Biology, B.S.

Learning Outcomes

Graduates with a bachelor's degree in biology will be able to demonstrate the following.

• Foundational Knowledge: Comprehension of Fundamental Principles and Concepts of Biology
  Graduates will be able to:
  explain fundamental biological principles within and across levels of organization, from molecules to ecosystem;
  apply foundational knowledge and conceptual frameworks to new situations;
  recognize the consequences of evolutionary history in contrasts between living organisms;
  appreciate the historical sequence and significant achievements of biological discovery; and
  evaluate new information reported in the news and/or in scientific publications against prior knowledge.

• New Discovery: Scientific Reasoning and Experimental Process in Biology
  Graduates will be able to:
  perform basic laboratory procedures, including correct operation of devices;
  formulate questions about biological processes based on current knowledge;
  construct a hypothesis to guide experimental enquiry;
  design experiments, identifying variables of analysis and controls for error;
  consider appropriate strategies or technologies applicable to investigate a novel problem;
  collect, organize, summarize, and interpret biological data;
  analyze and evaluate experimental results to inform a hypothesis; and
  distinguish between necessary and sufficient causes.

• Quantitative Skills: Mathematical Reasoning and Basic Numeracy Applied to Biology
  Graduates will be able to:
  perform essential mathematical operations such as unit conversions, dilutions, and molarity calculations;
  apply mathematical concepts and rules of probability to make predictions;
  select and apply appropriate statistical tests to determine significance of experimental results; and
  use mathematical and/or statistical expressions to evaluate hypotheses with experimental data.

• Information Literacy: Acquisition, Analysis, and Summary of Published Biological Information
  Graduates will be able to:
  locate and evaluate the relevance and credibility of information from electronic and print sources;
  navigate and obtain relevant information from public databases;
  recognize and appropriately cite sources of information;
  identify questions addressed and methodologies used; and
  assess findings reported and conclusions drawn in published scientific articles.

• Communication Proficiency: Written and Oral Presentation of Biological Information
  Graduates will be able to:
  write concise scientific reports based on findings or literature searches;
  construct visual presentations of results or findings from the scientific literature; and
  orally present findings or results from the literature with appropriate media.

Overview

All biology majors complete the chemistry/mathematics foundation and the biology core. In addition, B.S. students complete physics foundation courses and choose one of four tracks, while B.A. students choose courses from several breadth menus and have a wider selection of elective courses.

The department acquaints undergraduate students with the nature of practicing scientists' work by offering BIOL:3994 Introduction to Research (requires a Department of Biology faculty sponsor), BIOL:4898 Communicating Research (a course supporting students involved in research), and BIOL:4999 Honors Research in Biology (requires membership in the Biology Honors Program). Students associate with one of the department’s research groups for experiments, discuss current research, study specialized topics, and attend research seminars.

Students interested in field biology, zoology, or botany may take varied courses in those subjects offered during the summer at Iowa Lakeside Laboratory.

Requirements

The Bachelor of Science with a major in biology requires a minimum of 120 s.h., including at least 70-79 s.h. of work for the major. Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major.

Students who wish to apply transfer credit toward graduation with a major in biology should consult their biology advisor. They also must complete the College of Liberal Arts and Sciences GE CLAS Core.

Students must complete the chemistry/mathematics/physics foundation, the biology core, and one of four tracks. The four tracks emphasize dynamic and active areas in the biological sciences. Three of the tracks—cell and developmental biology, genetics and biotechnology, and neurobiology—emphasize distinct areas. The fourth track—integrative biology—provides highly diverse content.

