

Physics B.S.

Click here to view the Suggested Plan of Study (p. 2)

General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

General Education Foundations

F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Skills		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

Degree Requirements

Students must complete WVU General Education Foundations requirements, College B.S. requirements, major requirements, and electives to total a minimum of 120 hours. For complete details on these requirements, visit the B.S. Degrees tab on the Eberly College of Arts and Sciences (<http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/#bachelorofsciencetext>) pages.

Departmental Requirements for the B.S. in Physics

Students may not earn both a B.A. and a B.S. in Physics. All students wishing to obtain a degree in Physics must comply with the following:

- **Capstone Requirement:** The university requires the successful completion of a Capstone course. Students majoring in Physics must complete PHYS 496 (other options maybe available depending on AoE selected).
- **Writing and Communication Skills Requirement:** Physics Bachelor of Science students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), and two of the following **SpeakWrite Certified Courses**[™]: PHYS 199, PHYS 341, PHYS 496, ASTR 496.
- **Calculation of the GPA in the Major:** Students are required to maintain at least a minimum cumulative 2.2 GPA in all courses counted toward the major. If a course is repeated, all attempts will be included in the calculation of the GPA unless the course is eligible for a D/F repeat.
- **Area of Emphasis:** Students completing a Bachelor of Science in Physics must complete an Area of Emphasis selected from Applied Physics, Biophysics, Computational Physics, Materials Science, Medical Physics, Physics Teaching, Professional Preparation, or Space Physics. **The Professional Preparation Area of Emphasis is the typical plan of study for a B.S. degree in physics.**
- **Course Requirement:** Physics students completing the Materials Science, Professional Preparation, or Space Physics Areas of Emphasis are required to complete two semesters of PHYS 341. Students completing Applied Physics, Biophysics, Computational Physics, or Medical Physics Areas of Emphasis only need to complete one semester of PHYS 341. Students completing the Physics Teaching Area of Emphasis are required to complete PHYS 376 in place of PHYS 341.
- **Benchmark Expectations:** For details, go to the Physics admissions tab (<http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/physicsastronomyandphysicalscience/#admissionstext>).

Curriculum Requirements

UNIVERSITY REQUIREMENTS		23
PHYS 191	First-Year Seminar	
GEF Requirements (may vary depending on overlap)		
ECAS B.S. REQUIREMENTS		
Global Studies and Diversity Requirement		
College Mathematics Requirement		
MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus	
or		
MATH 155	Calculus 1	
Science Requirement:		
Please see the Eberly College of Arts and Sciences' Bachelor of Science (B.S.) tab.		
DEPARTMENTAL REQUIREMENTS		
Foundation Courses		15
PHYS 111	General Physics	
PHYS 112	General Physics	
PHYS 211	Introduction to Mathematical Physics	
PHYS 314	Introductory Modern Physics	
Mathematics Requirement		12
MATH 156	Calculus 2	
MATH 251	Multivariable Calculus	
MATH 261	Elementary Differential Equations	
Science Electives: 8 credits in BIOL, CHEM, CS, or GEOL		8
May overlap with Eberly B.S. Requirements		
Physics Advanced Level Courses		17
PHYS 331	Theoretical Mechanics 1	
PHYS 333	Electricity and Magnetism 1	
PHYS 332	Theoretical Mechanics 2 *	
or PHYS 334	Electricity and Magnetism	
PHYS 341	Advanced Laboratory **	
or PHYS 376	Research Methods	
PHYS 451	Introductory Quantum Mechanics	
PHYS 461	Thermodynamics and Statistical Mechanics	
Area of Emphasis		18
Number of hours will vary, depending on Area of Emphasis.		
General Electives		27
Number may vary depending on overlap		
Total Hours		120

* Students completing the Physics Teaching AoE may substitute any PHYS 300- or 400- level course, chosen with advisor's permission, in place of PHYS 332 or PHYS 334.

