

BS IN PHYSICS (BIOPHYSICS)

Units required for Major: 74-82, includes units of study in chosen concentration (see below).

Total units required for BS: 120

Program Description

Physics is the most fundamental science and underlies our understanding of nearly all areas of science and technology. In a broad sense, physics is concerned with the study of energy, space, and matter, and with the interactions between matter and the laws that govern these interactions. More specifically, physicists study mechanics, heat, light, electric and magnetic fields, gravitation, relativity, atomic and nuclear physics, and condensed matter physics.

The BS degrees are recommended for students seeking a career in the technology sector or planning to pursue a graduate degree.

Program Requirements

| Code | Title | Units |
|--|---|--------------|
| REQUIRED LOWER DIVISION CORE COURSES (27 Units) | | |
| MATH 30 | Calculus I ¹ | 4 |
| MATH 31 | Calculus II ¹ | 4 |
| MATH 32 | Calculus III | 4 |
| MATH 45 | Differential Equations for Science and Engineering | 3 |
| PHYS 11A | General Physics: Mechanics ¹ | 4 |
| PHYS 11B | General Physics: Heat, Light, Sound, Modern Physics | 4 |
| PHYS 11C | General Physics: Electricity and Magnetism | 4 |
| REQUIRED UPPER DIVISION CORE COURSES (17 Units) | | |
| PHYS 105 | Mathematical Methods in Physics | 3 |
| PHYS 106 | Introduction to Modern Physics | 3 |
| PHYS 110 | Classical Mechanics | 3 |
| PHYS 124 | Thermodynamics and Statistical Mechanics | 3 |
| PHYS 135 | Electricity And Magnetism | 3 |
| PHYS 175 | Advanced Physics Laboratory | 2 |
| PHYSICS COLLOQUIUM ATTENDANCE | | |
| Fulfill a minimum attendance requirement. ² | | |
| CONCENTRATION (30-38 Units) | | |
| Select from the following concentrations: | | 30 |
| | | - |
| | | 38 |
| General Physics | | |
| Applied Physics | | |
| Biophysics | | |
| Total Units | | 74-82 |

¹ Course also satisfies General Education (GE)/Graduation Requirement.

² Majors must fulfill a minimum attendance requirement at Department Colloquia. Students should consult with the Department for details.

Concentration in Biophysics (34-38 units)

| Code | Title | Units |
|---|---|--------------|
| REQUIRED COURSES (33-34 Units) | | |
| BIO 1 | Biodiversity, Evolution and Ecology ¹ | 5 |
| BIO 2 | Cells, Molecules and Genes | 5 |
| CHEM 1A | General Chemistry I | 5 |
| CHEM 1B | General Chemistry II | 5 |
| PHYS 115 | Electronics and Instrumentation | 4 |
| PHYS 162 | Scientific Computing: Basic Methods | 3 |
| PHYS 172 | Biological Physics | 3 |
| PHYS 199 | Special Problems ³ | 1 |
| Select one of the following (2 units minimum): | | 2 - |
| | | 3 |
| PHYS 116 | Advanced Electronics and Instrumentation | |
| PHYS 163 | Scientific Computing: Modeling, Simulation, and Visualization | |
| PHYS 191 | Senior Project ⁴ | |
| ELECTIVE COURSES (1-4 Units) | | |
| Select a minimum of 1 unit of upper-division coursework in the College of Natural Sciences and Mathematics chosen in consultation with an advisor. ⁵ | | 1 - |
| | | 4 |
| Total Units | | 34-38 |

¹ Course also satisfies General Education (GE)/Graduation Requirement.

³ Majors must complete 1 unit of PHYS 199 under the supervision of a faculty member. Students are encouraged to take PHYS 199 their junior year in preparation for further project work in the form of a summer research experience or a senior project (PHYS 191) if they choose this option for their senior year. Additional units of PHYS 199 may be taken subsequently to count towards elective units.

⁴ Students choosing Senior Project can take 1 unit of PHYS 191 in two consecutive semesters, or 2 units in one semester.

⁵ See list below for a list of Department approved electives. Other 100-level CHEM, BIO, or PHYS courses may be approved as electives after discussion with major advisor.