The B.S. with a major in biology requires the following course work.
### Chemistry/Mathematics/Physics Foundation

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tr>
<td>CHEM:1110 &amp; CHEM:1120</td>
<td>Principles of Chemistry I-II</td>
<td>8</td>
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<tr>
<td>CHEM:2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
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<tr>
<td>All of these:</td>
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<tr>
<td>PHYS:1511-PHYS:1512</td>
<td>College Physics I-II</td>
<td>8</td>
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<tr>
<td>PHYS:1611-PHYS:1612</td>
<td>Introductory Physics I-II</td>
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<tr>
<td>MATH:1460</td>
<td>Calculus for the Biological Sciences</td>
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<tr>
<td>MATH:1550</td>
<td>Engineering Mathematics I: Single Variable Calculus</td>
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<td>MATH:1850</td>
<td>Calculus I</td>
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<tr>
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<tr>
<td>STAT:2010</td>
<td>Statistical Methods and Computing (preferred for</td>
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</tr>
<tr>
<td></td>
<td>evolution track)</td>
<td></td>
</tr>
<tr>
<td>STAT:3510</td>
<td>Biostatistics</td>
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### Biology Core

<table>
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<tr>
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<th>Hours</th>
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<tbody>
<tr>
<td>BIOL:1411-BIOL:1412</td>
<td>Foundations of Biology - Diversity of Form and</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Function</td>
<td></td>
</tr>
<tr>
<td>BIOL:2512</td>
<td>Fundamental Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:2723</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
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</table>

### Experiential Elective

One of these 12 options:

- BIOL:3626 Cell Biology Laboratory (if not taken as a track course) 4
- BIOL:3655 Neurogenetics Laboratory 4
- BIOL:3656 Neurobiology Laboratory 4
- BIOL:3676 Evolution Lab 4
- BIOL:3716 Genetics and Biotechnology Lab 4
- BIOL:3736 Developmental Biology Lab (if not taken as a track course) 4
- BIOL:3994 & BIOL:4898 Introduction to Research - Communicating Research (BIOL:3994 must be taken for a total of 5 s.h.) 6
- BIOL:4213 Bioinformatics 4
- BIOL:4314 Introduction to Synthetic Biology in the Lab 4

Bachelor of Science students must select a single track. Each track includes at least eight courses. The experiential elective requirement may be satisfied by taking an appropriate investigative lab for the track, or through several other options: students who use BIOL:4999 Honors Investigations to fulfill the experiential elective requirement must complete a minimum of 6 s.h. in that course; students who use BIOL:3994 Introduction to Research must complete a minimum of 5 s.h. in that course in combination with 1 s.h. in BIOL:4898 Communicating Research; and students who use BIOL:4897 Teaching Internship in Biology or BIOL:4806 Service Learning in Biology must complete a minimum of 4 s.h. in those courses.

Additionally, students may satisfy the experiential elective requirement by completing at least 5 s.h. in two different courses from a combination of these courses: BIOL:3994 Introduction to Research, BIOL:4213 Bioinformatics, BIOL:4897 Teaching Internship in Biology, BIOL:4999 Honors Research in Biology, LATH:3001 Latham Fellows: Science Outreach Project, and an approved biology-related internship.

### Cell and Developmental Biology Track

The cell and developmental biology track provides education in the structure and function of cells and in the principles of development as they apply to animals and plants. This track is appropriate for students who wish to pursue graduate study in cellular and developmental biology, to prepare for professional study in medicine and other health-related fields, or to take positions in laboratories and companies engaged in cancer research and related fields.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:3172</td>
<td>Evolution</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3233</td>
<td>Introduction to Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3363</td>
<td>Plant Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3626</td>
<td>Cell Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3736</td>
<td>Developmental Biology Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3994 &amp; BIOL:4898</td>
<td>Introduction to Research - Communicating Research (BIOL:3994 must be taken for a total of 5 s.h.)</td>
<td>6</td>
</tr>
<tr>
<td>BIOL:4213</td>
<td>Bioinformatics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4314</td>
<td>Introduction to Synthetic Biology in the Lab</td>
<td>4</td>
</tr>
</tbody>
</table>
BIOL:4806  Service Learning in Biology  4
(taken two times for a total of 4 s.h.)

BIOL:4897  Teaching Internship in Biology  4
(must be taken two different semesters for a total of 4 s.h.)

