

BIOLOGY, B.S. (BEHREND)

Begin Campus: Any Penn State Campus

End Campus: Erie

Degree Requirements

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

Requirement	Credits
General Education	45
Requirements for the Major	97-99

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.

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 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
CHEM 110	Chemical Principles I	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
STAT 250	Introduction to Biostatistics	3
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 110	Biology: Basic Concepts and Biodiversity	4
BIOL 220W	Biology: Populations and Communities	4
BIOL 230W	Biology: Molecules and Cells	4
BIOL 240W	Biology: Function and Development of Organisms	4
BIOL 322	Genetic Analysis	3
Requirements for the Option		
Select an option		56-58

Requirements for the Option

Ecology, Evolution, and Behavior Option (56 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		
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 427	Evolution	3
Additional Courses		
Select one of the following:		
BIOL 402W	Biological Experimental Design ¹	3
STAT 461	Analysis of Variance	
STAT 462	Applied Regression Analysis	
STAT 464	Applied Nonparametric Statistics	
STAT 466	Survey Sampling	
Select one of the following sequences:		
CHEM 202 & CHEM 203	Fundamentals of Organic Chemistry I and Fundamentals of Organic Chemistry II	6-8
CHEM 210 & CHEM 212 & CHEM 213	Organic Chemistry I and Organic Chemistry II and Laboratory in Organic Chemistry	
Select one of the following sequences:		
PHYS 211 & PHYS 212 & PHYS 213	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics	8-10
PHYS 211 & PHYS 212 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Wave Motion and Quantum Physics	
PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II	
<i>Additional Courses: Require a grade of C or better</i>		
Select 9 credits of the following:		
BIOL 428	Population Genetics	9
BIOL 429	Animal Behavior	
BIOL 435	Ecology of Lakes and Streams	
BIOL 438	Theoretical Population Ecology	
BIOL 446	Physiological Ecology	
BIOL 463	General Ecology	
Supporting Courses and Related Areas		
Select item A or B:		
A		
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		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 6 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses ²		

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 (56 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		
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 427	Evolution	3
Additional Courses		
Select one of the following sequences:		6-8
CHEM 202 & CHEM 203	Fundamentals of Organic Chemistry I and Fundamentals of Organic Chemistry II	
CHEM 210 & CHEM 212 & CHEM 213	Organic Chemistry I and Organic Chemistry II and Laboratory in Organic Chemistry	
Select one of the following sequences:		8-10
PHYS 211 & PHYS 212 & PHYS 213	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics	
PHYS 211 & PHYS 212 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Wave Motion and Quantum Physics	
PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II	
Supporting Courses and Related Areas		
Select 20-24 credits from school approved list		20-24
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 15 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses ¹		15

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

Genetics and Developmental Biology Option (56 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.

Code	Title	Credits
Prescribed Courses		
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 427	Evolution	3
MICRB 201	Introductory Microbiology	3
MICRB 202	Introductory Microbiology Laboratory	2

Additional Courses

Select one of the following sequences:		8-10
PHYS 211 & PHYS 212 & PHYS 213	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics	
PHYS 211 & PHYS 212 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Wave Motion and Quantum Physics	
PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II	
<i>Additional Courses: Require a grade of C or better</i>		
Select three of the following:		9
BIOL 422	Advanced Genetics	
BIOL 428	Population Genetics	
BIOL 430	Developmental Biology	
BIOL 460	Human Genetics	
BMB 406	Molecular Biology	
Supporting Courses and Related Areas		
Select 15-17 credits from school approved list		15-17
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 6 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses ¹		6

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

Medical Technology Option (56-58 credits)

Students spend approximately twelve months at an affiliated hospital¹ 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.

¹ Current affiliation is with St. Vincent Health Center, School of Medical Technology, Erie, PA.

