

APPLIED 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 (<https://catalog.ucdavis.edu/departments-programs-degrees/physics/>) 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.

Graduate Study

The Department of Physics & Astronomy (<https://catalog.ucdavis.edu/departments-programs-degrees/physics/>) offers programs of study and research leading to M.S. and Ph.D. degrees. Further information regarding requirements for these 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 Requirements (<https://catalog.ucdavis.edu/undergraduate-education/university-degree-requirements/>) & College Requirements (<https://catalog.ucdavis.edu/undergraduate-education/college-degree-requirements/>); unless otherwise noted. The minimum number of units required for the Applied Physics Bachelor of Science major is 100.

Applied Physics—Atmospheric Physics Concentration

Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
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	
<i>Mathematics</i>		
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
<i>Physics</i>		
PHY 040	Introduction to Computational Physics	3
Preparatory Subject Matter Subtotal		44-50
Depth Subject Matter		
<i>Physics</i>		
PHY 104A	Introduction to Mathematical Methods in Physics	4
PHY 105A	Classical Mechanics	4
PHY 110A	Electricity & Magnetism	4
PHY 110B	Electricity & Magnetism	4
PHY 112	Thermodynamics & Statistical Mechanics	4
PHY 115A	Foundation of Quantum Mechanics	4
PHY 116A	Electronic Instrumentation	4
PHY 116B	Electronic Instrumentation	4
PHY 102 or PHY 104B	Computational Laboratory in Physics Computational Methods of Mathematical Physics	1-4
<i>Laboratory Requirement</i>		
Choose one:		4
PHY 116C	Introduction to Computer-Based Experiments in Physics	
PHY 122A	Advanced Laboratory in Condensed Matter Physics	
PHY 122B	Advanced Laboratory in Particle Physics	
<i>Concentration Courses</i>		
PHY 105C	Continuum Mechanics	4
ATM 120	Atmospheric Thermodynamics & Cloud Physics	4
ATM 121A	Atmospheric Dynamics	4
ATM 121B	Atmospheric Dynamics	4
GEL/ESP 150A	Physical & Chemical Oceanography	4
<i>Additional Electives</i>		

Choose one:		3-4	PHY 104A	Introduction to Mathematical Methods in Physics	4
PHY 104B	Computational Methods of Mathematical Physics		PHY 105A	Classical Mechanics	4
PHY 116C	Introduction to Computer-Based Experiments in Physics		PHY 110A	Electricity & Magnetism	4
GEL 116N/ ESP 116N DISCON** or EPS 116	Oceanography (Discontinued for fall 2026)		PHY 110B	Electricity & Magnetism	4
ATM 128	Atmospheric Radiation & Remote Sensing		PHY 112	Thermodynamics & Statistical Mechanics	4
MAT 118A	Partial Differential Equations: Elementary Methods		PHY 115A	Foundation of Quantum Mechanics	4
MAT 118B	Partial Differential Equations: Eigenfunction Expansions		PHY 116A	Electronic Instrumentation	4
<i>Program Variance</i>			PHY 116B	Electronic Instrumentation	4
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.			<i>Laboratory Requirement</i>		
Depth Subject Matter Subtotal		60-64	Choose one:		4
Total Units		104-114	PHY 116C	Introduction to Computer-Based Experiments in Physics	
			PHY 122A	Advanced Laboratory in Condensed Matter Physics	
			PHY 122B	Advanced Laboratory in Particle Physics	
<i>Concentration Courses</i>			PHY 115B	Applications of Quantum Mechanics	4
			PHY 140A	Introduction to Solid State Physics	4
			CHE 124A	Inorganic Chemistry: Fundamentals	3
<i>Program Variance</i>			<i>Program Variance</i>		
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.			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.		
Depth Subject Matter Subtotal		48	Depth Subject Matter Subtotal		48
Total Units		107-113	Total Units		107-113

Applied Physics—Chemical Physics Concentration

Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
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	
<i>Mathematics</i>		
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
<i>Physics</i>		
PHY 040	Introduction to Computational Physics	3
<i>Chemistry</i>		
CHE 002A	General Chemistry	5
CHE 002B	General Chemistry	5
CHE 002C	General Chemistry	5
Preparatory Subject Matter Subtotal		59-65
Depth Subject Matter		
<i>Physics</i>		
PHY 102	Computational Laboratory in Physics	1