** Please see individual AoE to select appropriate choice.

Suggested Plan of Study

First Year

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F 1)	3
MATH 155 (F 3)	4 Science Elective (B.S. First Area 2)	4
General Elective	3 MATH 156 (B.S. Second Area 1; F 8)	4
GEF 2 (B.S. First Area 1)	4 PHYS 111 (B.S. Third Area 1; F 8)	4

F 4	3	
	15	15
Second Year		
Fall	Hours Spring	Hours
ENGL 102 (F 1)	3 F 6	3
F 5	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15
Third Year		
Fall	Hours Spring	Hours
PHYS 331	3 ECAS Glo. St. & Div. Req. (F 7)	3
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	2 PHYS 341	2
AoE Course 1	4 AoE Course 2	3
General Elective	3 General Elective	4
	15	15
Fourth Year		
Fall	Hours Spring	Hours
PHYS 451	3 PHYS 461	3
AoE Course 3	3 Capstone	3
AoE Course 4	4 AoE Course 5	3
General Elective	3 General Elective	3
General Elective	2 General Elective	3
	15	15

Total credit hours: 120

Areas of Emphasis

- Applied Physics (p. 3)
- Astro/Space Physics (p. 4)
- Biophysics (p. 5)
- Computational Physics (p. 6)
- Materials Science (p. 7)
- Medical Physics (p. 8)
- Physics Teaching (p. 9)
- Professional Preparation (p. 10)

APPLIED PHYSICS

EE 221 & EE 222	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
EE 223 & EE 224	Electrical Circuits and Electrical Circuits Laboratory	4
EE 251 & EE 252	Digital Electronics and Digital Electronics Laboratory	4
CPE 271	Introduction to Digital Logic Design	3
PHYS 496 or EE 481	Senior Thesis Capstone Project - Implementation	3
Total Hours		18

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F4	3 CS 111 (B.S. First Area 2; F8)	4
CS 110 (B.S. First Area 1; F2)	4 MATH 156 (B.S. Second Area 1; F8)	4
MATH 155	4 PHYS 111 (B.S. Third Area 1; F8)	4
General Elective	3	
	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
F5	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15

Third Year

Fall	Hours Spring	Hours
PHYS 331	3 ECAS Glob. St. & Div. Req. (F7)	3
PHYS 333	3 CPE 271	3
PHYS 341	3 EE 223 & EE 224	4
EE 221 & EE 222	4 PHYS 332 or 334	3
General Elective	2 General Elective	2
	15	15

Fourth Year

Fall	Hours Spring	Hours
EE 251 & EE 252	4 PHYS 461	3
PHYS 451	3 PHYS 496 or EE 481	3
General Elective	3 General Elective	3
General Elective	3 General Elective	3
General Elective	2 General Elective	3
	15	15

Total credit hours: 120

SPACE PHYSICS

ASTR 367	Astrophysics 1	3
EE 221 & EE 222	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
PHYS 341	Advanced Laboratory	2
PHYS 321	Optics	3
Choose one of the following		3
PHYS 481 or ASTR 368	Plasma Physics Astrophysics 2	
PHYS 496	Senior Thesis	3
Total Hours		18

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F4	3 CS 111 (B.S. First Area 2; F8)	4
CS 110 (B.S. First Area 1; F2)	4 MATH 156	4
MATH 155	4 PHYS 111 (B.S. Third Area 1)	4
General Elective	3	
	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
F5	3 MATH 261	4
MATH 251 (B.S. Second Area 1)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15

Third Year

Fall	Hours Spring	Hours
EE 221 & EE 222	4 ECAS Glob. Stu. & Div. Req. (F7)	3
PHYS 331	3 PHYS 321	3
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	2 PHYS 341	2
General Elective	3 General Elective	4
	15	15

Fourth Year

Fall	Hours Spring	Hours
ASTR 367	3 PHYS 461	3
PHYS 451	3 PHYS 481 or ASTR 368	3
MATH Elective	3 PHYS 496	3
General Elective	3 General Elective	3
General Elective	3 General Elective	3
	15	15

Total credit hours: 120

BIOPHYSICS

BIOL 115	Principles of Biology	4
BIOC 339	Introduction to Biochemistry	4
CHEM 231 or CHEM 233 & CHEM 235	Organic Chemistry: Brief Course Organic Chemistry and Organic Chemistry Laboratory	4
PHYS 496	Senior Thesis	3
Total Hours		15

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F 4	3 CHEM 116 (B.S. First Area 2; F8)	4
CHEM 115 (B.S. First Area 1; F2)	4 MATH 156 (B.S. Second Area 1; F8)	4

MATH 155 (F3)	4 PHYS 111 (B.S. Third Area 1)	4
General Elective	3	
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	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
BIOL 115	4 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
	General Elective	1
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	15	15