Code	Title	Credits
Prescribed Courses		
PHYS 250	Introductory Physics I	4
PHYS 251	Introductory Physics II	4
<i>Prescribed Courses: Require a grade of C or better</i>		
MICRB 201	Introductory Microbiology	3
MICRB 202	Introductory Microbiology Laboratory	2
MICRB 405A	Seminar and Practicum in Medical Technology	8
MICRB 405B	Seminar and Practicum in Medical Technology	1
MICRB 405C	Seminar and Practicum in Medical Technology	6
MICRB 405D	Seminar and Practicum in Medical Technology	5
MICRB 405E	Seminar and Practicum in Medical Technology	7
MICRB 405F	Seminar and Practicum in Medical Technology	3
MICRB 408	Laboratory Instructional Practice	1
Additional Courses		

Select one of the following sequences: 8-10

CHEM 202 & CHEM 203 & CHEM 227	Fundamentals of Organic Chemistry I and Fundamentals of Organic Chemistry II and Analytical Chemistry
CHEM 210 & CHEM 212 & CHEM 213	Organic Chemistry I and Organic Chemistry II and Laboratory in Organic Chemistry

Supporting Courses and Related Areas

Select 1 credit from approved list 1

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

Select 3 credits of 400-level BMB, BIOL, MICRB of the following: 3

BIOL 460	Human Genetics
BIOL 472	Human Physiology
BMB 402	General Biochemistry
BMB 406	Molecular Biology
MICRB 415	General Virology: Bacterial and Animal Viruses

Molecular and Cellular Biology and Biochemistry Option (56 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 in the health sciences, graduate study, or careers in biotechnology or research.

Code	Title	Credits
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Prescribed Courses

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 427	Evolution	3
BMB 401	General Biochemistry	3
BMB 402	General Biochemistry	3
BMB 403	Biochemistry Laboratory	1
BMB 406	Molecular Biology	3
MICRB 201	Introductory Microbiology	3
MICRB 202	Introductory Microbiology Laboratory	2

Additional Courses

Select one of the following sequences: 8-10

PHYS 211 & PHYS 212 & PHYS 213	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics
PHYS 211 & PHYS 212 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Wave Motion and Quantum Physics
PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II

Additional Courses: Require a grade of C or better

Select one of the following: 3

BIOL 404	Cellular Mechanisms in Vertebrate Physiology
BIOL 439	Practical Bioinformatics
BIOL 441	Plant Physiology
BMB 465	Protein Structure and Function
MICRB 410	Principles of Immunology

MICRB 412	Medical Microbiology
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MICRB 415	General Virology: Bacterial and Animal Viruses
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Supporting Courses and Related Areas

Select 14-16 credits from school approved list 14-16

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

Select 3 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses¹ 3

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

Health Professions Option (56 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
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Prescribed Courses

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	Comparative Anatomy of Vertebrates	4
BIOL 427	Evolution	3
BIOL 472	Human Physiology	3
BIOL 473	Laboratory in Mammalian Physiology	2
BMB 402	General Biochemistry	3
BMB 403	Biochemistry Laboratory	1
MICRB 201	Introductory Microbiology	3
MICRB 202	Introductory Microbiology Laboratory	2

Additional Courses

Select one of the following sequences: 8-10

PHYS 211 & PHYS 212 & PHYS 213	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Fluids and Thermal Physics
PHYS 211 & PHYS 212 & PHYS 214	General Physics: Mechanics and General Physics: Electricity and Magnetism and General Physics: Wave Motion and Quantum Physics

PHYS 250 & PHYS 251	Introductory Physics I and Introductory Physics II
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Additional Courses: Require a grade of C or better

BMB 401 or CHEM 472	General Biochemistry or General Biochemistry I	3
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Supporting Courses and Related Areas

Select 11-13 credits from school approved list 11-13

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

Select 3 credits of 400-level BIOL, BMB, MICRB, PPEM, or WFS courses¹ 3

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

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 (<https://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 and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

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

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 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 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.