BIOLOGY, B.S. (BEHREND)

Begin Campus: Any Penn State Campus
End Campus: Erie

Program Description
The curriculum in Biology is designed to provide students with a strong background in the biological sciences. It provides preparation for students who intend to secure advanced degrees through graduate study, students who intend to prepare for careers in medicine or health-related fields, and students preparing for careers with companies or agencies requiring employees with biological backgrounds. The curriculum has six options allowing students to choose an area of specialization that will best meet their career goals. In addition to selecting an option, students are strongly encouraged to participate in faculty-supervised research. The options are:

1. General Biology - various areas of modern biology;
2. Ecology, Evolution, and Behavior - theoretical, practical, and applied ecology and evolution of plants and animals;
3. Genetics and Developmental Biology - genetics and developmental biology of plants and animals;
4. Molecular and Cellular Biology and Biochemistry - molecular and cellular mechanisms of biology;
5. Medical Technology - prepares students for careers in clinical laboratories; and
6. Health Professions - prepares students for careers in medicine and veterinary sciences; this option also allows exceptional students, who gain early admission to a professional school, to fulfill option requirements with a set number of academic credits taken during the first professional year.

What is Biology?
Biology is the scientific study of life: the diversity and organization of organisms, from single-celled bacteria to multi-cellular plants and animals, including humans. These different levels of biological organization range from the molecules and cells that compose an organism, to the interacting organisms that make up an ecosystem. Hands-on experiences, from designing and conducting lab experiments to making field observations using different procedures and instruments play an important role in gaining biological knowledge. Biologists explore ways to cure neurological diseases, conserve coral populations in tropical oceans, discover more efficient ways to use plants for food and bio-energy, develop vaccines for infectious diseases, and investigate many other facets of Biology.

You Might Like This Program If...
- You are curious about the natural world, from the smallest of cells to the largest of trees.
- You enjoy theoretical study as well as hands-on laboratory learning.
- You are interested chemistry, physics, and mathematics.
- You can envision yourself in a health care or medical career.
- You are looking for a foundational major that supports diverse career paths in the sciences, engineering, research, education, and health care.

Entrance to Major
In order for entrance to the Biology major, a student must have:

1. attained at least a 2.00 cumulative grade point average;
2. completed BIOL 110 and earned a grade of C or better; and
3. completed at least one of the following courses with a grade of C or better: BIOL 220W, or BIOL 240W.

Degree Requirements
For the Bachelor of Science degree in Biology, a minimum of 124 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>97-99</td>
</tr>
</tbody>
</table>

18 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses.

Per Senate Policy 83.80.5, the college dean or campus chancellor and program faculty may require up to 24 credits of coursework in the major to be taken at the location or in the college or program where the degree is earned.

General Education
Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (http://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Knowledge Domains
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- Inter-Domain or Approved Linked Courses: 6 credits

University Degree Requirements
First Year Engagement
All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3
credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

**Cultures Requirement**
6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

**Writing Across the Curriculum**
3 credits required from the college of graduation and likely prescribed as part of major requirements.

**Total Minimum Credits**
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

**Quality of Work**
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

**Limitations on Source and Time for Credit Acquisition**
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80). For more information, check the Suggested Academic Plan for your intended program.

**Requirements for the Major**
Each student must earn at least a grade of C in each 200-, 300-, and 400-level BIOL, BMB, MICRB, PPEM and WFS course in the major field.

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44). For more information, check the Suggested Academic Plan for your intended program.

**Prescribed Courses: Require a grade of C or better**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 110</td>
<td>Biology: Basic Concepts and Biodiversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 220W</td>
<td>Biology: Populations and Communities</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 230W</td>
<td>Biology: Molecules and Cells</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 240W</td>
<td>Biology: Function and Development of Organisms</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 322</td>
<td>Genetic Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

**Requirements for the Option**
Select an option 56-58 credits

**Ecology, Evolution, and Behavior Option (50-54 credits)**
Students can select courses in theoretical or applied ecology, evolution, field biology and animal behavior to build strength in ecological science. The option prepares students for graduate study in ecology and evolution, or careers in zoo science, environmental consulting, environmental management, environmental education or positions with regulatory agencies.

