

Have you always wondered about how the world around you works?
Do you want to go on to graduate school, medical school or law school?
Are you interested in: engineering? Data science?
Are you curious?
Do you like solving problems?
Would you like to make a difference in the world?
Are you interested in making big bucks?
Do you like being able to apply what you learn to your everyday life?

If you answered YES to ANY of these questions – PHYSICS OR BIOPHYSICS is for YOU!

TOP 10 REASONS TO MAJOR IN PHYSICS OR BIOPHYSICS AT USD

- 1) You can learn about how everything in the universe works from nuclei to cells to galaxies.
 - 2) You'll gain a unique set of skills that will set you apart.
 - 3) You can go on to do ANYTHING you want (only physics and biophysics majors can do this!).
 - 4) People will think you're really smart.
 - 5) You can solve numerous problems facing mankind right now including the energy crisis, global warming and the AIDS epidemic.
 - 6) You can get paid to go to graduate school.
 - 7) You can ace the MCATs and LSATs.
 - 8) You can wow your friends and family with cool demos and fun facts.
 - 9) You'll receive loads of one-on-one personal attention and advising and experience a sense of community hard to find in larger departments with many majors.
 - 10) Physics is the foundation for the other sciences and engineering so your knowledge will help you understand and succeed in a number of other fields.
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A FEW MORE REASONS PHYSICS IS TOTALLY AWESOME

- 1) You use it everyday!
- 2) It's responsible for most of the technological advances of the last few centuries including cars, airplanes, lasers, computers, the internet, MRIs, smart phones... get the point?
- 3) It explains what black holes actually are.
- 4) It explains how the human body and brain works.
- 5) Sally Ride and Elon Musk were physics majors. You'll be in excellent company.
- 6) It teaches you what $E = mc^2$ actually means.
- 7) It gives a purpose to all of that math you learn.
- 8) It explains why a soda can will explode if you freeze it and why the way a toilet flushes depends on the hemisphere you're in (ever watched a toilet flush in the southern hemisphere?)
- 9) With it, you can use the Heisenberg uncertainty principle to talk your way out of a traffic ticket.
- 10) It teaches you how to think and how to see what is important in a situation.

Faculty & Research

Rae M. R. Anderson, PhD, Professor, Chair: Single-molecule biophysics, Soft matter physics

Gregory D. Severn, PhD, Professor: Plasma Physics, Research methods

Daniel P. Sheehan, PhD, Professor: Thermodynamics, Astrophysics, Plasma Physics

Chad Kishimoto, PhD, Associate Professor: Theoretical High-Energy Neutrino Astrophysics

Ryan McGorty, PhD, Assistant Professor: Soft matter physics, Biophysics, Optics

Ted Dezen, PhD, Assistant Professor: Theoretical & Computational Astrophysics

Maren Mossman, PhD, Assistant Professor: Quantum Optics and Bose-Einstein Condensation

Michael W. Anderson, PhD, Lecturer: Societal impacts/applications of physics

Linhung Pham, PhD, Lecturer: Engineering applications of physics

George Coss, PhD, Lecturer: High-Energy and Quantum Physics

The Physics & Biophysics Majors

The Physics and Biophysics Department offers bachelor's degrees in both Physics and Biophysics. We also offer a streamlined track to complete a double major in Physics and Mechanical Engineering in 5 years. Additionally, there is now a 4-year path to earn a physics degree *plus* a teaching credential and preparation for the California Subject Examination for Teachers (CSET).

Physics explores the universe from its smallest to grandest scales. From the architecture of the cosmos to the insides of nuclei, physicists seek to explain nearly everything in the natural world. For even the most complex systems, like **human life and the universe**, physicists search for patterns to build models and extract fundamental truths. In fact, given the overwhelming complexity of life, the use of physics to discover new insights into biology encompasses a growing branch of interdisciplinary science: **biophysics**.

The mission of our department is to provide you – our students – with inspiring, hands-on education. We offer a wide range of courses from astrophysics to biophysics, and from quantum mechanics to thermodynamics. More importantly, we provide **close one-on-one mentoring and advising**, and **substantial opportunities for you to engage in cutting-edge research**. Working with faculty on independent research projects enables you to deepen and broaden your education, become an independent critical thinker and develop sought-after skills. You also **interact with leading scientists from other institutions, travel and present your research at conferences nationwide, and publish scientific papers**. These opportunities **set our program apart** among similar institutions and **enable you to succeed in your chosen career path**.

With a physics or biophysics degree YOU STAND OUT to graduate schools and employers! You can pursue almost ANY CAREER PATH that interests you. Physics graduates typically pursue: **graduate school** in physics, materials science, mathematics or engineering; employment in physics; or employment in **engineering or data science industries**. Biophysics graduates typically pursue: graduate study in biophysics, physics, medical physics, biochemistry, chemistry, or bioengineering; or employment in **biotechnology** and biomedical industries. The biophysics major also fulfills all of the **pre-health requirements** making it a superb major if you're interested in pursuing an advanced health professional degree (medical, dental, veterinary).

