

BIOPHYSICS, BACHELOR OF SCIENCE

Total Course Requirements for the Bachelor's Degree

See the "Requirements for the Bachelor's Degree (<https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/>)" in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

Elective Requirements

Completion of elective courses (beyond the requirements listed below) to reach a total of a minimum of 120 units.

General Education Requirements (49 units)

See the "General Education (<https://catalog.csudh.edu/general-education/>)" requirements in the University Catalog or the Class Schedule for the most current information on General Education requirements and course offerings.

Graduation Writing Assessment Requirement

See the "Graduation Writing Assessment Requirement (<https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/gwar-certifying-courses/>)" in the University Catalog.

Minor Requirements

Single field major, no minor required.

Major Requirements (Options 1 & 2: 78 units each)

Students must select one of the options listed below. The following courses, or their approved transfer equivalents, are required of all candidates for this degree.

Code	Title	Hours
A. Common Core Requirements (51 units)		
1. Lower Division Courses (43 units)		
BIO 120	Principles of Biology I	
BIO 121	Principles of Biology Laboratory I	
BIO 122	Principles of Biology II	
BIO 123	Principles of Biology Laboratory II	
BPH 202	SeminarII: The Art of Scientific Presentation and The Frontiers of Physics	
BPH 201	Seminar I: Introduction to Biophysics	
CHE 110	General Chemistry I	
CHE 112	General Chemistry II	
MAT 191	Calculus I	
MAT 193	Calculus II	
MAT 211	Calculus III	
PHY 120	Elements Of Physics I	
PHY 122	Elements Of Physics II	
2. Upper-Division Courses (8 units)		
BIO 340	Genetics	3
CHE 310	Organic Chemistry I	4

CHE 311	Organic Chemistry Lab I	1
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B. Major Requirements

Option 1: Research Focus

1. Upper-Division Courses (19-21 units)

BPH 330	Biological Physics	3
BPH 340	Experimental Biophysics	3
BPH 402	BIOPHYSICS RESEARCH	1-3
PHY 306	Math Methods In Physics	3
PHY 310	Theoretical Mechanics I	3
PHY 320	Physical Optics	3
PHY 346	Thermal Physics	3

2. Electives (6 units)

Students within this option must take BPH 406 and/or BPH 460 or any elective from Biophysics, Physics, Mathematics, Chemistry or Biology 6

Option 2: Professional Focus

1. Lower Division Course (3 units)

BIO 220	Molecular Biology	3
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2. Upper-Division Courses (19-21 units)

BPH 330	Biological Physics	3
BPH 340	Experimental Biophysics	3
BPH 410	Medical Biophysical Education and Medical Industry Impact on Society	3
PHY 306	Math Methods In Physics	3
PHY 320	Physical Optics	3
PHY 346	Thermal Physics	3

3. Electives (6 units)

Students in this option must take two electives from Biophysics, Physics, Mathematics, Chemistry or Biology 6

- Outcome 1: Students will demonstrate the acquisition of discipline-specific knowledge in physics.**
 - Objective 1: Students will be able to memorize and cite central physics concepts.*
 - Objective 2: Students will be able to explain central physics concepts and show an understanding of the context in which they are relevant.*
- Outcome 2: Students will demonstrate the ability to connect physics concepts with concepts from other disciplines.**
 - Objective 1: Students will identify and apply central concepts in their chosen track of Biophysics*
 - Objective 2: Students will apply mathematics, biology and/or chemistry, and computer skills to theoretical or experimental problems in a cross-disciplinary environment.*
- Outcome 3: Students will become skilled in biophysics experimental methods and use various scientific technologies**
 - Objective 1: Students will solve problems using their knowledge and skills in physics*
 - Objective 2: Students will explain how science relates to problems of societal concern*
- Outcome 4: Students will become skilled in biophysics experimental methods and use various scientific technologies**
 - Objective 1: Students will learn to collect, analyze, and explain data from biophysics experiments*
 - Objective 2: Students will design and carry out simple experiments*