**Code**

**Title**

**Credits**

**Prescribed Courses: Require a grade of C or better**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 427</td>
<td>Evolution</td>
<td>3</td>
</tr>
</tbody>
</table>

**Additional Courses**
Select one of the following: 3 credits

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 402</td>
<td>Analysis of Variance</td>
<td>1</td>
</tr>
<tr>
<td>STAT 461</td>
<td>Applied Regression Analysis</td>
<td>1</td>
</tr>
<tr>
<td>STAT 462</td>
<td>Applied Nonparametric Statistics</td>
<td>1</td>
</tr>
<tr>
<td>STAT 466</td>
<td>Survey Sampling</td>
<td>1</td>
</tr>
</tbody>
</table>

Select one of the following sequences: 6-8 credits

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 202</td>
<td>Fundamentals of Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>&amp; CHEM 203</td>
<td>and Fundamentals of Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 210</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 212</td>
<td>and Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 213</td>
<td>Laboratory in Organic Chemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following sequences: 8-10 credits

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 212</td>
<td>and General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 213</td>
<td>and General Physics: Fluids and Thermal Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 212</td>
<td>and General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 214</td>
<td>and General Physics: Wave Motion and Quantum Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>Introductory Physics I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; PHYS 251</td>
<td>and Introductory Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

**Additional Courses: Require a grade of C or better**
Select 9 credits of the following: 9 credits

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>BIOL 428</td>
<td>Population Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 429</td>
<td>Animal Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 435</td>
<td>Ecology of Lakes and Streams</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 438</td>
<td>Theoretical Population Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 446</td>
<td>Physiological Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 463</td>
<td>General Ecology</td>
<td>3</td>
</tr>
</tbody>
</table>

**Supporting Courses and Related Areas**
Select item A or B: 17-21 credits

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BIOL 400</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 401</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 402</td>
<td>Analysis of Variance</td>
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<td>BIOL 405</td>
<td>Survey Sampling</td>
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Select one of the following sequences: 6-8 credits

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<td>and Fundamentals of Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 210</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 212</td>
<td>and Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 213</td>
<td>Laboratory in Organic Chemistry</td>
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</tr>
</tbody>
</table>

Select one of the following sequences: 8-10 credits

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<td>&amp; PHYS 212</td>
<td>and General Physics: Electricity and Magnetism</td>
<td>4</td>
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<td>and General Physics: Fluids and Thermal Physics</td>
<td>4</td>
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<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
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<td>and General Physics: Electricity and Magnetism</td>
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<td>&amp; PHYS 214</td>
<td>and General Physics: Wave Motion and Quantum Physics</td>
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<td>PHYS 250</td>
<td>Introductory Physics I</td>
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</tr>
<tr>
<td>&amp; PHYS 251</td>
<td>and Introductory Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>
GEOG 160 & GEOG 161 & GEOG 363
Mapping Our Changing World and Applied Geographic Information Systems and Geographic Information Systems
Select 10-14 credits from school approved list

B
Select 17-21 credits from school approved list

Supporting Courses and Related Areas: Require a grade of C or better
Select 6 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses

1 Course requires a grade of C or better
2 Excluding BIOL 400 and any courses numbered 494, 495, 496, 497, 498, or 499.

General Biology Option (50-54 credits)
Students can select courses from a variety of areas of contemporary biology. The option provides the flexibility to enable students to tailor their program for graduate study in many fields of biology or careers requiring broad backgrounds and diverse skills in the biological sciences.

Code Title Credits
Prescribed Courses
Prescribed Courses: Require a grade of C or better
BIOL 427 Evolution 3

Additional Courses
Select one of the following sequences:
CHEM 202 Fundamentals of Organic Chemistry I 6-8
& CHEM 203 and Fundamentals of Organic Chemistry II
CHEM 210 Organic Chemistry I 6-8
& CHEM 212 and Organic Chemistry II
& CHEM 213 and Laboratory in Organic Chemistry

Select one of the following sequences:
PHYS 211 General Physics: Mechanics 8-10
& PHYS 212 and General Physics: Electricity and Magnetism
& PHYS 213 and General Physics: Fluids and Thermal Physics
PHYS 211 General Physics: Mechanics 8-10
& PHYS 212 and General Physics: Electricity and Magnetism
& PHYS 213 and General Physics: Fluids and Thermal Physics
& PHYS 214 and General Physics: Wave Motion and Quantum Physics
PHYS 250 Introductory Physics I 8-10
& PHYS 251 and Introductory Physics II

Supporting Courses and Related Areas
Select 20-24 credits from school approved list 20-24

Supporting Courses and Related Areas: Require a grade of C or better
Select 15 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses 15

1 Excluding BIOL 400 and any courses numbered 494, 495, 496, 497, 498, or 499.

Medical Technology Option (50-54 credits)
Students spend approximately twelve months at an affiliated hospital during their senior year to complete the clinical phase of their baccalaureate studies. A fixed number of spaces are available on a competitive basis of grade-point average and hospital approval. The Bachelor of Science degree in Biology is awarded upon successful completion of the clinical study. The graduate is also eligible to take the national examination for certification and registry as a medical technologist.

