PHYSICS, BACHELOR OF SCIENCE

College of Letters & Science

From the smallest subatomic particles to atoms, molecules, stars, and galaxies, the study of physics is the study of what makes the universe work. Knowledge gained using atomic-scale microscopes and high-energy particle accelerators and nuclear reactors teaches us not only what holds the atomic nucleus together but also how proteins function and why stars shine.

The Program

The Department of Physics & Astronomy offers a Bachelor of Arts in Physics and two Bachelor of Science degree programs: in Physics (which also offers an emphasis in Astrophysics), and in Applied Physics. The A.B. degree provides broad coverage of classical and modern physics while permitting a broader liberal arts education than is possible with the other two programs. The B.S. degree in either Physics or Applied Physics should be followed by the student who plans to enter physics as a profession, and also provides excellent training for a wide variety of technical career options. The B.S. in Applied Physics provides the student with a solid introduction to a particular applied physics specialty. For the student who plans to enter the job market upon completing a B.S. degree, the applied physics orientation would be an asset. Either B.S. program provides a solid foundation in physics for the student interested in graduate work in either pure or applied physics.

Career Alternatives

Careers in physics and applied physics include research and development, either in universities, government laboratories, or industry; teaching in high schools, junior colleges, and universities; management and administration in industrial laboratories and in government agencies; and in production and sales in industry. A major in physics also provides a strong base for graduate-level work in such interdisciplinary areas as chemical physics, biophysics and medical physics, geophysics and environmental physics, astrophysics and astronomy, computer science, and materials science.

Program Variance

Similar courses from other departments may be substituted for courses in the depth subject matter requirements by obtaining prior written permission from the Undergraduate Curriculum Committee Chairperson.

Astronomy

In addition to the introductory Astronomy courses listed, upper division and graduate courses in Astronomy, Astrophysics and Cosmology are listed under Physics.

Graduate Study

The Department of Physics & Astronomy offers programs of study and research leading to M.S. and Ph.D. degrees. Further information regarding requirements for these three degrees, graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, One Shields Avenue, University of California, Davis, CA 95616

The major requirements below are in addition to meeting University Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/) & College Degree Requirements (https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/); unless otherwise noted. The minimum number of units required for the Physics Bachelor of Science is 101.

Physics

Code	Title	Units
Preparatory Subject Matter		
Physics		
Choose a series:		19-25
PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	
PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE	Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics	
PHY 040	Introduction to Computational Physics	3
PHY 080	Experimental Techniques	4
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
MAT 022B	Differential Equations	3
Preparatory Subject Matter Subtotal		48-54
Depth Subject Matter		
Physics		
PHY 104A	Introduction to Mathematical Methods in Physics	4
PHY 105A	Classical Mechanics	4
PHY 105B	Analytical Mechanics	4
PHY 110A	Electricity & Magnetism	4
PHY 110B	Electricity & Magnetism	4
PHY 110C	Electricity & Magnetism	4
PHY 112	Thermodynamics & Statistical Mechanics	4
PHY 115A	Foundation of Quantum Mechanics	4
PHY 115B	Applications of Quantum Mechanics	4
PHY 102	Computational Laboratory in Physics (1 unit)	1-4
or PHY 104B	Computational Methods of Mathematical Physics	
Laboratory Requirement		
Choose PHY 122A or 122B or 116 series:		4-12
PHY 122A	Advanced Laboratory in Condensed Matter Physics	
OR		
PHY 122B	Advanced Laboratory in Particle Physics	
OR		
PHY 116A & PHY 116B & PHY 116C	Electronic Instrumentation and Electronic Instrumentation and Introduction to Computer-Based Experiments in Physics	

Concentration Courses		
Choose two courses from one specialty and one course from a different specialty:		12
General Relativity/Astrophysical Applications		
PHY 154	Astrophysical Applications of Physics	
PHY 155	General Relativity	
Condensed Matter		
PHY 140A	Introduction to Solid State Physics	
PHY 140B	Introduction to Solid State Physics	
Nuclear/Particle Physics		
PHY 129A	Introduction to Nuclear Physics	
PHY 130A	Elementary Particle Physics	
PHY 130B	Elementary Particle Physics	
Additional Upper Division Physics Courses		
Additional upper division Physics courses[1], for a total of 15 upper-division Physics courses of 3 or more units each. With prior departmental approval, one course from mathematics, engineering, or natural science may be used to meet this requirement. May include only one from:		0-12
PHY 194HA & PHY 194HB	Special Study for Honors Students and Special Study for Honors Students	
PHY 195	Senior Thesis	
PHY 198	Directed Group Study (Must be taken for at least 3 units to count as an elective.)	
PHY 199	Special Study for Advanced Undergraduates (Must be taken for at least 3 units to count as an elective.)	
Depth Subject Matter Subtotal		53-76
Total Units		**101-130**

1 Excluding PHY 160

Astrophysics Emphasis

Code	Title	Units
Preparatory Subject Matter		
Physics		
Choose a series:		19-25
PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	
PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE	Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics	
PHY 040	Introduction to Computational Physics	3
PHY 080	Experimental Techniques	4
Mathematics		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
MAT 022B	Differential Equations	3
Preparatory Subject Matter Subtotal		48-54
Depth Subject Matter		
Physics		
PHY 104A	Introduction to Mathematical Methods in Physics	4
PHY 105A	Classical Mechanics	4
PHY 108	Optics	3
PHY 108L	Optics Laboratory	1
PHY 110A	Electricity & Magnetism	4
PHY 110B	Electricity & Magnetism	4
PHY 112	Thermodynamics & Statistical Mechanics	4
PHY 115A	Foundation of Quantum Mechanics	4
PHY 115B	Applications of Quantum Mechanics	4
PHY 102	Computational Laboratory in Physics	1-4
or PHY 104B	Computational Methods of Mathematical Physics	
PHY 151	Stellar Structure & Evolution	4
PHY 152	Galactic Structure & the Interstellar Medium	4
PHY 153	Extragalactic Astrophysics	4
PHY 156	Introduction to Cosmology	4
Laboratory Requirement		
Choose one:		4
PHY 122A	Advanced Laboratory in Condensed Matter Physics	
PHY 122B	Advanced Laboratory in Particle Physics	
PHY 157	Astronomy Instrumentation & Data Analysis Laboratory	
Electives		
Choose two:		6-12
PHY 105B	Analytical Mechanics	
PHY 110C	Electricity & Magnetism	
PHY 116A	Electronic Instrumentation	
PHY 129A	Introduction to Nuclear Physics	
PHY 130A	Elementary Particle Physics	
PHY 130B	Elementary Particle Physics	
PHY 150	Special Topics in Physics	
PHY 154	Astrophysical Applications of Physics	
PHY 155	General Relativity	
GEL 163	Planetary Geology & Geophysics	
May include only one from:		
PHY 194HA & PHY 194HB	Special Study for Honors Students and Special Study for Honors Students	
PHY 195	Senior Thesis	
PHY 198	Directed Group Study (Must be taken for at least 3 units to count as an elective.)	
PHY 199	Special Study for Advanced Undergraduates (Must be taken for at least 3 units to count as an elective.)	
Depth Subject Matter Subtotal		59-68
Recommended		

AST 025	Introduction to Modern Astronomy & Astrophysics	
Total Units		**107-122**