- *Objective 3:* Students will be able to connect science and technology to real-world problems
 - *Objective 4:* Students will understand the interrelations between theory and observation; the role of systematic and random experimental errors and methods used to analyze experimental uncertainty and compare experiments with theory.
- **Outcome 5: Students will communicate biophysics concepts effectively both orally and in writing**
 - *Objective 1:* Students will write technical reports on projects
 - *Objective 2:* Students will explain their research work according to academic and industry standards
- **Outcome 6: Students will demonstrate the ability to read and comprehend scientific literature**
 - *Objective 1:* Students will demonstrate an ability to read and comprehend primary literature in at least one field of physics through successful discussion/debate and presentation of concepts in the chosen field according to academic and industry standards
 - *Objective 2:* Students will learn how to conduct literature reviews and use the library database to find relevant information
 - *Objective 3:* Students will demonstrate the ability to critically read and analyze their own work and the scientific literature and understand its impact on healthcare and society
- **Outcome 7: Students will use offered resources to pursue higher education or training (biophysics, professional studies, workforce) and engage as good citizens in a diverse community**
 - *Objective 1:* Students will be securing enrollment in graduate studies in physics/professional studies
 - *Objective 2:* Students will develop well-rounded, competitive applicants' packets for application in the medical and health science fields
 - *Objective 3:* Students will demonstrate workforce readiness (job applications and work performance and skills). For example, biophysicist has a career in instrumentation and devices, biomedical engineering, academic and clinical research, healthcare, etc.
 - *Objective 4:* Students will identify issues of diversity and equity in scholarly circles and the workforce - and will understand tools and actions which can mediate these challenges in their professional careers and environments
- **Outcome 8: Students will apply physical techniques to biological systems in diverse professional subdisciplines.**
 - *Objective 1:* Students will identify the biological, chemical, and physical properties of organisms on a molecular and cellular level
 - *Objective 2:* Students will solve problems involving the physics of biological materials
 - *Objective 3:* Students will demonstrate a conceptual understanding of the connections between physics and biology
 - *Objective 4:* Students will successfully complete a research project in the field of biophysics
 - *Objective 5:* Students will study diverse STEM fields and know the basic application of their major biological systems tools
 - *Objective 6:* Students will demonstrate basic knowledge and skill set compatible with success in health professional programs.

4-YEAR ROADMAP

Course	Title	Hours
First Year		
Fall		
GE Area A1 Oral Communication		3
PHY 120	Elements Of Physics I	4
MAT 191	Calculus I	5
BIO 120	Principles of Biology I	3
BIO 121	Principles of Biology Laboratory I	1
Hours		16
Spring		
PHY 122	Elements Of Physics II	4
MAT 193	Calculus II	5
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology Laboratory II	1
GE Area A2 Written Communication		3
Hours		16
Second Year		
Fall		
CHE 110	General Chemistry I	5
MAT 211	Calculus III	5
BPH 201	Seminar I: Introduction to Biophysics	1
HIS 101	History Of United States	3
GE Area A3 Logical/Critical Reasoning		3
Hours		17
Spring		
CHE 112	General Chemistry II	5
BPH 201	Seminar I: Introduction to Biophysics	1
POL 101	American Institutions	3
GE Area D1 Perspectives on Individual Groups and Society		3
GE Area C1 Arts		3
Hours		15
Third Year		
Fall		
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BPH 340	Experimental Biophysics	3
PHY 346	Thermal Physics	3
GE Area C2 Letters		3
Hours		14
Spring		
PHY 320	Physical Optics	3
PHY 306	Math Methods In Physics	3
BPH 330	Biological Physics	3
GE Area C1 or C2 Arts or Letters		3
GE Area D2 Global and Historical Perspectives		3
Hours		15
Fourth Year		
Fall		
BIO 340	Genetics	3
BPH 402	BIOPHYSICS RESEARCH	3
PHY 310	Theoretical Mechanics I	3
GE Area C3 Integrative Studies in the Humanities		3
GE Area D3 Integrative Studies in the Social Sciences		3
Hours		15
Spring		
GE Area F Ethnic Studies		3
BPH 406 or BPH 460	Computational Biophysics or Advanced Microscopy	3
GE Area E Lifelong Learning and Self Development		3