Code Title Credits
Prescribed Courses
PHYS 250 Introductory Physics I 4
PHYS 251 Introductory Physics II 4
Prescribed Courses: Require a grade of C or better
MICRB 201 Introductory Microbiology 3
MICRB 202 Introductory Microbiology Laboratory 2
MICRB 405A Seminar and Practicum in Medical Technology 8

Genetics and Developmental Biology Option (50-54 credits)
Students can select courses to develop strengths in various areas of transmission, medical, population or molecular genetics and/or study the developmental process at the organismal, histological or molecular levels. The option prepares students for admission to professional programs in the health sciences, graduate programs in genetic counseling, plant or animal breeding, developmental biology, or careers in research or biotechnology.
**Molecular and Cellular Biology and Biochemistry Option (50-54 credits)**

Students can select courses to develop strengths in the study of biology at the cellular and molecular levels, including basic metabolism and its regulations, DNA recombinant technology, bioinformatics and genomics. The option prepares students for admission to professional programs at the cellular and molecular levels, including basic metabolism and its regulations, DNA recombinant technology, bioinformatics and genomics. The option is also provided for exceptional students who are admitted into a "3+4" accelerated or early acceptance program at an approved or affiliated professional school. Students are granted 21 credits toward the Bachelor of Science degree following the successful completion of the first professional academic year. The Health Professions Committee will work with such students to develop an appropriate program of study.

### Code | Title | Credits
---|---|---
CHEM 210 | Organic Chemistry I | 3
CHEM 212 | Organic Chemistry II | 3
CHEM 213 | Laboratory in Organic Chemistry | 2

**Prescribed Courses: Require a grade of C or better**

- BIOL 400
- BIOL 404
- BIOL 409
- BIOL 410
- BIOL 411
- BIOL 412
- BIOL 413
- BIOL 414
- BIOL 415
- BIOL 416
- BIOL 417
- BIOL 418
- BIOL 419
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- BIOL 493
- BIOL 494
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- BIOL 496
- BIOL 497
- BIOL 498
- BIOL 499

**Supporting Courses and Related Areas**

Select 1 credit from approved list

**Supporting Courses and Related Areas: Require a grade of C or better**

Select 3 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses

**Additional Courses: Require a grade of C or better**

Select one of the following:

- BIOL 404
- BIOL 409
- BIOL 410
- BIOL 411
- BIOL 412

**Supporting Courses and Related Areas**

Select 14-16 credits from school approved list

**Supporting Courses and Related Areas: Require a grade of C or better**

Select 3 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses

1 Excluding BIOL 400 and any courses numbered 494, 495, 496, 497, 498, or 499.

**Health Professions Option (50-54 credits)**

Students can prepare for the rigors of advanced health professions education by following the course of study outlined in this option. This option is also provided for exceptional students who are admitted into a "3+4" accelerated or early acceptance program at an approved or affiliated professional school. Students are granted 21 credits toward the Bachelor of Science degree following the successful completion of the first professional academic year. The Health Professions Committee will work with such students to develop an appropriate program of study.

### Code | Title | Credits
---|---|---
CHEM 210 | Organic Chemistry I | 3
CHEM 212 | Organic Chemistry II | 3
CHEM 213 | Laboratory in Organic Chemistry | 2

**Prescribed Courses: Require a grade of C or better**

- BIOL 421
- BIOL 422
- BIOL 423
- BIOL 424
- BIOL 425
- BIOL 426
- BIOL 427
- BIOL 428
- BIOL 429
- BIOL 430
- BIOL 431
- BIOL 432
- BIOL 433
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- BIOL 494
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- BIOL 496
- BIOL 497
- BIOL 498
- BIOL 499

**Additional Courses**

Select one of the following sequences:

- PHYS 211
- PHYS 212
- PHYS 213
- PHYS 214
- PHYS 250
- PHYS 251

**Additional Courses: Require a grade of C or better**

- PHYS 211
- PHYS 212
- PHYS 213
- PHYS 214
- PHYS 250
- PHYS 251

**Additional Courses**

- BMB 401
- CHEM 472

**Additional Courses: Require a grade of C or better**

- BMB 401
- CHEM 472
Supporting Courses and Related Areas
Select 11-13 credits from school approved list

Supporting Courses and Related Areas: Require a grade of C or better
Select 3 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses

1 Excluding BIOL 400 and any courses numbered 494, 495, 496, 497, 498, or 499.

Program Learning Objectives
Students should be able to:

1. Apply physical laws to biological dynamics.
2. Apply statistical methods to diverse data.
3. Understand the relationship of the chemistry of molecules to biological systems.
4. Develop biological applications to solve societal problems.
5. Develop and interpret graphs.
6. Computationally model dynamic systems.
7. Design scientific process to understand living systems.
8. Communicate ideas and results of experiments and research effectively both orally and in writing.
9. Search for, acquire and interpret original scientific literature.

Students should be able to articulate and explain for multiple levels of the biological hierarchy that:

1. Evolution explains the diversity and unity of life.
2. Organisms store and process information.
3. The physical and chemical characteristics of biological structures influence their function.
4. Organisms capture and transform energy and matter.
5. Biological systems are complex and hierarchical.

Academic Advising
The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy)

Erie
Beth Potter, Ph.D.
Associate Professor of Biology
163 Nick
Erie, PA 16563
814-898-6510

bap16@psu.edu

Suggested Academic Plan
The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2019-20 academic year. To access previous years' suggested academic plans, please visit the archive (http://bulletins.psu.edu/undergraduate/archive) to view the appropriate Undergraduate Bulletin edition (Note: the archive only contain suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin).

General Biology Option at Erie Campus
The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 110</td>
<td>4</td>
<td>BIOL 240W</td>
<td>4</td>
</tr>
<tr>
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17.5          16.5

Second Year

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16-17         16

Third Year

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16-17         16
### Fourth Year

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<tr>
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Total Credits 127-132

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
# Course is an Entrance to Major requirement
‡ Course satisfies General Education and degree requirement

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

### Program Notes

1.) Students who have not met the admission requirement of two units of a high school world language must complete a college level-one world language within their first 60 credits.

2.) School Approved List of Course for Electives - All courses listed in the Penn State University course listings except those specifically listed in the 'non-approved courses' below are considered approved courses and can be used as supporting courses electives.

School of Science Non-Approved List of Courses for the BIOBC Major
- BIOL no course under 100
- MATH no course under MATH 140, MATH 140A (2 of 6 credits)
- BISC 1, BISC 2, BISC 3, BISC 4
- MICRB 106 and MICRB 107
- BMB 1, BMB 3
- PHYS 1, PHYS 150, PHYS 151
- CHEM 1, CHEM 3, CHEM 101, CHEM 106 (2 of 5 credits), CHEM 108
- PLSC 7, PLSC 8, PLSC 11
- CMPSC 1, CMPSC 100

### Genetics and Development Option at Erie Campus

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

#### First Year

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<tr>
<th>Course</th>
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<td>CHEM 110*†</td>
<td>3 CHEM 112‡</td>
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<td>CHEM 111†</td>
<td>1 CHEM 113‡</td>
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<td>MATH 140 (or appropriate MATH Course from ALEKS test)‡†</td>
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General Education Course (GHW) 1.5

#### Second Year

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<td>General Education Course</td>
<td>3 CHEM 213</td>
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General Education Course 3

#### Third Year

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<td>PHYS 211 or 250†</td>
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<tr>
<td>MICRB 201*</td>
<td>3 BMB 406 or BIOL 422 (or BIOL 460)*</td>
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<td>MICRB 202*</td>
<td>2 BIOL 430*</td>
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<td>ENGL 202C††</td>
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General Education Course 3

18 16
Fourth Year

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14-16 15

Total Credits 128-130

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
‡ Course is an Entrance to Major requirement
‡† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

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Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

Program Notes

1.) Students who have not met the admission requirement of two units of a high school world language must complete a college level-one world language within their first 60 credits.

2.) School Approved List of Course for Electives - All courses listed in the Penn State University course listings except those specifically listed in the 'non-approved courses' below are considered approved courses and can be used as supporting courses electives.