BIOL:4999  Honors Research in Biology  6
or
A combination of at least two different courses for a total of 5 s.h. from these:
BIOL:3994  Introduction to Research  2-3
BIOL:4213  Bioinformatics  2
BIOL:4897  Teaching Internship in Biology  2-3
BIOL:4999  Honors Research in Biology  arr.
LATH:3001  Latham Fellows: Science Outreach Project  2

An approved biology-related internship

Electives
At least three of these, with a minimum of one course numbered 3000 or above:
BIOL:2254  Endocrinology  3
BIOL:2603  Mechanisms of Aging  3
BIOL:2753  Introduction to Neurobiology  3
BIOL:3172  Evolution (if not taken as a track course)  4
BIOL:3233  Introduction to Developmental Biology (if not taken as a track course)  3
BIOL:3253  Neurobiology  4
BIOL:3314  Genomics  3
BIOL:3343  Animal Physiology  3
BIOL:3363  Plant Developmental Biology (if not taken as a track course)  3
BIOL:3663  Plant Response to the Environment  3
BIOL:3713  Molecular Genetics  4
BIOL:3753  Developmental Neurobiology  3
BIOL:4333  Genes and Development  3

Genetics and Biotechnology Track
The genetics and biotechnology track provides education in the key principles of transmission, maintenance, regulation, and manipulation of genes. This track is appropriate for students who wish to pursue graduate study in fields related to genetics or to enter the modern biotechnology industry. It also provides excellent preparation for professional study in medicine and other health-related fields.

<table>
<thead>
<tr>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOL:3172</td>
<td>Evolution</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3314</td>
<td>Genomics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3713</td>
<td>Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab</td>
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One of these:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIO:3120</td>
<td>Biochemistry and Molecular Biology II (students who take BIO:3120 as a chemistry/mathematics/physics foundation course must take this course)</td>
<td>3</td>
</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CS:2110</td>
<td>Programming for Informatics</td>
<td>4</td>
</tr>
<tr>
<td>MICR:2157-MICR:2158</td>
<td>General Microbiology - General Microbiology Laboratory</td>
<td>5</td>
</tr>
</tbody>
</table>

| Track Courses |

- At least three of these, with a minimum of one course numbered 3000 or above:
  - BIOL:2254  Endocrinology  3
  - BIOL:2603  Mechanisms of Aging  3
  - BIOL:2753  Introduction to Neurobiology  3
  - BIOL:3172  Evolution (if not taken as a track course)  4
  - BIOL:3233  Introduction to Developmental Biology (if not taken as a track course)  3
  - BIOL:3314  Neurobiology  4
  - BIOL:3343  Animal Physiology  3
  - BIOL:3363  Plant Developmental Biology (if not taken as a track course)  3
  - BIOL:3663  Plant Response to the Environment  3
  - BIOL:3713  Molecular Genetics  4
  - BIOL:3753  Developmental Neurobiology  3
  - BIOL:4333  Genes and Development  3

- One of these:
  - BIO:3120  Biochemistry and Molecular Biology II (students who take BIO:3120 as a chemistry/mathematics/physics foundation course must take this course)  3
  - CHEM:2220  Organic Chemistry II  3
  - CS:2110  Programming for Informatics  4
  - MICR:2157-MICR:2158  General Microbiology - General Microbiology Laboratory  5

- An approved biology-related internship

- Electives

  - At least one of these options:
    - BIOL:3994  Introduction to Research  2-3
    - BIOL:4213  Bioinformatics  2
    - BIOL:4897  Teaching Internship in Biology  2-3
    - BIO:4999  Honors Research in Biology  arr.
    - LATH:3001  Latham Fellows: Science Outreach Project  2

  - An approved biology-related internship

  - Electives

    - At least two of these, with a minimum of one course numbered 3000 or above:
      - BIO:2254  Endocrinology  3
      - BIO:2603  Mechanisms of Aging  3
      - BIO:2753  Ecology  3
      - BIO:3172  Introduction to Neurobiology  3
      - BIO:3233  Introduction to Developmental Biology  3
      - BIO:3244  Animal Behavior  3,5
      - BIO:3253  Neurobiology  4
      - BIO:3343  Animal Physiology  3
      - BIO:3363  Plant Developmental Biology  3
      - BIO:3373  Human Population Genetics and Variation  3
      - BIO:3383  Introduction to Systems Biology  3

    - OR

      - A combination of at least two different courses for a total of 5 s.h. from these:
        - BIO:3994  Introduction to Research  2-3
        - BIO:4213  Bioinformatics  2
        - BIO:4897  Teaching Internship in Biology  2-3
        - BIO:4999  Honors Research in Biology  arr.
        - LATH:3001  Latham Fellows: Science Outreach Project  2

      - An approved biology-related internship
Biology, B.S.