Any Elective in BPH/BIO/CHE/PHY	3
Hours	12
Total Hours	120

2-YEAR ROADMAP

Course	Title	Hours
Third Year		
Fall		
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BPH 201	Seminar I: Introduction to Biophysics	1
PHY 346	Thermal Physics	3
GE Area C3 Integrated Studies in the Humanities		3
Elective		2
Hours		14
Spring		
PHY 320	Physical Optics	3
PHY 306	Math Methods In Physics	3
BPH 202	SeminarII: The Art of Scientific Presentation and The Frontiers of Physics	1
GE Area D3 Integrated Studie in the Social Sciences		3
Elective		3
Elective		3
Hours		16
Fourth Year		
Fall		
BPH 330	Biological Physics	3
BPH 340	Experimental Biophysics	3
PHY 310	Theoretical Mechanics I	3
Elective		3
Elective		3
Hours		15
Spring		
BIO 340	Genetics	3
BPH 402	BIOPHYSICS RESEARCH	3
BPH 406 or BPH 460	Computational Biophysics or Advanced Microscopy	3
Elective in BPH/BIO/CHE/PHY		3
Elective		3
Hours		15
Total Hours		60

4-YEAR ROADMAP

Course	Title	Hours
First Year		
Fall		
GE Area A1 Oral Communication		3
PHY 120	Elements Of Physics I	4
MAT 191	Calculus I	5
BIO 120	Principles of Biology I	3
BIO 121	Principles of Biology Laboratory I	1
Hours		16
Spring		
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology Laboratory II	1
PHY 122	Elements Of Physics II	4
MAT 193	Calculus II	5
GE Area A2 Written Communication		3
Hours		16

Second Year

Fall		
CHE 110	General Chemistry I	5
MAT 211	Calculus III	5
BPH 201	Seminar I: Introduction to Biophysics	1
HIS 101	History Of United States	3
GE Area A3 Logical/Critical Reasoning		3
Hours		17
Spring		
CHE 112	General Chemistry II	5
BPH 202	SeminarII: The Art of Scientific Presentation and The Frontiers of Physics	1
POL 101	American Institutions	3
GE Area D1 Perspectives on Individuals, Groups and Society		3
GE Area C1 Arts		3
Hours		15

Third Year

Fall		
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BIO 220	Molecular Biology	3
BPH 340	Experimental Biophysics	3
PHY 346	Thermal Physics	3
GE Area C2 Letters		3
Hours		17
Spring		
PHY 320	Physical Optics	3
PHY 306	Math Methods In Physics	3
BPH 330	Biological Physics	3
GE Area C1 or C2 Arts or Letters		3
GE Area D2 Global and Historical Perspectives		3
Hours		15

Fourth Year

Fall		
BIO 340	Genetics	3
PHY 340		3
GE Area D3 Integrative Studies in the Social Sciences		3
GE Area C3 Integrative Studies in the Humanities		3
Hours		12
Spring		
BPH 410	Medical Biophysical Education and Medical Industry Impact on Society	3
GE Area F Ethnic Studies		3
GE Area E Lifelong Learning and Self-Development		3
Elective Any Elective in BPH/BIO/CHE/PHY		3
Hours		12
Total Hours		120

2-YEAR ROADMAP

Course	Title	Hours
Third Year		
Fall		
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BPH 201	Seminar I: Introduction to Biophysics	1
PHY 346	Thermal Physics	3
GE Area C3 Integrated Studies in the Humanities		3
Elective		2
Hours		14
Spring		
PHY 306	Math Methods In Physics	3
PHY 320	Physical Optics	3

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BPH 202	SeminarII: The Art of Scientific Presentation and The Frontiers of Physics	1
GE Area D3 Integrated Studies in the Social Sciences		3
Elective		3
Elective		3
Hours		16
Fourth Year		
Fall		
BPH 330	Biological Physics	3
BPH 340	Experimental Biophysics	3
BPH 410	Medical Biophysical Education and Medical Industry Impact on Society	3
Elective		3
Elective		3
Hours		15
Spring		
BPH 406 or BPH 460	Computational Biophysics or Advanced Microscopy	3
BIO 340	Genetics	3
Elective in BPH/BIO/CHE/PHY		3
Elective		3
Elective		3
Hours		15
Total Hours		60