Applied Physics—Computational Physics Concentration

Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
Choose a series:		
PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	19-25
PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE	Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics	
<i>Mathematics</i>		
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
<i>Computer Science Engineering</i>		
ECS 036A	Programming & Problem Solving	4
ECS 036B	Software Development & Object-Oriented Programming in C++	4

Preparatory Subject Matter Subtotal		49-55	PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics		
Depth Subject Matter						
<i>Physics</i>						
PHY 104A	Introduction to Mathematical Methods in Physics	4	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 105A	Classical Mechanics	4	PHY 040	Introduction to Computational Physics		
PHY 110A	Electricity & Magnetism	4	PHY 080	Experimental Techniques		
PHY 110B	Electricity & Magnetism	4	<i>Mathematics</i>			
PHY 112	Thermodynamics & Statistical Mechanics	4	MAT 021A	Calculus		
PHY 115A	Foundation of Quantum Mechanics	4	MAT 021B	Calculus		
PHY 116A	Electronic Instrumentation	4	MAT 021C	Calculus		
PHY 116B	Electronic Instrumentation	4	MAT 021D	Vector Analysis		
<i>Concentration Courses</i>						
PHY 104B	Computational Methods of Mathematical Physics	4	MAT 022A	Linear Algebra		
PHY 116C	Introduction to Computer-Based Experiments in Physics	4	MAT 022B	Differential Equations		
ECS 036C	Data Structures, Algorithms, & Programming	4	<i>Engineering</i>			
ECS 122A	Algorithm Design & Analysis	4	ENG 017 or ENG 017V	Circuits I Circuits I		
<i>Additional Electives</i>						
Choose one each from Computer Science (ECS), Mathematics (MAT), and Physics (PHY):		12	Preparatory Subject Matter Subtotal			
Depth Subject Matter						
<i>Physics</i>						
ECS 120	Theory of Computation		PHY 102	Computational Laboratory in Physics		
ECS 122B	Algorithm Design & Analysis		PHY 104A	Introduction to Mathematical Methods in Physics		
ECS 130	Scientific Computation		PHY 105A	Classical Mechanics		
<i>Mathematics</i>						
MAT 128A	Numerical Analysis		PHY 110A	Electricity & Magnetism		
MAT 128B	Numerical Analysis in Solution of Equations		PHY 110B	Electricity & Magnetism		
MAT 128C	Numerical Analysis in Differential Equations		PHY 112	Thermodynamics & Statistical Mechanics		
<i>Physics</i>						
PHY 105C	Continuum Mechanics		PHY 115A	Foundation of Quantum Mechanics		
PHY 115B	Applications of Quantum Mechanics		<i>Laboratory Requirement</i>			
PHY 140A	Introduction to Solid State Physics		PHY 122A or PHY 122B	Advanced Laboratory in Condensed Matter Physics Advanced Laboratory in Particle Physics		
<i>Program Variance</i>						
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.						
Depth Subject Matter Subtotal		60	<i>Concentration Courses</i>			
Total Units		109-115	PHY 110C	Electricity & Magnetism		
Applied Physics—Physical Electronics Concentration			PHY 140A	Introduction to Solid State Physics		
Code	Title	Units	EEC 100	Circuits II		
Preparatory Subject Matter						
<i>Physics</i>			<i>Additional Concentration Electives</i>			
Choose a series:		19-25	Choose four:			
<i>Program Variance</i>						
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.						

Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
Choose a series:		