**Integrative Biology Track**

The integrative biology track offers a diverse, well-balanced introduction to the major fields of biology. This track prepares students for graduate study in the biological sciences, in science education, and for work in laboratories that engage in research and applications in many fields of biology. It also provides broadly based preparation for professional study in medicine and other health-related fields.

<table>
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<tr>
<td>BIOL:2673</td>
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<td>BIOL:3172</td>
<td>Evolution</td>
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<td>BIOL:3130</td>
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</tr>
<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CS:2110</td>
<td>Programming for Informatics</td>
<td>4</td>
</tr>
<tr>
<td>MICR:2157-MICR:2158</td>
<td>General Microbiology - General Microbiology Laboratory</td>
<td>5</td>
</tr>
</tbody>
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**Breadth Menus:**

**Genes and Genomes**

One of these:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:3314</td>
<td>Genomics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3373</td>
<td>Human Population Genetics and Variation</td>
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<tr>
<td>BIOL:3713</td>
<td>Molecular Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4333</td>
<td>Genes and Development</td>
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<tr>
<td>BIOL:4373</td>
<td>Molecular Evolution: Genes, Genomes, and Organisms</td>
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<tr>
<td>BIOL:4386</td>
<td>Introduction to Scientific Computing for Biologists</td>
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**Biological Systems**

Two of these:

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<tr>
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<tbody>
<tr>
<td>BIOL:2254</td>
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<td>3</td>
</tr>
<tr>
<td>BIOL:2603</td>
<td>Mechanisms of Aging</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:2753</td>
<td>Introduction to Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3233</td>
<td>Introduction to Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3244</td>
<td>Animal Behavior</td>
<td>3,5</td>
</tr>
<tr>
<td>BIOL:3253</td>
<td>Neurobiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3343</td>
<td>Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3363</td>
<td>Plant Development Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3383</td>
<td>Introduction to Systems Biology</td>
<td>3</td>
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<tr>
<td>BIOL:3663</td>
<td>Plant Response to the Environment</td>
<td>3</td>
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<tr>
<td>BIOL:3753</td>
<td>Developmental Neurobiology</td>
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**Investigative Lab**

One of these:

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<td>BIOL:2246</td>
<td>Entomology Lab</td>
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<tr>
<td>BIOL:3626</td>
<td>Cell Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3656</td>
<td>Neurobiology Laboratory</td>
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<tr>
<td>BIOL:3676</td>
<td>Evolution Lab</td>
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<tr>
<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab</td>
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<tr>
<td>BIOL:3736</td>
<td>Developmental Biology Lab</td>
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**Experiential Elective**

One of these 12 options:

<table>
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<tr>
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<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOL:2246</td>
<td>Entomology Lab (if not used for investigative lab course)</td>
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</tr>
<tr>
<td>BIOL:3626</td>
<td>Cell Biology Laboratory (if not used for investigative lab course)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3656</td>
<td>Neurobiology Laboratory (if not used for investigative lab course)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3676</td>
<td>Evolution Lab (if not used for investigative lab course)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab (if not used for investigative lab course)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3736</td>
<td>Developmental Biology Lab (if not used for investigative lab course)</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3994 &amp; BIOL:4898</td>
<td>Introduction to Research - Communicating Research (BIOL:3994 must be taken for a total of 5 s.h.)</td>
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</tr>
<tr>
<td>BIOL:4213</td>
<td>Bioinformatics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:4806</td>
<td>Service Learning in Biology</td>
<td>4</td>
</tr>
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<td>BIOL:4897</td>
<td>Teaching Internship in Biology</td>
<td>4</td>
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<tr>
<td>BIOL:4999</td>
<td>Honors Research in Biology</td>
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</table>

