BIOLOGICAL EDUCATION (TEACHER PREPARATION BIOLOGY)

Individuals interested in teaching in K-12 schools must complete a degree in the content area they want to teach plus the teacher preparation program through the Department of Teaching and Learning. Individuals must complete the teaching major/teaching track within that degree program, which may contain different course requirements than the academic major 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/currinst/undergradprograms/secondary/licensure)
- Licensure Degree Requirements (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences/teaching-learning/lic-secondary-licensure)

Bachelor of Arts - Biology; Biological Education Concentration

College Humanities & Sciences

Degree Specific Credits: 62

Required Cumulative GPA: 2.75

Catalog Year: 2017-2018

Note: This option provides students with coursework in biology and related science and mathematics needed to be certified by the State of Montana to teach secondary biology (in 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

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<th>Requirement</th>
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<td>Animal-Based Organismal Requirement</td>
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<td>Required Content Courses Outside of the Major</td>
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<td>Mathematics - Calculus</td>
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<tr>
<td>Mathematics - Statistics</td>
<td></td>
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<tr>
<td>Chemistry</td>
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<tr>
<td>Physics</td>
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<tr>
<td>Environmental Geosciences</td>
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<td>Education</td>
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<td>Upper Division Writing Expectation for the Major</td>
<td>3</td>
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<tr>
<td>Secondary Teaching Licensure</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
<td>65</td>
</tr>
</tbody>
</table>

Biology/Microbiology Lower Division Core

Rule: All of the following courses are required.

Note: The lower division core should be completed before attempting most upper division major courses.

AP Biology credit may be substituted for either BIOB 160N/BIOB 161N or BIOB 170N/BIOB 171N.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</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>Prcnpls of Living Systems Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 170N</td>
<td>Prncpls 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>
<tr>
<td>Total</td>
<td>Hours</td>
<td>17</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Upper Division Core Courses Required by the Biological Education Concentration

Rule: All of the following courses are required.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</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>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>Hours</td>
<td>14</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Animal-Based Organismal Requirement

Rule: Complete one of the following courses

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<thead>
<tr>
<th>Course</th>
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<th>Credits</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>
<tr>
<td>Total</td>
<td>Hours</td>
<td>3</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Required Content Courses Outside of the Major

Minimum Required Grade: C-

Mathematics - Calculus

Rule: Complete one of the following calculus courses

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mathematics - Calculus</td>
<td></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>
</tr>
</tbody>
</table>
Note: Choose M 171, if you plan to take additional calculus courses, or if you plan a double major or minor in a field that requires more calculus (e.g. math, physics, biochemistry, computer science).

M 162 \hspace{1cm} \text{Applied Calculus} \hspace{1cm} 4
or M 171 \hspace{1cm} \text{Calculus I} \hspace{1cm} 4

Total Hours \hspace{1cm} 4

Minimum Required Grade: C-

Mathematics - Statistics

Rule: The following course is required

STAT 216 \hspace{1cm} \text{Introduction to Statistics} \hspace{1cm} 4

Total Hours \hspace{1cm} 4

Minimum Required Grade: C-

Chemistry

Rule: All of the following courses are required

CHMY 123 \hspace{1cm} \text{Introduction to Organic and Biochemistry} \hspace{1cm} 5
& CHMY 124 \hspace{1cm} \text{and Introduction to Organic and Biochemistry Lab}

Choose one of the Chemistry sequences: \hspace{1cm} 4-10

CHMY 121N \hspace{1cm} \text{Introduction to General Chemistry}

CHMY 485 \hspace{1cm} \text{Laboratory Safety}

Or (Required for the broadfield teaching concentration)

CHMY 141N \hspace{1cm} \text{College Chemistry I}

CHMY 142N \hspace{1cm} \text{College Chemistry I Lab}

CHMY 143N \hspace{1cm} \text{College Chemistry II}

& CHMY 144N \hspace{1cm} \text{and College Chemistry II Lab}

Total Hours \hspace{1cm} 9-15

Minimum Required Grade: C-

Physics

Select one of the following Physics sequences: \hspace{1cm} 10

Algebra- and Trigonometry-based:

PHSX 205N \hspace{1cm} \text{College Physics I}
& PHSX 206N \hspace{1cm} \text{and College Physics I Laboratory}

PHSX 207N \hspace{1cm} \text{College Physics II}
& PHSX 208N \hspace{1cm} \text{and College Physics II Laboratory}

Calculation-based:

PHSX 215N \hspace{1cm} \text{Fund of Physics w/Calc I}
& PHSX 216N \hspace{1cm} \text{and Physics Laboratory I w/Calc (requires M 171)}

PHSX 217N \hspace{1cm} \text{Fund of Physics w/Calc II}
& PHSX 218N \hspace{1cm} \text{and Physics Laboratory II w/Calc}

Total Hours \hspace{1cm} 10

Minimum Required Grade: C-

Environmental Geosciences

Rule: Complete one of the following courses

GEO 105N \hspace{1cm} \text{Oceanography} \hspace{1cm} 3
or GEO 103N \hspace{1cm} \text{Introduction to Environmental Geology}

Total Hours \hspace{1cm} 3

Minimum Required Grade: C-

Education

Rule: The following course is required

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.

EDU 497 \hspace{1cm} \text{Teaching and Assessing} \hspace{1cm} 4

Total Hours \hspace{1cm} 4

Minimum Required Grade: C-

Advanced College Writing Requirement

Rule: Complete the equivalent of a full writing course (either three 1/3 writing courses or one 2/3 writing course + one 1/3 writing course or one complete writing course)

Note: To meet the Advanced College Writing Requirement, Biology students take 2 or 3 partial writing courses (either three 1/3 writing courses or one 1/3 writing course and one 2/3 writing course) or one complete writing course. The Biological Education concentration requires one 2/3 writing course (BIOE 371) and one 1/3 writing course (BIOO 434). No additional courses are needed to meet this requirement.

Minimum Required Grade: C-

1/3 Advanced Writing Courses

BCH 482 \hspace{1cm} \text{Advanced Biochemistry II} \hspace{1cm} 3

BIOB 410 \hspace{1cm} \text{Immunology} \hspace{1cm} 3

BIOB 425 \hspace{1cm} \text{Adv Cell & Molecular Biology} \hspace{1cm} 3

BIOB 483 \hspace{1cm} \text{Phylogenics and Evolution} \hspace{1cm} 3

BIOE 403 \hspace{1cm} \text{Vert Design & Evolution} \hspace{1cm} 5

BIOE 409 \hspace{1cm} \text{Behavior & Evolution Discussion} \hspace{1cm} 1

BIOE 428 \hspace{1cm} \text{Freshwater Ecology} \hspace{1cm} 5

BIOL 484 \hspace{1cm} \text{Plant Evolution} \hspace{1cm} 3

BIOM 402 \hspace{1cm} \text{Medical Bacteriology & Mycology} \hspace{1cm} 3

BIOO 320 \hspace{1cm} \text{General Botany} \hspace{1cm} 5

BIOO 434 \hspace{1cm} \text{Plant Physiology Lab} \hspace{1cm} 1

BIOO 470 \hspace{1cm} \text{Ornithology} \hspace{1cm} 4

BIOO 475 \hspace{1cm} \text{Mammalogy} \hspace{1cm} 4

Minimum Required Grade: C-

2/3 Advanced Writing Courses

BCH 486 \hspace{1cm} \text{Biochemistry Research Lab} \hspace{1cm} 3

BCH 499 \hspace{1cm} \text{Senior Thesis/Capstone} \hspace{1cm} 3-6

BIOB 411 \hspace{1cm} \text{Immunology Laboratory} \hspace{1cm} 2

BIOB 499 \hspace{1cm} \text{Undergraduate Thesis} \hspace{1cm} 3-6

BIOE 342 \hspace{1cm} \text{Field Ecology} \hspace{1cm} 5

BIOE 371 \hspace{1cm} \text{Gen Ecology Lab (equiv to 271)} \hspace{1cm} 2

BIOM 411 \hspace{1cm} \text{Exprmntl Microbial Genetcs Lab} \hspace{1cm} 1

BIOM 499 \hspace{1cm} \text{Undergraduate Thesis} \hspace{1cm} 3-6

Minimum Required Grade: C-
**Complete Advanced Writing Course**
BIOH 462 Principles Medical Physiology 3

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**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 (see the College of Education & Human Sciences (http://catalog.umt.edu/colleges-schools-programs/education-human-sciences))

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**Exception to the Modern/Classical Languages Requirement**
*Rule:* Choose one of the following Math courses

*Note:* The Division of Biological Sciences has been granted an exception to the Modern/Classical Language Requirement. Either of these Calculus courses (required by the major) will satisfy this requirement.

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<td>Applied Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171</td>
<td>Calculus I</td>
<td></td>
</tr>
</tbody>
</table>

Total Hours 4

Minimum Required Grade: C-