Third Year

Fall	Hours Spring	Hours
F5	3 ECAS Glo. Stu. & Div. Req. (F7)	3
PHYS 331	3 CHEM 233 & CHEM 235	4
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	3 General Elective	5
General Elective	3	
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	15	15

Fourth Year

Fall	Hours Spring	Hours
BIOC 339	4 PHYS 461	3
PHYS 451	3 PHYS 496	3
General Elective	4 General Elective	3
General Elective	4 General Elective	3
	General Elective	3
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	15	15

Total credit hours: 120

COMPUTATIONAL PHYSICS

CPE 271	Introduction to Digital Logic Design	3
CS 210	File and Data Structures	4
CS 220	Discrete Mathematics	3
PHYS 301	Computational Physics	3
PHYS 496	Senior Thesis	3
or CS 481	Capstone Project - Implementation	
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Total Hours		16

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F4	3 CS 111 (B.S. First Area 2; F8)	4
CS 110 (B.S. First Area 1; F2)	4 MATH 156 (B.S. Second Area 1 (F8))	4
MATH 155 (F3)	4 PHYS 111 (B.S. Third Area 1; F8)	4
General Elective	3	
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	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
F5	3 MATH 261	4

MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15

Third Year

Fall	Hours Spring	Hours
CPE 271	3 ECAS Glo. Stu. & Div. Req. (F7)	3
PHYS 331	3 CS 210	4
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	3 General Elective	3
General Elective	3 General Elective	2
	15	15

Fourth Year

Fall	Hours Spring	Hours
CS 220	3 MATH Elective	3
PHYS 301	3 PHYS 461	3
PHYS 451	3 PHYS 496 or CS 481	3
General Elective	3 General Elective	3
General Elective	3 General Elective	3
	15	15

Total credit hours: 120

MATERIALS SCIENCE

EE 221 & EE 222	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	4
CHE 366	Materials Science	3
CHE 466	Electronic Materials Processing	3
PHYS 341	Advanced Laboratory	2
PHYS 471	Solid State Physics	3
PHYS 496 or CHE 456	Senior Thesis Chemical Process Design 2	3

Total Hours 18

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F4	3 CHEM 116 (B.S. First Area 1; F8)	4
CHEM 115 (B.S. First Area 1; F2)	4 MATH 156 (B.S. Second Area 1; F8)	4
MATH 155 (f3)	4 PHYS 111 (B.S. Third Area 1; F8)	4
General Elective	3	
	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
F5	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15

Third Year

Fall	Hours Spring	Hours
EE 221 & EE 222	4 ECAS Glob. Stu. & Div. Req. (F7)	3
PHYS 331	3 CHE 366	3
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	3 PHYS 341	2
General Elective	2 General Elective	4
	15	15

Fourth Year

Fall	Hours Spring	Hours
CHE 466	3 PHYS 461	3
PHYS 451	3 PHYS 471	3
General Elective	3 PHYS 496 or CHE 456	3
General Elective	3 General Elective	3
General Elective	3 General Elective	3
	15	15

Total credit hours: 120

MEDICAL PHYSICS

BIOL 115	Principles of Biology	4
BIOL 117	Introductory Physiology	4
CHEM 231 or CHEM 233 & CHEM 235	Organic Chemistry: Brief Course * Organic Chemistry and Organic Chemistry Laboratory	4
PHYS 225	Medical Imaging Physics	3
PHYS 496	Senior Thesis	3
Total Hours		18

SUGGESTED PLAN OF STUDY**First Year**

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101 (F1)	3
F4	3 CHEM 116 (B.S. First Area 2; F8)	4
CHEM 115 (B.S. First Area 1; F8)	4 MATH 156 (B.S. Second Area 1; F8)	4
MATH 155 (F3)	4 PHYS 111 (B.S. Third Area; F8)	4
General Elective	3	
	15	15

Second Year

Fall	Hours Spring	Hours
ENGL 102 (F1)	3 F6	3
F5	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15

Third Year

Fall	Hours Spring	Hours
BIOL 115	4 ECAS Glo. Stu. & Div. Req. (F7)	3
PHYS 331	3 BIOL 117	4
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	3 General Elective	4

General Elective	3	
	16	14
Fourth Year		
Fall	Hours Spring	Hours
CHEM 233 & CHEM 235	4 PHYS 225	3
MATH Elective	3 PHYS 461	3
PHYS 451	3 PHYS 496	3
General Elective	3 General Elective	3
General Elective	2 General Elective	3
	15	15