Elective List

| Code | Title | Units |
|----------|---|-------|
| BIO 104 | Physiology of Human Reproduction | 3 |
| BIO 120 | Biology of Aging | 3 |
| BIO 126 | Comparative Vertebrate Morphology | 3 |
| BIO 128 | Plant Anatomy and Physiology | 4 |
| BIO 131 | Systemic Physiology | 4 |
| BIO 152 | Human Parasitology | 3 |
| BIO 157 | General Entomology | 4 |
| BIO 162 | Ichthyology: The Study of Fishes | 3 |
| BIO 164 | Amphibians and Reptiles: An Introduction to Herpetology | 3 |
| BIO 165 | Vertebrate Zoology | 3 |
| BIO 166 | Ornithology | 3 |
| BIO 168 | Mammalogy | 4 |
| PHYS 116 | Advanced Electronics and Instrumentation ⁶ | 3 |
| PHYS 130 | Acoustics | 3 |
| PHYS 136 | Electrodynamics of Waves, Radiation, and Materials | 3 |

| | | |
|----------|--|----------|
| PHYS 142 | Applied Solid State Physics | 3 |
| PHYS 145 | Optics | 3 |
| PHYS 150 | Quantum Mechanics | 3 |
| PHYS 156 | Classical and Statistical Mechanics | 3 |
| PHYS 163 | Scientific Computing: Modeling, Simulation, and Visualization ⁶ | 3 |
| PHYS 191 | Senior Project ⁶ | 2 |
| PHYS 195 | Teaching Internship | 1 - 2 |
| PHYS 199 | Special Problems ⁶ | 1 - 3 |
| NSM 195A | STEM Pedagogical Practices | 1 |
| NSM 195B | Field Experience in Secondary STEM Classrooms | 1 |

⁶ If not used to satisfy other requirement of the degree.
Example: PHYS 116, PHYS 163, or PHYS 191 are required for the BS in Physics (Biophysics) concentration. If two of the three are taken, one will count as an elective. Additional units of PHYS 199 beyond the required 1 unit will also be counted as electives.

General Education Requirements⁷

| Code | Title | Units |
|---|--|-----------|
| AREA A: BASIC SUBJECTS (9 Units) | | |
| A1 | Oral Communication | 3 |
| A2 | Written Communication | 3 |
| A3 | Critical Thinking | 3 |
| AREA B: PHYSICAL UNIVERSE AND ITS LIFE FORMS (3 Units) | | |
| B1 | Physical Science ⁸ | 0 |
| B2 | Life Forms ⁸ | 0 |
| B3 | Lab (Lab experience to be taken with one of the following: B1, B2 or B5) ⁸ | 0 |
| B4 | Math Concepts ⁸ | 0 |
| B5 | Additional Course - Take upper-division course to complete Area & upper division requirements. | 3 |
| AREA C: ARTS AND HUMANITIES (12 Units) | | |
| C1 | Arts | 3 |
| C2 | Humanities | 3 |
| C1/C2 | Area C Course | 3 |
| C1/C2 | Area C Course - Take upper-division course to complete Area & upper division requirements. | 3 |
| AREA D: THE INDIVIDUAL AND SOCIETY (9 Units) | | |
| Area D Course | | 3 |
| Area D Course | | 3 |
| Area D Course | Take upper-division course to complete Area & upper division requirements. | 3 |
| AREA E: UNDERSTANDING PERSONAL DEVELOPMENT (3 Units) | | |
| Area E Course | | 3 |
| AREA F: ETHNIC STUDIES (3 Units) | | |
| Area F Course | | 3 |
| Total Units | | 39 |

⁷ To help you complete your degree in a timely manner and not take more units than absolutely necessary, there are ways to use single courses to meet more than one requirement (overlap). For further information,

please visit the General Education page (<https://catalog.csus.edu/colleges/academic-affairs/general-education/>).

Note: There is no way to list all possible overlaps so please consult with a professional advisor. The Academic Advising Center can be visited online (<http://www.csus.edu/acad/>), by phone (916) 278-1000, or email (advising@csus.edu).

⁸ Required in Major; also satisfies GE.

Graduation Requirements⁷

| Code | Title | Units |
|---|-------|-------|
| GRADUATION REQUIREMENTS (REQUIRED BY CSU) (9 Units) | | |
| American Institutions: U.S. History | | 3 |
| American Institutions: U.S. Constitution & CA Government | | 3 |
| Writing Intensive (WI) | | 3 |
| GRADUATION REQUIREMENTS (REQUIRED BY SACRAMENTO STATE) (6 Units) | | |
| English Composition II | | 3 |
| Race and Ethnicity in American Society (RE) | | 3 |
| Foreign Language Proficiency Requirement ⁹ | | 0 |

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⁹ If not satisfied before entering Sacramento State, it may be satisfied in General Education Area C2 (Humanities). "C- or better required." The alternative methods for satisfying the Foreign Language Proficiency Requirement are described here: <https://www.csus.edu/college/arts-letters/world-languages-literatures/foreign-language-requirement.html>

Note: Students with a declared major of BS in Physics are exempt from the Foreign Language Graduation Requirement.