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- BIOL no course under 100
- MATH no course under MATH 140, MATH 140A (2 of 6 credits)
- BISC 1, BISC 2, BISC 3, BISC 4
- MICRB 106 and MICRB 107
- BMB 1, BMB 3
- PHYS 1, PHYS 150, PHYS 151
- CHEM 1, CHEM 3, CHEM 101, CHEM 106 (2 of 5 credits), CHEM 108
- PLSC 7, PLSC 8, PLSC 11
- CMPSC 1, CMPSC 100

- LED 5, LED 10
- ENGL 4, ENGL 5
- STAT 100

Advising Notes

1.) CHEM 110: Prerequisite satisfactory performance on the MATH placement test (ALEKS) - i.e. placement beyond the level of MATH 22; or CHEM 101 and MATH 22 or MATH 41

2.) MICRB 201 should be taken concurrently with MICRB 202 Lab

3.) Take PHYS 213 if you have taken PHYS 211 and PHYS 212

4.) Take PHYS 214 if you have taken PHYS 211 and PHYS 212

Health Professions Option at Erie Campus

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

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<tr>
<th>Fall</th>
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<tr>
<td>BIOL 110*#</td>
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<td>CHEM 110†</td>
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<td>CHEM 111†</td>
<td>1 CHEM 113†</td>
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<td>MATH 140 (or appropriate MATH Course from ALEKS test)**</td>
<td>4 General Education Course</td>
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<td>PSU 7</td>
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General Education Course (GHW) 1.5

17.5 16.5

Second Year

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13 15

Third Year

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<td>3 BIOL 473†</td>
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15 19

Fourth Year

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Supporting Course (School Approved List) | 3 Supporting Course (School Approved List)  
General Education Course | 3 Supporting Course (School Approved List)  
General Education Course | 3 General Education Course  

Total Credits 127
* Course requires a grade of C or better for the major
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# Course is an Entrance to Major requirement
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- MICRB 106 and MICRB 107
- BMB 1, BMB 3
- PHYS 1, PHYS 150, PHYS 151
- CHEM 1, CHEM 3, CHEM 101, CHEM 106 (2 of 5 credits), CHEM 108
- PLSC 7, PLSC 8, PLSC 11
- CMPSC 1, CMPSC 100
- LLED 5, LLED 10
- ENGL 4, ENGL 5
- STAT 100
- BIOL 421: Comparative Anatomy and BIOL 497: Human Anatomy alternate each year

Advising Notes
1.) CHEM 110: Prerequisite satisfactory performance on the MATH placement test (ALKES) - i.e. placement beyond the level of MATH 22; or CHEM 101 and MATH 22 or MATH 41

Medical Technology Option at Erie Campus
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First Year

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<td>MATH 141‡</td>
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<td>CHEM 111†</td>
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<td>PSU 7</td>
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Second Year

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<td>BIOL 220W*</td>
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Third Year

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Fourth Year

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Molecular and Cell Biology and Biochemistry Option at Erie Campus

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<table>
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<td>MATH 140 (or appropriate MATH Course from ALEKS test)**</td>
<td>4</td>
<td>General Education Course</td>
<td>3</td>
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<tr>
<td>PSU 7</td>
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<td>General Education Course (GHW)</td>
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General Education Course (GHW) 1.5

| Credits | 16.5 |

Second Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 220W*</td>
<td>4</td>
<td>BIOL 230W*</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 210</td>
<td>3</td>
<td>CAS 100</td>
<td>3</td>
</tr>
<tr>
<td>Elective or MATH 141 (if Calculus is not completed)</td>
<td>3-4</td>
<td>CHEM 202 or 212 and 213</td>
<td>3-5</td>
</tr>
<tr>
<td>General Education Course</td>
<td>3</td>
<td>STAT 250</td>
<td>3</td>
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<tr>
<td>General Education Course</td>
<td>3</td>
<td>General Education Course</td>
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| Credits | 16-17 | 16-18 |

