BIOLOGY - GENETICS AND EVOLUTION

Bachelor of Science - Biology; Genetics and Evolution Concentration

College Humanities & Sciences

Degree Specific Credits: 70

Required Cumulative GPA: 2.0

Catalog Year: 2018-2019

Note: The Genetics and Evolution Concentration is for students interested in genetics and evolutionary biology, including molecular genetics, population genetics, ecological genetics, and genomics. This concentration is a graduate prep program, and is for students interested in academia or research jobs in private or government laboratories. It is also an excellent concentration for students interested in a professional health program such as medical school or a genetic counseling graduate program.

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></td>
<td>Biology/Microbiology Lower Division Core</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Upper Division Core Courses Required by the Genetics &amp; Evolution Concentration</td>
<td>11</td>
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<tr>
<td></td>
<td>Additional UD Major Courses Required for the Genetics &amp; Evolution Concentration</td>
<td>16-22</td>
</tr>
<tr>
<td></td>
<td>Biochemistry</td>
<td></td>
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<tr>
<td></td>
<td>Genetics/Evolution Depth Courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physiology Requirement</td>
<td></td>
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<tr>
<td></td>
<td>Required Courses Outside of the Major</td>
<td>26-42</td>
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<tr>
<td></td>
<td>Mathematics - Calculus</td>
<td></td>
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<tr>
<td></td>
<td>Mathematics - Statistics</td>
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<tr>
<td></td>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td></td>
</tr>
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<td>Total Hours</td>
<td>70-92</td>
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Biology/Microbiology Lower Division Core

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>
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<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>Princls Biological Diversity</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 171N</td>
<td>Principls 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 Hours</td>
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<td>17</td>
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</table>

Minimum Required Grade: C-

Upper Division Core Courses Required by the Genetics & Evolution Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 486</td>
<td>Genomics</td>
<td>3</td>
</tr>
<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>Total Hours</td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Additional UD Major Courses Required for the Genetics & Evolution Concentration

Biochemistry

If introductory chemistry is completed, then BCH 380 must be taken. Either BCH 380 or BCH 480-BCH 482 may be taken if the advanced chemistry sequence is completed.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>4-6</td>
</tr>
<tr>
<td>BCH 480</td>
<td>Advanced Biochemistry I</td>
<td></td>
</tr>
<tr>
<td>BCH 482</td>
<td>Advanced Biochemistry II</td>
<td></td>
</tr>
<tr>
<td>Total Hours</td>
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<td>4-6</td>
</tr>
</tbody>
</table>

Minimum Required Grade: C-

Genetics/Evolution Depth Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 480</td>
<td>Conservation Genetics</td>
<td>9-12</td>
</tr>
<tr>
<td>BIOB 483</td>
<td>Phylogenics and Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOB 488</td>
<td>Programming for Biology</td>
<td></td>
</tr>
<tr>
<td>BIOE 403</td>
<td>Vert Design &amp; Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOE 406</td>
<td>Behavior &amp; Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOL 484</td>
<td>Plant Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOM 410</td>
<td>Microbial Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOM 415</td>
<td>Microbial Dvrsty Eclgy &amp; Evltn</td>
<td></td>
</tr>
<tr>
<td>CSCI 451</td>
<td>Computational Biology</td>
<td></td>
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<tr>
<td>Total Hours</td>
<td></td>
<td>9-12</td>
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Minimum Required Grade: C-

Physiology Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BIOB 425</td>
<td>Adv Cell &amp; Molecular Biology</td>
<td>3-4</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td></td>
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</tbody>
</table>
Biology - Genetics and Evolution

BIOL 435 Comparative Animal Physiology
BIOM 450 Microbial Physiology
& BIOM 451 and Microbial Physiology Lab
BIO 433 Plant Physiology
& BIO 434 and Plant Physiology Lab

Total Hours 3-4

Minimum Required Grade: C-

Required Courses Outside of the Major

Minimum Required Grade: C-

Mathematics - Calculus
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).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>M 162</td>
<td>Applied Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171</td>
<td>Calculus I</td>
<td></td>
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</table>

Total Hours 4

Minimum Required Grade: C-

Mathematics - Statistics
Select either one semester or a full year of statistics from the following:

One Semester:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>STAT 216</td>
<td>Introduction to Statistics</td>
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Full Year:

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 451 &amp; STAT 452</td>
<td>Statistical Methods I and Statistical Methods II</td>
<td></td>
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<tr>
<td>STAT 457 &amp; STAT 458</td>
<td>Computer Data Analysis I and Computer Data Analysis II</td>
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Total Hours 4-8

Minimum Required Grade: C-

Chemistry

Complete a sequence of general and organic chemistry

Introductory:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>CHMY 121N</td>
<td>Introduction to General Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHMY 123 &amp; CHMY 124</td>
<td>Introduction to Organic and Biochemistry and Introduction to Organic and Biochemistry Lab</td>
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Advanced:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CHMY 141N</td>
<td>College Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHMY 142N</td>
<td>College Chemistry I Lab</td>
<td></td>
</tr>
<tr>
<td>CHMY 143N</td>
<td>College Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHMY 144N</td>
<td>College Chemistry II Lab</td>
<td></td>
</tr>
<tr>
<td>CHMY 221 &amp; CHMY 222</td>
<td>Organic Chemistry I and Organic Chemistry I Lab</td>
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</table>

CHMY 223 Organic Chemistry II
& CHMY 224 and Organic Chemistry II Lab

Total Hours 8-20

Minimum Required Grade: C-

Physics

Complete a two-semester sequence of physics

Algebra- and Trigonometry-based:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>PHSX 205N</td>
<td>College Physics I and College Physics I Laboratory</td>
<td></td>
</tr>
<tr>
<td>PHSX 207N</td>
<td>College Physics II and College Physics II Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Calculus-based:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 215N &amp; PHSX 216N</td>
<td>Fund of Physics w/Calc I and Physics Laboratory I w/Calc</td>
<td></td>
</tr>
<tr>
<td>PHSX 217N &amp; PHSX 218N</td>
<td>Fund of Physics w/Calc II and Physics Laboratory II w/Calc</td>
<td></td>
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</table>

Total Hours 10

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 Genetics & Evolution concentration requires one 2/3 writing course: BIOE 371. The Advanced College Writing Requirement is completed with one additional course, chosen from any of the following.

1/3 Advanced Writing Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>BCH 482</td>
<td>Advanced Biochemistry II</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 410</td>
<td>Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 425</td>
<td>Adv Cell &amp; Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 483</td>
<td>Phylogenics and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 403</td>
<td>Vert Design &amp; Evolution</td>
<td>5</td>
</tr>
<tr>
<td>BIOE 409</td>
<td>Behavior &amp; Evolution Discussion</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 428</td>
<td>Freshwater Ecology</td>
<td>5</td>
</tr>
<tr>
<td>BIOL 484</td>
<td>Plant Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 402</td>
<td>Medical Bacteriology &amp; Mycology</td>
<td>3</td>
</tr>
<tr>
<td>BIO 320</td>
<td>General Botany</td>
<td>5</td>
</tr>
<tr>
<td>BIO 343</td>
<td>Plant Physiology Lab</td>
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<tr>
<td>BIO 470</td>
<td>Ornithology</td>
<td>4</td>
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<tr>
<td>BIO 475</td>
<td>Mammalogy</td>
<td>4</td>
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Minimum Required Grade: C-
### 2/3 Advanced Writing Courses

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<th>Hours</th>
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<tbody>
<tr>
<td>BCH 486</td>
<td>Biochemistry Research Lab</td>
<td>3</td>
</tr>
<tr>
<td>BCH 499</td>
<td>Senior Thesis/Capstone</td>
<td>3-6</td>
</tr>
<tr>
<td>BIOB 411</td>
<td>Immunology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>BIOB 499</td>
<td>Undergraduate Thesis</td>
<td>3-6</td>
</tr>
<tr>
<td>BIOE 342</td>
<td>Field Ecology</td>
<td>5</td>
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<tr>
<td>BIOE 371</td>
<td>Gen Ecology Lab (equiv to 271)</td>
<td>2</td>
</tr>
<tr>
<td>BIOM 411</td>
<td>Exprmntl Microbial Genetcs Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIOM 499</td>
<td>Undergraduate Thesis</td>
<td>3-6</td>
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Minimum Required Grade: C-

### Complete Advanced Writing Course

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>BIOH 462</td>
<td>Principles Medical Physiology</td>
<td>3</td>
</tr>
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Minimum Required Grade: C-