Physics Major Course Requirements*

Preparation for the Major (33 or 34 units):

PHYS 270/270L: Intro to Mechanics, Wave Motion & Thermodynamics (4)

PHYS 271/271L: Intro to Electricity & Magnetism (4)

PHYS 281: Introduction to Optics (1)

PHYS 272/272L: Introduction to Modern Physics (4)

PHYS 282: Introduction to Methods in Computational Physics (1)

MATH 150, 151, 250: Calculus I, II, III (12)

CHEM 151/151L: General Chemistry I (4)

CHEM 152/152L (4) OR MATH 260 (3) OR MATH 262 (3)

Major Requirements (32 units):

PHYS 300: Mathematical Methods (3)

PHYS 314: Analytical Mechanics (3)

PHYS 324: Electromagnetism (3)

PHYS 330: Quantum Mechanics (3)

PHYS 319: Thermal and Statistical Physics (3)

PHYS 371: Computational Physics (3)

PHYS 480: Experimental Physics (4)

PHYS 493: Craft of Scientific Presentation (1)

PHYS 495: Frontiers of Physics (1)

PHYS 400: Research Forum (1)

PHYS 496: Research (2)

6 units of the following:

PHYS 301: Energy and the Environment

PHYS 307: Astrophysics (3)

PHYS 340: Biological Physics (3)

PHYS 325: Introduction to Fluids (3)

PHYS 494: Special Topics (3)

All physics majors are highly encouraged to minor in Mathematics.

Sample Course Schedule:

Freshman Year		Sophomore Year	
Fall	Spring	Fall	Spring
LLC (3)	LLC (3)	PHYS 271, 271L, 281 (5)	PHYS 272, 272L, 282 (5)
MATH 150 (4)	PHYS 270, 270L (4)	MATH 250 (4)	MATH 260 (3)
CORE, Electives (5-8)	MATH 151 (4)	CHEM 151, 151L (4)	PHYS 300 (3)
	CORE, Electives (1-4)	CORE, Electives (0-3)	CORE, Electives (0-3)
Junior Year		Senior Year	
Fall	Spring	Fall	Spring
PHYS 324 (3)	PHYS 314 (3)	PHYS 330 (4)	PHYS 480 (4)
MATH 330 (3)	PHYS 319 (3)	PHYS 307 (3) (elective)	PHYS 325 (3) (elective)
PHYS 371 (3)	PHYS 496 (1)	PHYS 493 (1)	PHYS 495 (1)
PHYS 400, 496 (2)	CORE, Electives (5-8)	PHYS 496 (1)	PHYS 496 (1)
CORE, Electives (2-5)		CORE, Electives (3-6)	CORE, Electives (3-6)

*Students are urged to work with their biophysics academic advisor go over the requirements. Depending on the catalog year you declare, requirements may not be identical to this list.

**Students completing a double major in Physics and Mechanical Engineering will have a different schedule which can be found on our department website.

Biophysics Major Course Requirements*

Preparation for the Major (50 Units):

PHYS 270, 270L: Intro to Mechanics, Wave Motion & Thermodynamics/Lab (4)
 PHYS 271, 271L: Intro to Electricity & Magnetism/Lab (4)
 PHYS 281: Introduction to Optics (1)
 PHYS 272, 272L: Introduction to Modern Physics (4)
 PHYS 282: Introduction to Methods in Computational Physics (1)
 MATH 150, 151, 250: Calculus I, II, III (12)
 CHEM 151/151L, 152/152L: General Chemistry I, II (8)
 CHEM 301/301L, 302/302L: Organic Chemistry I, II (8)
 BIO 240/240L: Bioenergetics and Systems, 242/242L: Genomes and Evolution (8)

Major Requirements (27 Units):

PHYS 319: Thermal and Statistical Physics (3)
 PHYS 340: Biological Physics (3)
 PHYS 381: Experimental Biophysics (4)
 PHYS 400: Research Forum (1)
 PHYS 493: Craft of Scientific Presentation (1)
 PHYS 493: PHYS 495: Frontiers of Physics (1)
 PHYS 496: Research (2)
 CHEM 331: Biochemistry (3)
 BIOL 300: Genetics (3)

suggested electives continued:

PHYS 307: Astrophysics
 PHYS 330: Quantum Mechanics
 BIOL 484: Immunology
 BIOL 342: Microbiology
 BIOL 432: Electron Microscopy
 BIOL 332: Biochemistry II
 BIOL 480: Cell Physiology
 BIOL 482: Molecular Biology
 CHEM 427: Biophysical Chemistry
 CHEM 311: Physical Chemistry
 CHEM 335: Biochemistry Laboratory
 EOSC 452: Marine Geochemistry
 EOSC 478: Boundary Layer Flow

2 upper-division PHYS/BIOL/CHEM/EOSC electives

**subject to advisor approval, suggested electives:*

PHYS 371: Computational Physics
 PHYS 325: Introduction to Fluids
 PHYS 301: Energy and the Environment

Sample Course Schedule:

Freshman Year			Sophomore Year	
Fall	Spring		Fall	Spring
MATH 150 (4)	PHYS 270, 270L (4)		PHYS 271, 271L, 281 (5)	PHYS 272, 272L, 282 (5)
CHEM 151, 151L (4)	MATH 151 (4)		MATH 250 (4)	BIOL 242, 242L (4)
BIOL 240, 240L (4)	CHEM 152, 152L (4)		CHEM 301, 301L (4)	CHEM 302, 302L (4)
CORE, Electives (0-3)	CORE, Electives (0-3)		CORE, Electives (0-3)	CORE, Electives (0-3)
Junior Year			Senior Year	
Fall	Spring		Fall	Spring
PHYS 319 (3)	PHYS 340 (3)		BIOL 300 (3)	PHYS 325 (3) (elective)
PHYS 381 (4)	CHEM 331 (3)		PHYS 493 (1)	PHYS 495 (1)
PHYS 400, 496 (2)	PHYS 496 (1)		PHYS 371 (3) (elective)	PHYS 496 (1)
CORE, Electives (4-7)	CORE, Electives (5-8)		CORE, Electives (5-8)	CORE, Electives (7-10)

*Students are urged to work with their biophysics academic advisor go over the requirements. Depending on the catalog year you declare, requirements may not be identical to this list.