An approved Iowa Lakeside Laboratory course or

A combination of at least two different courses for a total of 5 s.h. from these:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOL:3994</td>
<td>Introduction to Research</td>
<td>2-3</td>
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<td>Teaching Internship in Biology</td>
<td>2-3</td>
</tr>
<tr>
<td>BIOL:4999</td>
<td>Honors Research in Biology</td>
<td>arr.</td>
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<tr>
<td>LATH:3001</td>
<td>Latham Fellows: Science Outreach Project</td>
<td>2</td>
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</tbody>
</table>

An approved biology-related internship

**Neurobiology Track**

The neurobiology track provides education in nervous system function at all levels, from molecular to systems biology. This track is appropriate for students who wish to pursue graduate study in neurobiology and related areas, including psychology and the social sciences; to enter laboratories that study the
therapeutic basis of neurological disorders; or to work in pharmaceutical companies. It also provides good preparation for professional study in medicine and other health-related fields.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOL:2753</td>
<td>Introduction to Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL:3244</td>
<td>Animal Behavior</td>
<td>5</td>
</tr>
<tr>
<td>BIOL:3253</td>
<td>Neurobiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL:3656</td>
<td>Neurobiology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>BIOC:3130</td>
<td>Biochemistry and Molecular Biology II</td>
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</tr>
<tr>
<td></td>
<td>(students who take BIOC:3120 as a chemistry/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mathematics/physics foundation course may</td>
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<tr>
<td></td>
<td>take this course)</td>
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<tr>
<td>CHEM:2220</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CS:2110</td>
<td>Programming for Informatics</td>
<td>4</td>
</tr>
<tr>
<td>MICR:2157-</td>
<td>General Microbiology - General Microbiology</td>
<td>5</td>
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<td>PHYS:3850</td>
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<tr>
<td>PSY:3040</td>
<td>Psychology of Learning</td>
<td>3</td>
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<td>PSY:3230</td>
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<td>PSY:3240</td>
<td>Motivation, Addiction, and the Brain</td>
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Other courses by permission of advisor

**Experiential Elective**

One of these 11 options:

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<td>BIOL:3626</td>
<td>Cell Biology Laboratory</td>
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<td>BIOL:3655</td>
<td>Neurogenetics Laboratory</td>
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<td>Introduction to Research - Communicating Research (BIOL:3994 must be taken for a total of 5 s.h.)</td>
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<td>BIOL:4213</td>
<td>Bioinformatics</td>
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<td>BIOL:4314</td>
<td>Introduction to Synthetic Biology in the Lab</td>
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<td>BIOL:4806</td>
<td>Service Learning in Biology (taken two times for a total of 4 s.h.)</td>
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<td>BIOL:4897</td>
<td>Teaching Internship in Biology (must be taken two different semesters for a total of 4 s.h.)</td>
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<tr>
<td>BIOL:4997</td>
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<tr>
<td>BIOL:4213</td>
<td>Bioinformatics</td>
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**Teacher Licensure**

Students interested in teaching in elementary and/or secondary schools should seek admission to the Teacher Education Program (TEP) in the College of Education.

To qualify for licensure in secondary teaching, students in the TEP complete a degree in education as well as a related College of Liberal Arts and Sciences degree. See Teacher Education Program Application and Admission on the College of Education website for details on requirements and deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

**Combined Programs**

**B.S./M.S. in Business Analytics (Career Subprogram)**

Students majoring in biology who are interested in earning a master's degree in business analytics with a career subprogram may apply to the combined B.S./M.S. program offered by the College of Liberal Arts and Sciences and the Tippie College of Business. The program enables students to begin the study of business analytics before they complete their bachelor's degree. Students are able to complete both degrees in five years rather than six.

Separate application to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the combined degree program. For information about the business analytics program, see the M.S. in business analytics (career) in the Tippie College of Business section of the Catalog.

**B.S./M.S. in Finance**

Students majoring in biology who are interested in earning a master's degree in finance may apply to the combined B.S./M.S. program offered by the College of Liberal Arts and Sciences and the Tippie College of Business. The program
enables students to begin the study of finance before they complete their bachelor's degree. Students are able to complete both degrees in five years rather than six.

