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		
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	
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
Physics		
PHY 040	Introduction to Computational Physics	3
Preparatory Subject Matter Subtotal		44-50
Depth Subject Matter		
Physics		
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	Computational Laboratory in Physics	1-4
or PHY 104B	Computational Methods of Mathematical Physics	
Laboratory Requirement		
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	
Concentration Courses		
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
Additional Electives		

Choose one:		3-4
PHY 104B	Computational Methods of Mathematical Physics	
PHY 116C	Introduction to Computer-Based Experiments in Physics	
GEL/ESP 116N	Oceanography	
ATM 128	Atmospheric Radiation & Remote Sensing	
MAT 118A	Partial Differential Equations: Elementary Methods	
MAT 118B	Partial Differential Equations: Eigenfunction Expansions	
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.		
Depth Subject Matter Subtotal		60-64
Total Units		**104-114**

Applied Physics—Chemical Physics Concentration

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	
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
Physics		
PHY 040	Introduction to Computational Physics	3
Chemistry		
CHE 002A	General Chemistry	5
CHE 002B	General Chemistry	5
CHE 002C	General Chemistry	5
Preparatory Subject Matter Subtotal		59-65
Depth Subject Matter		
Physics		
PHY 102	Computational Laboratory in Physics	1
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
Laboratory Requirement		
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	
Concentration Courses		
PHY 115B	Applications of Quantum Mechanics	4
PHY 140A	Introduction to Solid State Physics	4
CHE 124A	Inorganic Chemistry: Fundamentals	3
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.		
Depth Subject Matter Subtotal		48
Total Units		**107-113**

Applied Physics—Computational Physics Concentration

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	
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
Computer Science Engineering		
ECS 036A	Programming & Problem Solving	4
ECS 036B	Software Development & Object-Oriented Programming in C++	4
Preparatory Subject Matter Subtotal		49-55
Depth Subject Matter		
Physics		

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
Concentration Courses		
PHY 104B	Computational Methods of Mathematical Physics	4
PHY 116C	Introduction to Computer-Based Experiments in Physics	4
ECS 036C	Data Structures, Algorithms, & Programming	4
ECS 122A	Algorithm Design & Analysis	4
Additional Electives		
Choose one each from Computer Science (ECS), Mathematics (MAT), and Physics (PHY):		12
Computer Science		
ECS 120	Theory of Computation	
ECS 122B	Algorithm Design & Analysis	
ECS 130	Scientific Computation	
Mathematics		
MAT 128A	Numerical Analysis	
MAT 128B	Numerical Analysis in Solution of Equations	
MAT 128C	Numerical Analysis in Differential Equations	
Physics		
PHY 105C	Continuum Mechanics	
PHY 115B	Applications of Quantum Mechanics	
PHY 140A	Introduction to Solid State Physics	
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.		
Depth Subject Matter Subtotal		60
Total Units		**109-115**

Applied Physics—Physical Electronics Concentration

Code	Title	Units
Preparatory Subject Matter		
Physics		
Choose a series:		19-25
PHY 009A	Classical Physics	
& PHY 009B	and Classical Physics	
& PHY 009C	and Classical Physics	
& PHY 009D	and Modern Physics	
PHY 009HA	Honors Physics	
& PHY 009HB	and Honors Physics	
& PHY 009HC	and Honors Physics	
& PHY 009HD	and Honors Physics	
& PHY 009HE	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
Engineering		
ENG 017	Circuits I	4
or ENG 017V	Circuits I	
Preparatory Subject Matter Subtotal		52-58
Depth Subject Matter		
Physics		
PHY 102	Computational Laboratory in Physics	1
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
Laboratory Requirement		
PHY 122A	Advanced Laboratory in Condensed Matter Physics	4
or PHY 122B	Advanced Laboratory in Particle Physics	
Concentration Courses		
PHY 110C	Electricity & Magnetism	4
PHY 140A	Introduction to Solid State Physics	4
EEC 100	Circuits II	5
Additional Concentration Electives		
Choose four:		16
EEC 110A	Electronic Circuits I	
EEC 110B	Electronic Circuits II	
EEC 140A	Principles of Device Physics I	
or EEC 140AV	Principles of Device Physics I	
EEC 140B	Principles of Device Physics II	
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.		
Depth Subject Matter Subtotal		58
Total Units		**110-116**

Applied Physics—Geophysics Concentration

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
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		44-50
Depth Subject Matter		
Physics		
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
Laboratory Requirement		
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	
Concentration Courses		
PHY 104B	Computational Methods of Mathematical Physics	4
GEL 161	Geophysical Field Methods	3
GEL 162	Geophysics of the Solid Earth	3
Additional Electives		
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:		
GEL 146	Radiogenic Isotope Geochemistry & Cosmochemistry	
GEL 163	Planetary Geology & Geophysics	
Choose one:		
ATM 120	Atmospheric Thermodynamics & Cloud Physics	
ATM 121A	Atmospheric Dynamics	
ATM 121B	Atmospheric Dynamics	
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.		
Depth Subject Matter Subtotal		56-58
Total Units		**100-108**

Applied Physics—Materials Science Concentration

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
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		44-50
Depth Subject Matter		
Physics		
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	Computational Laboratory in Physics	1-4

or PHY 104B	Computational Methods of Mathematical Physics	
Laboratory Requirement		
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	
Concentration Courses		
PHY 115B	Applications of Quantum Mechanics	4
PHY 140A	Introduction to Solid State Physics	4
PHY 140B	Introduction to Solid State Physics	4
EMS 174	Mechanical Behavior of Materials	4
EMS 180	Materials in Engineering Design	4
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.		
Depth Subject Matter Subtotal		57-60
Total Units		**101-110**

Applied Physics—Physical Oceanography Concentration

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
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		44-50
Depth Subject Matter		
Physics		
PHY 102	Computational Laboratory in Physics	1
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 115A	Foundation of Quantum Mechanics	4
PHY 116A	Electronic Instrumentation	4
PHY 116B	Electronic Instrumentation	4
Laboratory Requirement		
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	
Concentration Courses		
PHY 105C	Continuum Mechanics	4
ATM 120	Atmospheric Thermodynamics & Cloud Physics	4
ATM 121A	Atmospheric Dynamics	4
ATM 121B	Atmospheric Dynamics	4
GEL/ESP 116N	Oceanography	3
GEL/ESP 150A	Physical & Chemical Oceanography	4
Additional Electives		
Choose one:		4
PHY 104B	Computational Methods of Mathematical Physics (Substitutions: Physics 102 is waived for students who take Physics 104B.)	
PHY 112	Thermodynamics & Statistical Mechanics	
PHY 116C	Introduction to Computer-Based Experiments in Physics	
MAT 118A	Partial Differential Equations: Elementary Methods	
or MAT 118B	Partial Differential Equations: Eigenfunction Expansions	
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.		
Depth Subject Matter Subtotal		60
Total Units		**104-110**