Third Year

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<tr>
<th>Fall</th>
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<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 322*</td>
<td>3</td>
<td>PHYS 212 or 251</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211 or 250†</td>
<td>4</td>
<td>BMB 406*</td>
<td>3</td>
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<tr>
<td>ENGL 202C††</td>
<td>3</td>
<td>BMB 465 or BIOL 441 or MICRB 410 or MICRB 412 or MICRB 415*</td>
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<tr>
<td>MICRB 201*</td>
<td>3</td>
<td>General Education Course</td>
<td>3</td>
</tr>
<tr>
<td>MICRB 202*</td>
<td>2</td>
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General Education Course

| Credits | 13-14 |

Fourth Year

<table>
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<th>Fall</th>
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<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL, MICRB, BMB, PPEM, ENT, or WFS 400-level course*</td>
<td>3-4</td>
<td>BIOL 427*</td>
<td>3</td>
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<tr>
<td>BMB 401 or CHEM 472*</td>
<td>3</td>
<td>Supporting Course (School Approved List)</td>
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<tr>
<td>PHYS 213 or PHYS 214 or Supporting Course (School Approved List)</td>
<td>2-3</td>
<td>BMB 402*</td>
<td>3</td>
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</tbody>
</table>

*†‡ Course requires a grade of C or better for the major
†‡ Course requires a grade of C or better for General Education
# Course is an Entrance to Major requirement
† Course satisfies General Education and degree requirement

1. MICRB 410 must be completed before clinical courses at St. Vincent.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of ‘C’ or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

Program Notes

1.) Students who have not met the admission requirement of two units of a high school world language must complete a college level-one world language within their first 60 credits.

2.) School Approved List of Course for Electives - All courses listed in the Penn State University course listings except those specifically listed in the 'non-approved courses' below are considered approved courses and can be used as supporting courses electives.

School of Science Non-Approved List of Courses for the BIOBC Major
- BIOL no course under 100
- MATH no course under MATH 140, MATH 140A (2 of 6 credits)
- BISC 1, BISC 2, BISC 3, BISC 4
- MICRB 106 and MICRB 107
- BMB 1, BMB 3
- PHYS 1, PHYS 150, PHYS 151
- CHEM 1, CHEM 3, CHEM 101, CHEM 106 (2 of 5 credits), CHEM 108
- PLSC 7, PLSC 8, PLSC 11
- CMPSC 1, CMPSC 100
- LLED 5, LLED 10
- ENGL 4, ENGL 5
- STAT 100

Advising Notes

1.) CHEM 110: Prerequisite satisfactory performance on the MATH placement test (ALKES) - i.e. placement beyond the level of MATH 22; or CHEM 101 and MATH 22 or MATH 41
2.) MICRB 201 should be taken concurrently with MICRB 202 Lab
3.) MICRB 410 required for admission to clinical program
Supporting Course (School Approved List) | 3 BMB 403* | 1
Supporting Course (School Approved List) | 3 Supporting Course (School Approved List) | 3
Supporting Course (School Approved List) | 3 Supporting Course (School Approved List) | 3

Total Credits 124-130

* Course requires a grade of C or better for the major
† Course requires a grade of C or better for General Education
‡ Course is an Entrance to Major requirement
‡† Course satisfies General Education and degree requirement

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- BIOL no course under 100
- MATH no course under MATH 140, MATH 140A (2 of 6 credits)
- BISC 1, BISC 2, BISC 3, BISC 4
- MIRCB 106 and MIRCB 107
- BMB 1, BMB 3
- PHYS 1, PHYS 150, PHYS 151
- CHEM 1, CHEM 3, CHEM 101, CHEM 106 (2 of 5 credits), CHEM 108
- PLSC 7, PLSC 8, PLSC 11
- CMPSC 1, CMPSC 100
- LLED 5, LLED 10
- ENGL 4, ENGL 5
- STAT 100

Advising Notes

1. CHEM 110: Prerequisite satisfactory performance on the MATH placement test (ALKES) - i.e. placement beyond the level of MATH 22; or CHEM 101 and MATH 22 or MATH 41

Ecology, Evolution, and Behavior Option at Erie Campus

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL 110*#</td>
<td>4 BIOL 240W*</td>
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<tr>
<td>ENGL 15 or 30†</td>
<td>3 MATH 141</td>
<td>4</td>
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<tr>
<td>CHEM 110*†</td>
<td>3 CHEM 112†</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHEM 111†</td>
<td>1 CHEM 113†</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MATH 140 (or appropriate MATH Course based on ALEKS scores)**</td>
<td>4 General Education Course</td>
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<td></td>
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<td>18</td>
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Second Year