Total credit hours: 120

PHYSICS TEACHING AREA OF EMPHASIS

PHYS 490	Teaching Practicum	3
Choose one of the following sets of courses		6-8
MATH 376 & C&I 434	Foundations, Functions and Regression Models and Teaching Mathematics: Secondary School	
CHEM 215 & CHEM 231	Introductory Analytical Chemistry and Organic Chemistry: Brief Course	
CHEM 215 & CHEM 341 & CHEM 342	Introductory Analytical Chemistry and Physical Chemistry: Brief Course and Experimental Physical Chemistry	
CHEM 231 & CHEM 341 & CHEM 342	Organic Chemistry: Brief Course and Physical Chemistry: Brief Course and Experimental Physical Chemistry	
PHYS 496	Senior Thesis	3
Total Hours		12-14

SUGGESTED PLAN OF STUDY FOR THE B.S. IN PHYSICS WITH AN AREA OF EMPHASIS IN TEACHING

First Year		
Fall	Hours Spring	Hours
F7	3 ENGL 101 (F1)	3
CHEM 115 (ECAS B.S. First Area 1; F2B)	4 CHEM 116 (ECAS B.S. First Area 2; F8)	4
MATH 155 (F3)	4 MATH 156 (GEF 8; B.S. Second Area 1; F8)	4
General Elective	1 PHYS 111 (ECAS B.S. Third Area 1; F8)	4
PHYS 191 (First Year Experience)	1	
General Elective	2	
	15	15
Second Year		
Fall	Hours Spring	Hours
F4	3 ECAS Glob. & Div. Studies Req; F6	3
ENGL 102 (F1)	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (ECAS B.S. Third Area 2)	4 PHYS 314	4
General Elective	1 General Elective	1
	15	15
Third Year		
Fall	Hours Spring	Hours
PHYS Teaching AoE Course 1	4 PHYS Teaching AoE Course 2	4
PHYS 331	3 PHYS 376	3

PHYS 333	3 PHYS 332 or 334	3
General Elective	3 PHYS 461	3
General Elective	2 General Elective	2
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Fourth Year

Fall	Hours Spring	Hours
F5	3 PHYS 496	3
PHYS 451	3 General Elective	4
PHYS 490	3 General Elective	4
General Elective	3 General Elective	4
General Elective	3	
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Total credit hours: 120

PROFESSIONAL PREPARATION AREA OF EMPHASIS

PHYS 341	Advanced Laboratory	2
Physics Electives: Select 3 from any PHYS 300- or 400- level course** or the following ASTR courses		9
ASTR 367	Astrophysics 1	
ASTR 368	Astrophysics 2	
ASTR 469	Observational Astronomy	
ASTR 470	General Relativity	
Math Elective: Any Math, Computer Science, Statistics course at the 300- or 400- level		3
PHYS 496	Senior Thesis	3
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Total Hours		17

** No more than 6 hours combined of PHYS 490, 491, 494, 495, or 497 may be used to fulfill major requirements.

First Year

Fall	Hours Spring	Hours
PHYS 191	1 ENGL 101	3
F4	3 B.S. First Area 2; F8	4
B.S. First Area 1; F 2	4 MATH 156 (B.S. Second Area 1; F8)	4
MATH 155 (F 3)	4 PHYS 111 (Third Area 1; F8)	4
General Elective	3	
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Second Year

Fall	Hours Spring	Hours
ENGL 102	3 F6	3
F5	3 MATH 261	4
MATH 251 (B.S. Second Area 2)	4 PHYS 211	3
PHYS 112 (B.S. Third Area 2; F8)	4 PHYS 314	4
General Elective	1 General Elective	1
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Third Year

Fall	Hours Spring	Hours
PHYS 331	3 ECAS Glob. Stu. and Div. Req. (F7)	3
PHYS 333	3 PHYS 332 or 334	3
PHYS 341	2 PHYS 341	2
General Elective	4 Physics Elective 1	3
General Elective	3 General Elective	1
	General Elective	3
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Fourth Year

Fall	Hours Spring	Hours
Math Elective	4 PHYS 461	3
PHYS 451	3 PHYS 496	3
Physics Elective 2	3 Physics or Astronomy Elective 3	3
General Elective	3 General Elective	3
General Elective	2 General Elective	3
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	15	15

Total credit hours: 120