Separate application to each degree program is required. Applicants must be admitted to both programs before they may be admitted to the combined degree program. For information about the finance program, see the M.S. in finance (Tippie College of Business) section of the Catalog.

Honors

Honors in the Major

Students majoring in biology have the opportunity to graduate with honors in the major. The Biology Honors Program introduces students to the pursuits of practicing scientists. Honors students associate with one of the department's research groups and participate in an independent research project guided by a faculty member (the research supervisor).

Biology honors students write a thesis based on an interesting biological problem, which is usually identified by the research supervisor. The thesis should clearly document that the student has acquired the necessary experimental skills to address specific questions and test specific hypotheses related to the research problem. Honors Seminar in Biology (BIOL:4998), or an equivalent seminar, provides students with an ideal opportunity to improve their skills in seminar presentation and in writing scientific English. Throughout undergraduate residence, departmental honors students also may enroll in courses with honors sections offered by the Department of Biology and by other departments and programs.

To graduate with honors in the biology major, students must fulfill the following requirements:

- complete the requirements for a major in biology with a g.p.a. of at least 3.33 in all course work in the major taken at the University of Iowa (including all biology courses and cognates in chemistry, physics, biochemistry, mathematics, and statistics);
- complete 2 s.h. in either BIOL:4998 Honors Seminar in Biology or an advanced biology seminar course;
- complete a minimum of 6 s.h. (taken over two or more semesters) of BIOL:4999 Honors Research in Biology;
- write a brief research proposal summarizing the background and goals of their proposed honors research;
- upon completion of their research, submit an acceptable honors thesis; and
- give a brief oral presentation of their research findings to other biology honors students.

Students pursuing a B.S. in biology may apply 6 s.h. of BIOL:4999 Honors Research in Biology toward the experiential elective requirement in an appropriate track.

Biology majors interested in graduating with honors in the major should contact the biology honors advisor as early as possible, preferably during their sophomore or junior year, so that they may be matched with an appropriate lab. Visit Biology Honors Program to learn more about honors study in the department.

Students who are interested in the University of Iowa Honors Program satisfy the level two requirements when they satisfy the biology honors requirements; see University Honors Program below.

University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the University's honors program.

Students who satisfy the requirements for honors in the biology major also satisfy Level Two: Learning by Doing of the University Honors Requirements.

Membership in the UI Honors Program is not required to earn honors in the biology major.

Academic Plans

Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University's Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

Before the third semester begins: MATH:1460 Calculus for the Biological Sciences or MATH:1550 Engineering Mathematics I; Single Variable Calculus or MATH:1850 Calculus I, CHEM:1110 Principles of Chemistry I, CHEM:1120 Principles of Chemistry II, and BIOL:1411 Foundations of Biology

Before the fifth semester begins: BIOL:1412 Diversity of Form and Function, CHEM:2210 Organic Chemistry I, STAT:2010 Statistical Methods and Computing or STAT:3510 Biostatistics, and two other courses in the major

Before the seventh semester begins: BIOL:2512 Fundamental Genetics; PHYS:1512 College Physics II, PHYS:1511 College Physics I and PHYS:1512 College Physics II, or equivalents; six or seven more courses in the major; and at least 90 s.h. earned toward the degree

Before the eighth semester begins: two or more courses in the major

During the eighth semester: enrollment in all remaining course work in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate

Sample Plans of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

Biology, B.S.

- Cell and Developmental Biology Track [p. ]
- Genetics and Biotechnology Track [p. ]
- Integrative Biology Track [p. ]
- Neurobiology Track [p. ]
Cell and Developmental Biology Track

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GE CLAS Core: Diversity and Inclusion | 3 |

Fourth Year

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Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall)

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**Second Year**

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**Third Year**

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**Fourth Year**

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**Integrative Biology Track**