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<th>Spring</th>
<th>Credits</th>
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<tr>
<td>BIOL 220W*</td>
<td>4 BIOL 230W*</td>
<td>4</td>
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<tr>
<td>CHEM 210 (or Elective)</td>
<td>3 CHEM 202 or 212 and 213</td>
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<tr>
<td>Elective or MATH 141 (if Calculus has not been completed)</td>
<td>3-4 CAS 100</td>
<td>3</td>
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<tr>
<td>General Education Course</td>
<td>3 STAT 250</td>
<td>3</td>
<td></td>
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<tr>
<td>General Education Course</td>
<td>3 General Education Course</td>
<td>3</td>
<td></td>
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<tr>
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<td>16-17</td>
<td>16-18</td>
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Third Year

<table>
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<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 322*</td>
<td>3 BIOL 438 (or BIOL, MIRCB, BMB, PPEM, or WFS 400-level Course)*</td>
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<td>BIOL 429 or BIOL 435 or BIOL 438 or BIOL, MIRCB, BMB, PPEM, or WFS 400-level Course or Supporting Course (School Approved List)*</td>
<td>3-4 BIOL 402*</td>
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<tr>
<td>PHYS 211 or 250†</td>
<td>4 PHYS 212 or 251</td>
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<tr>
<td>CHEM 203 (or Supporting Course (School Approved List))</td>
<td>3 ENGL 202C††</td>
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<tr>
<td>General Education Course</td>
<td>3 General Education Course</td>
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<td>16-17</td>
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Fourth Year

<table>
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<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL, MIRCB, BMB, PPEM, or WFS 400-level Course*</td>
<td>3-4 BIOL 427*</td>
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<td></td>
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<tr>
<td>BIOL, MIRCB, BMB, PPEM, or WFS 400-level Course*</td>
<td>3-4 Supporting Course (School Approved List)</td>
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<tr>
<td>Supporting Course (School Approved List)</td>
<td>3 Supporting Course (School Approved List)</td>
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Supporting Course (School Approved List) or STAT Selection

PHYS 213 or 214

<table>
<thead>
<tr>
<th>Supporting Course (School Approved List)</th>
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<th>Supporting Course (School Approved List)</th>
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<tbody>
<tr>
<td>2 BIOL, MICRB, BMB, PPEM, or WFS 400-level Course*</td>
<td>3</td>
<td>4</td>
<td>14-16</td>
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</table>

Total Credits 127.5-134.5

* Course requires a grade of C or better for the major
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- LLED 5, LLED 10
- ENGL 4, ENGL 5
- STAT 100

Advising Notes

1.) CHEM 110: Prerequisite satisfactory performance on the MATH placement test (ALKES) - i.e. placement beyond the level of MATH 22; or CHEM 101 and MATH 22 or MATH 41

2.) Take PHYS 213 if you have taken PHYS 211 and PHYS 212

3.) Take PHYS 214 if you have taken PHYS 211 and PHYS 212

Career Paths

Biology is among the most versatile of college majors and a jumping-off point for careers that can range from astrobiologist to microbiologist to zoologist. Whether you envision a career working with cancer cells or California condors, a Biology degree from Penn State Behrend can make that happen. Penn State Behrend has a comprehensive support system to help you identify and achieve your goals for college and beyond. Meet with your academic adviser often and take advantage of the services offered by the Academic and Career Planning Center beginning in your first semester.

Careers

Biologists are everywhere! Penn State Behrend biology graduates include bioforensic identification specialists, orthotists, research biologists, biophysicists, anesthesiologist, dentists, veterinarians, national park rangers, doctors, high school teachers, physician assistants, college professors, lawyers, and even a lead elephant zookeeper!

Opportunities for Graduate Studies

Biology is a common foundational major for graduate study in a specialized subdiscipline such as aquatic biology or genetics. Its broad diversity of experiences make it a popular undergraduate major for future medical doctors, veterinarians, physician assistants, and other health-care professionals. Penn State Behrend offers numerous pre-health profession options within its degree program, including 3+4 and early admissions programs.

Professional Resources

- American Institute of Biological Sciences (https://www.aibs.org/home)
- American Society for Cell Biology (http://www.ascb.org)
- American Society for Microbiology (http://www.ascb.org)
- American Society of Human Genetics (http://www.ashg.org)
- Entomological Society of America (http://www.entsoc.org)
- National Association of Biology Teachers (http://www.nabt.org)
- Society for the Study of Evolution (http://www.evolutionsociety.org)

Contact

Erie

SCHOOL OF SCIENCE
1 Prischak
4205 College Drive
Erie, PA 16563
814-898-6105
behrend-science@psu.edu

http://behrend.psu.edu/school-of-science