PHYSICS, B.S. (BEHREND)

Begin Campus: Any Penn State Campus

End Campus: Erie

Degree Requirements

For the Bachelor of Science degree in Physics, a minimum of 122 credits is required:

Requirement	Credits
General Education	45
Electives	1
Requirements for the Major	94

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 300- and 400-level 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 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
CMPSC 121	Introduction to Programming Techniques	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 220	Matrices	2
MATH 230	Calculus and Vector Analysis	4
MATH 251	Ordinary and Partial Differential Equations	4
Prescribed Courses: Require a grade of C or better		
CHEM 110	Chemical Principles I	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
PHYS 213	General Physics: Fluids and Thermal Physics	2
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
PHYS 237	Introduction to Modern Physics	3
PHYS 400	Intermediate Electricity and Magnetism	3
PHYS 419	Theoretical Mechanics	3
PHYS 420	Thermal Physics	3
PHYS 421W	Research Methods in Physics	3
PHYS 458	Intermediate Optics	4
PHYS 494	Physics Research Project	3
Requirements for the Option		
Select an option		28

Requirements for the Option

Computational Physics Option (28 credits)

Code	Title	Credits
Prescribed Courses		
CMPSC 122	Intermediate Programming	3
Prescribed Courses: Require a grade of C or better		
MATH 455	Introduction to Numerical Analysis I	3
PHYS 402	Electronics for Scientists	4
Additional Courses		
Additional Courses: Require a grade of C or better		
Select one of the following:		3
CMPSC 459		
CMPSC 465	Data Structures and Algorithms	
CMPSC 474	Operating System & Systems Programming	
Select 12 credits of the following:		12
EE 352	Signals and Systems: Continuous and Discrete-Time	
EE 453	Fundamentals of Digital Signal Processing	
MATH 456	Introduction to Numerical Analysis II	
ME 410	Heat Transfer	
ME 428	Applied Computational Fluid Dynamics	
PHYS 410	Introduction to Quantum Mechanics I	
PHYS 414	Solid State Physics	
PHYS 446		
PHYS 494	Physics Research Project (1-3 credits)	
PHYS 495	Internship (1-3 credits)	
Supporting Courses and Related Areas		
Select 3 credits from a school-approved list		3

General Physics Option (28 credits)

Code	Title	Credits
Prescribed Courses		
Prescribed Courses: Require a grade of C or better		
PHYS 410	Introduction to Quantum Mechanics I	3
Additional Courses		
Additional Courses: Require a grade of C or better		
Select 12 credits of the following:		12
MATH 421	Complex Analysis	
MATH 455	Introduction to Numerical Analysis I	
MATH 456	Introduction to Numerical Analysis II	
PHYS 402	Electronics for Scientists	
PHYS 414	Solid State Physics	
PHYS 446		
PHYS 494	Physics Research Project (1-3 credits)	
PHYS 495	Internship (1-3 credits)	
Supporting Courses and Related Areas		
Select one of the following two sequences:		13

Sequence A	
Select 8 credits of a world language [1]	
Select 5 credits from a school-approved list	
Sequence B	
CMPSC 122	Intermediate Programming
Select one of the following:	
CMPSC 459 [2]	
CMPSC 465	Data Structures and Algorithms [2]
CMPSC 474	Operating System & Systems Programming [2]
Select 7 credits from a school-approved list	

[1] Proficiency demo by examination or coursework to the level of the second semester in a world language is required. If fewer than 8 credits are needed to reach the required proficiency, students choose selections from a school-approved list to make a total of 8 credits.

[2] Course requires a grade of C or better.

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.