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<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
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<tr>
<td>RHET:1030 or ENGL:1200</td>
<td>Rhetoric or The Interpretation of Literature</td>
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<td><strong>GE CLAS Core: World Languages First Level</strong></td>
<td>Proficiency or elective course</td>
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<tr>
<td>CSI:1600</td>
<td>Success at Iowa</td>
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<td><strong>Spring</strong></td>
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<tr>
<td>BIOL:1411</td>
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<tr>
<td>CHEM:1120</td>
<td>Principles of Chemistry I</td>
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**Academic Career**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Spring</strong></td>
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<tr>
<td>BIOL:1411</td>
<td>Foundations of Biology</td>
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</tbody>
</table>

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**Notes:**

a. Fulfills a major requirement and may fulfill a GE requirement.

b. Enrollment in chemistry courses requires completion of a placement exam.

c. Students who have completed four years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world language courses requires a placement exam, unless enrolling in a first-semester-level course.

d. Enrollment in math courses requires completion of a placement exam.

e. Students who take BIOC:3120 also must take BIOC:3130 as one of their track courses.

f. GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.

g. At least one elective must be numbered 3000 or above.

h. Choose either BIOC:3130 (must choose this if BIOC:3120 was taken) or CHEM:2210 or CS:2110 or both MIRC:2157 and MIRC:2158.

i. Students may take an investigative lab for the track. Or, students who use BIOL:4999 to fulfill the requirement must complete 6 s.h. in that course; students who use BIOL:3994 must complete 5.5 s.h. in that course in combination with 1 s.h. in BIOL:4898; and students who use BIOL:4897 or BIOL:4806 must complete 4 s.h. in those courses. Students may complete at least 5 s.h. from a combination of BIOL:3994, BIOL:4213, BIOL:4897, BIOL:4999, LATH:3001, or an approved biology-related internship.

j. Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor. For more information visit http://commencement.uiowa.edu/. If applicable search for “Early and Late Participation” to find this page (e.g. walk in graduation ceremony in May, degree conferred in August).
GE CLAS Core: World Languages Second Level Proficiency or elective course e 4 - 5
MATH:1460 Calculus for the Biological Sciences c, i 4

Hours 16-17

Second Year
Any Semester

Research: students interested in research should begin the placement search process in the second year.

Fall
BIOL:1412 Diversity of Form and Function c 4
CHEM:2210 Organic Chemistry I 3
STAT:3510 or STAT:2010 Biostatistics c or Statistical Methods and Computing 3
GE CLAS Core: World Languages Second Level Proficiency or elective course e 4 - 5

Hours 14-15

Spring
BIOL:2512 Fundamental Genetics 4
BIOL:2723 Cell Biology 3
PHYS:1511 College Physics I c 4
GE CLAS Core: World Languages Fourth Level Proficiency or elective course e 4 - 5

Hours 15-16

Third Year

Fall
BIOL:2673 Ecology 3
PHYS:1512 College Physics II c 4
BIOC:3110 or BIOL:3120 Biochemistry g or Biochemistry and Molecular Biology I 3
ENGL:1200 or RHET:1030 The Interpretation of Literature or Rhetoric 3
GE CLAS Core: Social Sciences d 3

Hours 16

Spring
BIOL:3172 Evolution 4
Major: biological systems course I 3
BIOC:3130 Biochemistry and Molecular Biology II h 3 - 5
GE CLAS Core: Diversity and Inclusion d 3

Hours 13-15

Fourth Year

Fall
Major: biological systems course II 3
Major: investigative lab or elective course 3 - 4
Major: experiential elective or elective course i 2 - 4
GE CLAS Core: International and Global Issues d 3
GE CLAS Core: Historical Perspectives d 3

Hours 14-17

Spring
Major: genes and genomes course 3
Major: experiential elective or elective course i 2 - 4
Major: investigative lab or elective course 3 - 4
GE CLAS Core: Values and Culture d 3

