

# BA PHYSICS

## Program Learning Objectives

1. Demonstrate a good understanding of both the theoretical concepts and mathematical techniques of the major fields of physics: classical mechanics, electromagnetism, thermodynamics, and quantum physics.
2. Work safely with modern laboratory equipment to carry out measurements and analyze data.
3. Use computers to perform numerical computations, to simulate physical phenomena, and to collect and analyze data in the laboratory.
4. Communicate effectively, both orally and in writing.
5. Move successfully into graduate school or a career in teaching or industry.

## Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>) section of this catalog, including:

- 60 units of upper-division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No Major courses with a lab component may be selected as credit/no credit.<sup>1</sup>

Note: Students intending to double major must consult the Physics department chair, preferably prior to sophomore year.

### MAJOR COURSES

PHYS 141	General Physics I	4
PHYS 142	General Physics II (B1 & B3) <sup>1,2</sup>	4
PHYS 143	General Physics III <sup>1</sup>	4
PHYS 206	Electronics and Instrumentation <sup>1</sup>	4
or PHYS 202	Physics on the Computer	
PHYS 211	Modern Physics I	4
PHYS 212	Modern Physics II	4
PHYS 301	Thermal Physics I	4
PHYS 305	Classical Mechanics I (Upper-Division B) <sup>2</sup>	4
PHYS 320	Methods of Theoretical Physics I	4
PHYS 405	Quantum Mechanics I	4
PHYS 408	Electromagnetic Fields and Waves I	4
PHYS 461	Senior Project I	2
MATH 141	Calculus I (B4) <sup>2</sup>	4
MATH 142	Calculus II (GE Electives) <sup>2</sup>	4
MATH 143	Calculus III	4
MATH 206	Linear Algebra I	4
MATH 241	Calculus IV	4
MATH 242	Differential Equations I	4

### Approved Electives

Select from the following: 22

#### Laboratory Electives

Select one from the following:<sup>1,3</sup>

ASTR 444	Observational Astronomy
PHYS 323	Optics
PHYS 340	Quantum Physics Laboratory I
PHYS 341	Quantum Physics Laboratory II
PHYS 357	Advanced Instrumentation in Experimental Physics
PHYS 422	Polymer Electronics Laboratory
PHYS 423	Advanced Optics
PHYS 426	Solid State Physics Laboratory
PHYS 428	Nonlinear Dynamical Systems

#### Technical Electives

Select 14 units from the following:<sup>1,4,5</sup>

Any 300-400 level courses with PHYS, ASTR, or GEOL prefix.<sup>6</sup>

OR one of the following:

HIST 350	The Scientific Revolution, c. 1500-1800
PHIL 321	Philosophy of Science
PHIL 323	Ethics, Science and Technology
PHIL 421	Philosophy of Space, Time and Matter

#### Breadth Electives

Select 7 units from any 300-400 level course or PHYS 100, PHYS 220.

#### GENERAL EDUCATION (GE)

(See GE program requirements below.) 56

#### FREE ELECTIVES

Free Electives<sup>7,8</sup> 32

**Total units 180**

<sup>1</sup> Major courses with lab component may not be taken as CR/NC grading: PHYS 142, PHYS 143, PHYS 206, PHYS 323, PHYS 340, PHYS 341, PHYS 342, PHYS 357, PHYS 422, PHYS 423, PHYS 426, PHYS 428, ASTR 444.

<sup>2</sup> Required in Major or Support; also satisfies General Education (GE) requirement.

<sup>3</sup> Units in excess of 1 unit will count towards Technical Elective units.

<sup>4</sup> Excess units will count towards Breadth Elective units.

<sup>5</sup> Total combined elective credit in PHYS 400, PHYS 404, ASTR 400, ASTR 404, GEOL 400, and GEOL 404 limited to 8 units, with a maximum of 2 units per quarter.

<sup>6</sup> PHYS 321 is recommended.

<sup>7</sup> CHEM 124 and CHEM 125 are recommended.

<sup>8</sup> At least 8 units must be upper-division (300-400 level).

## General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- If any of the remaining 56 units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.

- See the complete GE course listing (<http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

<b>Area A</b>	<b>English Language Communication and Critical Thinking</b>	
A1	Oral Communication	4
A2	Written Communication	4
A3	Critical Thinking	4
<b>Area B</b>	<b>Scientific Inquiry and Quantitative Reasoning</b>	
B1	Physical Science (4 units in Major) <sup>1</sup>	0
B2	Life Science	4
B3	One lab taken with either a B1 or B2 course	
B4	Mathematics/Quantitative Reasoning (4 units in Major) <sup>1</sup>	0
Upper-Division B (4 units in Major) <sup>1</sup>		0
<b>Area C</b>	<b>Arts and Humanities</b>	
Lower-division courses in Area C must come from three different subject prefixes.		
C1	Arts: Arts, Cinema, Dance, Music, Theater	4
C2	Humanities: Literature, Philosophy, Languages other than English	4
Lower-Division C Elective - Select a course from either C1 or C2		4
Upper-Division C		4
<b>Area D</b>	<b>Social Sciences - Select courses in Area D from at least two different prefixes</b>	
D1	American Institutions (Title 5, Section 40404 Requirement)	4
D2	Lower-Division D	4
Upper-Division D		4
<b>Area E</b>	<b>Lifelong Learning and Self-Development</b>	
Lower-Division E		4
<b>Area F</b>	<b>Ethnic Studies</b>	
F	Ethnic Studies	4
<b>GE Electives in Areas B, C, and D</b>		
Select courses from two different areas; may be lower-division or upper-division courses.		
GE Electives (4 units in Major plus 4 units in GE) <sup>1</sup>		4
<b>Total units</b>		<b>56</b>

<sup>1</sup> Required in Major or Support; also satisfies General Education (GE) requirement.