Depth Subject Matter Subtotal	58	<i>Additional Electives</i>
Total Units	110-116	Choose three: 10-12
		Choose one:
		PHY 105B Analytical Mechanics
		PHY 116C Introduction to Computer-Based Experiments in Physics
		PHY 151 Stellar Structure & Evolution
		Choose one:
		EPS 163 or GEL 163 DISCONTINUED FOR FALL 2026 **
		GEL 146 Radiogenic Isotope Geochemistry & Cosmochemistry
		Choose one:
		ATM 120 Atmospheric Thermodynamics & Cloud Physics
		ATM 121A Atmospheric Dynamics
		ATM 121B Atmospheric Dynamics
		<i>Program Variance</i>
		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.
Preparatory Subject Matter Subtotal	44-50	Depth Subject Matter Subtotal 56-58
Total Units	100-108	
** Course(s) discontinued; see your advisor for course options.		
Applied Physics—Materials Science Concentration		
Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
PHY 104A	Introduction to Mathematical Methods in Physics	4
PHY 105A	Classical Mechanics	4
PHY 110A	Electricity & Magnetism	4
PHY 110B	Electricity & Magnetism	4
PHY 112	Thermodynamics & Statistical Mechanics	4
PHY 115A	Foundation of Quantum Mechanics	4
PHY 116A	Electronic Instrumentation	4
PHY 116B	Electronic Instrumentation	4
<i>Laboratory Requirement</i>		
Choose one:	4	
PHY 116C	Introduction to Computer-Based Experiments in Physics	
PHY 122A	Advanced Laboratory in Condensed Matter Physics	
PHY 122B	Advanced Laboratory in Particle Physics	
<i>Concentration Courses</i>		
PHY 104B	Computational Methods of Mathematical Physics	4
GEL 161	Geophysical Field Methods (Discontinued for fall 2026) **	3
or EPS 161		
GEL 162	Geophysics of the Solid Earth (Discontinued for fall 2026) **	3
or EPS 162		

PHY 104A	Introduction to Mathematical Methods in Physics	4	MAT 022B	Differential Equations	3		
PHY 105A	Classical Mechanics	4	Preparatory Subject Matter Subtotal		44-50		
Depth Subject Matter							
<i>Physics</i>							
PHY 110B	Electricity & Magnetism	4	PHY 102	Computational Laboratory in Physics	1		
PHY 112	Thermodynamics & Statistical Mechanics	4	PHY 104A	Introduction to Mathematical Methods in Physics	4		
PHY 115A	Foundation of Quantum Mechanics	4	PHY 105A	Classical Mechanics	4		
PHY 116A	Electronic Instrumentation	4	PHY 110A	Electricity & Magnetism	4		
PHY 116B	Electronic Instrumentation	4	PHY 110B	Electricity & Magnetism	4		
PHY 102 or PHY 104B	Computational Laboratory in Physics Computational Methods of Mathematical Physics	1-4	PHY 115A	Foundation of Quantum Mechanics	4		
<i>Laboratory Requirement</i>		4	PHY 116A	Electronic Instrumentation	4		
Choose one:		4	PHY 116B	Electronic Instrumentation	4		
PHY 116C	Introduction to Computer-Based Experiments in Physics		<i>Laboratory Requirement</i>		4		
PHY 122A	Advanced Laboratory in Condensed Matter Physics		PHY 116C	Introduction to Computer-Based Experiments in Physics			
PHY 122B	Advanced Laboratory in Particle Physics		PHY 122A	Advanced Laboratory in Condensed Matter Physics			
<i>Concentration Courses</i>							
PHY 115B	Applications of Quantum Mechanics	4	PHY 122B	Advanced Laboratory in Particle Physics			
PHY 140A	Introduction to Solid State Physics	4	<i>Concentration Courses</i>				
PHY 140B	Introduction to Solid State Physics	4	PHY 105C	Continuum Mechanics	4		
EMS 174	Mechanical Behavior of Materials	4	ATM 120	Atmospheric Thermodynamics & Cloud Physics	4		
EMS 180	Materials in Engineering Design	4	ATM 121A	Atmospheric Dynamics	4		
<i>Program Variance</i>							
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.			ATM 121B	Atmospheric Dynamics	4		
Depth Subject Matter Subtotal		57-60	GEL 116N/ ESP 116N	Oceanography (Discontinued for fall 2026) DISCONTINUED FOR FALL 2026 or EPS 116	3		
Total Units		101-110	GEL/ESP 150A	Physical & Chemical Oceanography	4		

Applied Physics—Physical Oceanography Concentration

Code	Title	Units
Preparatory Subject Matter		
<i>Physics</i>		
Choose a series:		
PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	19-25
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
<i>Mathematics</i>		
MAT 021A	Calculus	4
MAT 021B	Calculus	4
MAT 021C	Calculus	4
MAT 021D	Vector Analysis	4
MAT 022A	Linear Algebra	3
Depth Subject Matter Subtotal		60
Total Units		104-110