GE CLAS Core: World Languages First Level Proficiency or elective course e 4 - 5

Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) j

Hours 14-17

Total Hours 116-128

a After completing BIOL:1412 Diversity of Form & Function, students are eligible to enroll in Lakeside Laboratory summer field courses. Registration for these courses is in winter of each year.
b Enrollment in chemistry courses requires completion of a placement exam.
c Fulfills a major requirement and may fulfill a GE requirement.
d GE CLAS Core courses may be completed in any order unless used as a prerequisite for another course. Students should consult with an advisor about the best sequencing of courses.
e Students who have completed four years of a single language in high school have satisfied the GE CLAS Core World Languages requirement. Enrollment in world languages courses requires a placement exam, unless enrolling in a first-semester-level course.
f Enrollment in math courses requires completion of a placement exam.
g Students who take BIOL:3120 also must take BIOL:3130 as one of their track courses.
h Choose either BIOL:3130 (must choose this if BIOL:3120 was taken) or CHEM:2220 or CS:2110 or both MICR:2157 and MICR:2158.
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j Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor. For more information visit http://commencement.uiowa.edu/. If applicable search for “Early and Late Participation” to find this page (e.g. walk in graduation ceremony in May, degree conferred in August).

Neurobiology Track

Course Title Hours

First Year

Fall
CHEM:1110 Principles of Chemistry I a, b 4
RHET:1030 or ENGL:1200 Rhetoric or The Interpretation of Literature 3 - 4
GE CLAS Core: World Languages First Level Proficiency or elective course e 4 - 5
CSI:1600 Success at Iowa 2

Hours 13-15

Spring
BIOL:1411 Foundations of Biology 4
CHEM:1120 Principles of Chemistry II 4
GE CLAS Core: World Languages Second Level Proficiency or elective course e 4 - 5
MATH:1460 Calculus for the Biological Sciences b, d 4

Hours 16-17
### Second Year

#### Any Semester

**Research:** students interested in research should begin the placement search process in the second year.

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL:1412 Diversity of Form and Function</td>
<td>4</td>
<td>BIOL:2753 Introduction to Neurobiology</td>
<td>3</td>
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<tr>
<td>CHEM:2210 Organic Chemistry I</td>
<td>3</td>
<td>BIOL:2512 Fundamental Genetics</td>
<td>4</td>
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<tr>
<td>STAT:3510 Biostatistics or STAT:2010 Statistical Methods and Computing</td>
<td>3</td>
<td>PHYS:1511 College Physics I b</td>
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<tr>
<td>GE CLAS Core: World Languages Second Level Proficiency or elective course a</td>
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<td>GE CLAS Core: World Languages Fourth Level Proficiency or elective course c</td>
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**Third Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOL:3244 Animal Behavior</td>
<td>5</td>
<td>BIOL:2723 Cell Biology</td>
<td>3</td>
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<tr>
<td>BIOL:3110 or BIOL:3120 Biochemistry or Biochemistry and Molecular Biology</td>
<td>3</td>
<td>PHYS:1512 College Physics II b</td>
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<tr>
<td>ENGL:1200 or RHET:1030 The Interpretation of Literature or Rhetoric</td>
<td>3 - 4</td>
<td>BIOL:3130 Biochemistry and Molecular Biology II g</td>
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<tr>
<td>GE CLAS Core: Social Sciences f</td>
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<td>GE CLAS Core: Historical Perspectives f</td>
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<tr>
<td>GE CLAS Core: Diversity and Inclusion f</td>
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<td>Hours</td>
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**Fourth Year**

<table>
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<tr>
<th>Fall</th>
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<th>Spring</th>
<th>Hours</th>
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<tr>
<td>BIOL:3253 Neurobiology</td>
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<td>BIOL:3656 Neurobiology Laboratory</td>
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<td>Major: neurobiology elective II h</td>
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<tr>
<td>Major: experiential elective or elective course i</td>
<td>2 - 4</td>
<td>Major: experiential elective or elective course i</td>
<td>2 - 4</td>
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<tr>
<td>GE CLAS Core: International and Global Issues f</td>
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<td></td>
<td>Hours</td>
<td>15-17</td>
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</tbody>
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**Total Hours:** 115-127

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### Career Advancement

The major in biology prepares students to enter research or service careers associated with private industry or government programs and for primary and secondary school teaching. It also prepares them to enter advanced degree programs leading to careers in higher education and to independent research in a variety of biological fields, or for practice in health professions such as medicine, dentistry, pharmacy, nursing, veterinary medicine, medical technology, and physical therapy.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.