Individuals interested in teaching in K-12 schools must complete a degree in the content area they want to teach plus the Teacher Education Program through the Department of Teaching and Learning. Individuals must complete the teaching track within that degree program, which may contain different course requirements than the non-teaching track since the sequence of courses is designed to meet state standards. Upon completion of the degree program with the teaching track and the secondary licensure program, one will be eligible for a standard Montana teaching license in this content area.

- Secondary Education Licensure Program (http://www.coehs.umt.edu/departments/curriculum/undergradprograms/secondary-licensure)
- Licensure Degree Requirements (http://catalog.umt.edu/colleges-schools/programs/education-human-sciences/teaching-learning/lic-licensure)

Bachelor of Arts - Biology; Biological Education Concentration

College of Humanities & Sciences

Degree Specific Credits: 71

Required Cumulative GPA: 2.75

Catalog Year: 2018-2019

Note: This concentration provides students with coursework in Biology and related sciences and mathematics needed to be certified by the State of Montana to teach secondary Biology (middle and high school). This concentration is appropriate for students interested in teaching Biology in a larger, more urban school. In order to be licensed to teach secondary Biology, students must be admitted to the Teacher Education Program through the Phyllis J. Washington College of Education and Human Sciences.

General Education Requirements

Information regarding these requirements can be found in the General Education Section (http://catalog.umt.edu/academics/general-education-requirements) of the catalog.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology/Microbiology Lower-Division Core</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Upper-Division Core Courses Required by the Biological Education Concentration</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>Animal-Based Organismal Course Requirement</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Required Courses Outside of the Major</td>
<td>Mathematics - Calculus</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Mathematics - Statistics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td></td>
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<tr>
<td></td>
<td>Environmental Geosciences</td>
<td></td>
</tr>
</tbody>
</table>

Education

Advanced College Writing Requirement
Secondary Teaching Licensure

Total Hours 71

Biology/Microbiology Lower-Division Core

Note: The lower-division core should be completed before attempting most upper division major courses. AP Biology credit with a score of 3 may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160N</td>
<td>Principles of Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 161N</td>
<td>Prncpls of Living Systems Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 170N</td>
<td>Princpls Biological Diversity</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 171N</td>
<td>Prncpls Biological Dvrsty Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 272</td>
<td>Genetics and Evolution</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Hours 17

Minimum Required Grade: C-

Upper-Division Core Courses Required by the Biological Education Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOE 370</td>
<td>General Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 371</td>
<td>Gen Ecology Lab (equiv to 271)</td>
<td>2</td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 361</td>
<td>General Microbiology Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIOO 433</td>
<td>Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 434</td>
<td>Plant Physiology Lab</td>
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</tbody>
</table>

Total Hours 14

Minimum Required Grade: C-

Animal-Based Organismal Course Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 301</td>
<td>Developmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>or BIOL 435</td>
<td>Comparative Animal Physiology</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 3

Minimum Required Grade: C-

Required Courses Outside of the Major

Mathematics - Calculus

Note: Students should choose M 171 if they plan to take additional calculus courses or if they plan a double major or minor in a field that requires more calculus (e.g. math, physics, biochemistry, computer science).
Complete one of the following courses:

- M 162  Applied Calculus  4
- M 171  Calculus I  4

Total Hours 4

Minimum Required Grade: C-

**Mathematics - Statistics**

Complete the following course:

- STAT 216  Introduction to Statistics  4

Total Hours 4

Minimum Required Grade: C-

**Chemistry**

Complete all of the following courses:

- CHMY 121N  Introduction to General Chemistry
- CHMY 123  Introduction to Organic and Biochemistry
- CHMY 124  Introduction to Organic and Biochemistry Lab
- CHMY 485  Laboratory Safety

Total Hours 0

Minimum Required Grade: C-

**Physics**

Complete one of the following Physics sequences:

- Algebra- and Trigonometry-based Physics:
  - PHSX 205N  College Physics I
  - & PHSX 206N  and College Physics I Laboratory
- Calculus-based Physics:
  - PHSX 215N  Fund of Physics w/Calc I
  - & PHSX 216N  and Physics Laboratory I w/Calc (requires M 171)

Total Hours 10

Minimum Required Grade: C-

**Environmental Geosciences**

Complete one of the following courses:

- GEO 105N  Oceanography  3
- or GEO 103N  Introduction to Environmental Geology

Total Hours 3

Minimum Required Grade: C-

**Education**

**Note:** The course number EDU 497 covers many different teaching method courses. The section of EDU 497 entitled "Methods: 5 - 12 Science" for 3 credits is required for the Biological Education option.

Complete the following course:

- EDU 497  Teaching and Assessing  4

Total Hours 4

Minimum Required Grade: C-

**Advanced College Writing Requirement**

**Rule:** To meet the Advanced College Writing Requirement, Biology in the Biological Education concentration must complete 2 or 3 partial writing courses (either three 1/3 advanced writing courses or one 1/3 advanced writing course and one 2/3 advanced writing course) or one complete advanced writing course, chosen from the following:

**Option 1 - 1/3 Advanced Writing Courses**

Complete three of the following courses:

- BCH 482  Advanced Biochemistry II  3
- BIOB 410  Immunology  3
- BIOB 425  Adv Cell & Molecular Biology  3
- BIOB 483  Phylogenics and Evolution  3
- BIOE 403  Vert Design & Evolution  5
- BIOE 409  Behavior & Evolution Discussion  1
- BIOE 428  Freshwater Ecology  5
- BIOL 484  Plant Evolution  3
- BIOM 402  Medical Bacteriology & Mycology  3
- BIOO 320  General Botany  5
- BIOO 434  Plant Physiology Lab  1
- BIOO 470  Ornithology  4
- BIOO 475  Mammalogy  4

Minimum Required Grade: C-

**Option 2 - 2/3 Advanced Writing Courses**

Complete the following course in addition to one 1/3 advanced writing course:

- BCH 486  Biochemistry Research Lab  3
- BCH 499  Senior Thesis/Capstone  3-6
- BIOB 411  Immunology Laboratory  2
- BIOB 499  Undergraduate Thesis  3-6
- BIOE 342  Field Ecology  5
- BIOE 371  Gen Ecology Lab (equiv to 271)  2
- BIOM 411  Exprmntl Microbial Genetcs Lab  1
- BIOM 499  Undergraduate Thesis  3-6

Minimum Required Grade: C-

**Option 3 - Complete Advanced Writing Course**

Complete the following course:

- BIOH 462  Principles Medical Physiology  3

Minimum Required Grade: C-
Secondary Teaching Licensure

Note: For endorsement to teach Biology, a student also must gain admission to the Teacher Education Program and meet all the requirements for secondary teaching licensure (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences/teaching-learning/lic-secondary-licensure). For more information, see the Teaching and Learning Department (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences/teaching-learning).