, organization, and analysis of genetic information.

12 upper-level guided elective hours out of the required 13-15 hours of guided electives must be completed from the courses listed below. Of those 12 hours, a maximum of 3 hours can be independent research (BIO 394/395/397). The remaining 1-3 credit hours may come from the list of approved electives for the general biology track, which may include an additional 3 hours of independent research (BIO 394/395/397).
Biology (B.S.) • 4

Courses from outside the Biology department:
ASC 364 Reproductive Physiology of Farm Animals ........................................ 4
ENT 568 Insect Behavior ................................................................................. 3
MI 595 Immunobiology Laboratory ................................................................. 2
PGY 560 Pathophysiology: Integrative Study in Physiology and Medicine .......... 1
PSY 459 Neuropsychopharmacology: Drugs and Behavior ............................. 3
ANA 410G Neurobiology of Brain and Spinal Cord Disorders ......................... 3
ANA 442 Molecular and Cellular Neurobiology .............................................. 3
PGY 431 Introduction to Neuroendocrinology .................................................. 3

Other courses can be accepted by the Director of Undergraduate Studies in Biology on a case by case basis.
*Only for students who do not use the course to fulfill the 2nd Tier Core.
**Subtitle must be approved by Director of Undergraduate Studies.

Plant Biology Track

The Plant Biology Track focuses on fundamental aspects of how plants function as organisms and interact with their environment. A wide variety of scientific disciplines are integrated within the track, including physiology, taxonomy, reproduction, and ecology.

A degree in biology with an emphasis in plant biology serves as an excellent launching point for a wide range of career options, including domestic and international opportunities in business, research, and teaching. The program is excellent preparation for students wishing to enter graduate or other professional schools. Plant biologists can work in the laboratory or field, forestry, botanical gardens and nurseries, agricultural companies, biotechnology, pharmaceuticals, energy and chemical industries, or environmental protection.

12 upper-level guided elective hours out of the required 13-15 hours of guided electives must be completed from the courses listed below. Of those 12 hours, a maximum of 3 hours can be independent research (BIO 394/395/397). The remaining 1-3 credit hours may come from the list of approved electives for the general biology track, which may include an additional 3 hours of independent research (BIO 394/395/397). A maximum of 6 credit hours of independent research can be counted toward the Biology degree. Of the 13-15 hours of total upper-level electives required, 9 credit hours must have a BIO prefix.

BIO 310 The Life Processes of Plants ................................................................. 3
BIO 351 Plant Kingdom ................................................................................... 3
BIO 394/395/397 Research in Neuroscience/Biology/ Microbiology (maximum 3 credits toward track) ...................................................... 1-3
BIO 420G Taxonomy of Vascular Plants ......................................................... 4
**BIO 430G Plant Physiology ........................................................................... 4
BIO 525 Advanced Ecology ........................................................................... 3
**BIO 380 Special Topics in Biology (Intermediate Level) (Subtitle required) ................................................................. 1-4

Courses outside the Biology department:
ENT 310 Insect Pests of Field Crops ................................................................. 3
ENT 320 Horticultural Entomology ................................................................. 3
FOR 340 Forest Ecology ................................................................................... 4
ENT/ FOR 502 Forest Entomology ................................................................. 3
PLS 502 Ecology of Economic Plants ............................................................ 3
PLS 566 Soil Microbiology ............................................................................ 3
PLS 567 Methods in Soil Microbiology ......................................................... 1
PPA 400G Principles of Plant Pathology ......................................................... 3
PLS 320 Woody Horticultural Plants ............................................................... 4
PLS 366 Fundamentals of Soil Science ........................................................... 4

Other courses can be accepted by the Director of Undergraduate Studies in Biology on a case by case basis.
*Only for students who do not use the course to fulfill the 2nd Tier Core.
**Subtitle must be approved by Director of Undergraduate Studies.

--- CONTINUED ---
**Pre-Professional Track**

The Pre-Professional Track in the biology major broadly explores organismal structure and function in the context of preparing students for health-related professional programs. The courses in this track give the students a broad view of both normal and abnormal organismal function, with courses specializing in neuroscience, physiology, microbiology, and molecular biology. Independent research in this track will be an opportunity for students to work with science professionals within their desired field. Through completion of this track, students can fulfill prerequisite and recommended courses for most pre-professional health programs. Students who excel in this track can go on to enroll in a variety of professional programs, including medical, dental, optometry, veterinary, and physician’s assistant programs. A biology degree with a pre-professional health emphasis also prepares students for careers as research scientists, research lab technicians, microbiologists, genetic counselors, biology teachers, and many other general biology careers.

12 upper-level guided elective hours out of the required 13-15 hours of guided electives must be completed from the courses listed below. Of those 12 hours, a maximum of 3 hours can be independent research (BIO 394/395/397). The remaining 1-3 credit hours may come from the list of approved electives for the general biology track, which may include an additional 3 hours of independent research (BIO 394/395/397). A maximum of 6 credit hours of independent research can be counted toward the Biology degree. Of the 13-15 hours of total upper-level electives required, 9 credit hours must have a BIO prefix.

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 302 Introduction to Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIO 305 Introduction to Neuroscience Techniques</td>
<td>4</td>
</tr>
<tr>
<td>BIO 308 General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 309 Microbiology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIO 394/395/397 Research in Neuroscience/Biology/ Microbiology (maximum 3 credits toward track)</td>
<td>1-3</td>
</tr>
<tr>
<td>BIO 405 Human Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 410 Vertebrate Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 440 Comparative and Functional Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIO 445 The Biology of Sex</td>
<td>3</td>
</tr>
<tr>
<td>BIO 446 Neurophysiology Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIO 494G Immunobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 495G Bacterial Pathogenesis</td>
<td>3</td>
</tr>
<tr>
<td>BIO 502 Systems, Cellular and Molecular Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 507 Biology of Sleep and Circadian Rhythms</td>
<td>3</td>
</tr>
<tr>
<td>BIO 510 Recombinant DNA Techniques Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIO 520 Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>BIO 527 Stem Cells, Tissue Engineering, and Regenerative Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIO 429 Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 535 Comparative Neurobiology and Behavior</td>
<td>3</td>
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<tr>
<td>BIO 550 Advanced Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 582 Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 542 Histology</td>
<td>5</td>
</tr>
<tr>
<td>*BIO 315 Introduction to Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>*BIO 350 Animal Physiology</td>
<td>4</td>
</tr>
<tr>
<td>**BIO 380 Special Topics in Biology (Intermediate Level) (Subtitle required)</td>
<td>1-4</td>
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</table>

**Courses from Outside the Biology department:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANA 410G Neurobiology of Brain and Spinal Cord Disorders</td>
<td>3</td>
</tr>
<tr>
<td>ANA 442 Molecular and Cellular Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BCH 401G Fundamentals of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHE 550 Biological Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHE 552 Biological Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>MI/PAT 598 Clinical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>PGY 560 Pathophysiology: Integrative Study in Physiology and Medicine</td>
<td>1</td>
</tr>
<tr>
<td>PSY 459 Neuropsychopharmacology: Drugs and Behavior</td>
<td>3</td>
</tr>
<tr>
<td>PGY 512 Evolutionary Medicine</td>
<td>3</td>
</tr>
<tr>
<td>PGY 431 Introduction to Neuroendocrinology</td>
<td>3</td>
</tr>
</tbody>
</table>

Other courses can be accepted by the Director of Undergraduate Studies in Biology on a case by case basis.

*Only for students who do not use the course to fulfill the 2nd Tier Core.
**Subtitle must be approved by Director of Undergraduate Studies.

| Total Hours Option B | 25-27 |