

# 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://physics.ucdavis.edu/>) offers a Bachelor of Science in Applied Physics. Students can choose from seven different concentrations. The B.S. degree in Applied Physics should be would prepare students 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. Our program provides a solid foundation in physics for the student interested in graduate work in either pure or applied physics.

## Career Alternatives

Careers in 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 offers programs of study and research leading to M.S. and Ph.D. degrees. For further information regarding requirements, graduate research, teaching assistantships, and research assistantships, please see Physics (<https://physics.ucdavis.edu/graduates>) Graduate Group.

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 101.

## Applied Physics—Atmospheric Physics Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<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
<b>Depth Subject Matter</b>		
<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>Atmospheric Science</i>		
ATM 120	Atmospheric Thermodynamics & Cloud Physics	4
ATM 121A	Atmospheric Dynamics	4
ATM 121B	Atmospheric Dynamics	4
<i>Concentration Courses</i>		
PHY 105C	Continuum Mechanics	4
GEL/ESP/EPS 150A	Physical & Chemical Oceanography (GEL 150A Discontinued for fall 2026) **	4
<i>Additional Electives</i>		
Choose one:		3-4
ATM 128	Atmospheric Radiation & Remote Sensing	
GEL 116N or EPS 116	Oceanography (Discontinued for fall 2026) ** Oceanography	

MAT 118A	Partial Differential Equations: Elementary Methods
MAT 118B	Partial Differential Equations: Eigenfunction Expansions
PHY 104B	Computational Methods of Mathematical Physics
PHY 116C	Introduction to Computer-Based Experiments in 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	60-64
<b>Total Units</b>	<b>104-114</b>

## Applied Physics—Chemical Physics Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		

*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
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*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 115B	Applications 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 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
<b>Total Units</b>	<b>107-113</b>

## Applied Physics—Computational Physics Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		

*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
ECS 036C	Data Structures, Algorithms, & Programming	4
Preparatory Subject Matter Subtotal		53-59

**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 104B	Computational Methods of Mathematical Physics	4
<i>Laboratory Requirement</i>		
PHY 116B	Electronic Instrumentation	4
PHY 116C	Introduction to Computer-Based Experiments in Physics	4
<i>Computer Science Engineering</i>		
ECS 122A	Algorithm Design & Analysis	4
<i>Additional Electives</i>		
Choose one each from Computer Science (ECS), Mathematics (MAT), and Physics (PHY):		12
<i>Computer Science</i>		
ECS 120	Theory of Computation	
ECS 122B	Algorithm Design & Analysis	
ECS 130	Scientific Computation	
<i>Mathematics</i>		
MAT 128A	Numerical Analysis	
MAT 128B	Numerical Analysis in Solution of Equations	
MAT 128C	Numerical Analysis in Differential Equations	
<i>Physics</i>		
PHY 105C	Continuum Mechanics	
PHY 115B	Applications of Quantum Mechanics	
PHY 140A	Introduction to Solid State 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		56
<b>Total Units</b>		<b>109-115</b>

## Applied Physics—Physical Electronics Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<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	
PHY 040	Introduction to Computational Physics	3
PHY 080	Experimental Techniques	4
<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>Engineering</i>		
ENG 017 or ENG 017V	Circuits I Circuits I	4
Preparatory Subject Matter Subtotal		52-58
<b>Depth Subject Matter</b>		
<i>Physics</i>		
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 140A	Introduction to Solid State Physics	4
<i>Laboratory Requirement</i>		
PHY 122A or PHY 122B	Advanced Laboratory in Condensed Matter Physics Advanced Laboratory in Particle Physics	4
<i>Concentration Courses</i>		
PHY 110C	Electricity & Magnetism	4
EEC 100	Circuits II	5
<i>Additional Concentration Electives</i>		
Electrical & Computer Engineering		16
EEC 110A	Electronic Circuits I	
EEC 110B	Electronic Circuits II	
EEC 140A or EEC 140AV	Principles of Device Physics I Principles of Device Physics I	
EEC 140B	Principles of Device Physics II	
<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		58
<b>Total Units</b>		<b>110-116</b>

## Applied Physics—Geophysics Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<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	
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
MAT 022B	Differential Equations	3
Preparatory Subject Matter Subtotal		44-50
<b>Depth Subject Matter</b>		
<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 104B	Computational Methods of Mathematical Physics	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>Geology</i>		
GEL 161	Geophysical Field Methods (Discontinued for fall 2026) **	3
or EPS 161	Geophysical Field Methods	
GEL 162	Geophysics of the Solid Earth (Discontinued for fall 2026) **	3
or EPS 162	Geodynamics	
<i>Additional Electives</i>		
Choose three:		11

Choose one:		
PHY 105B	Analytical Mechanics	
PHY 116C	Introduction to Computer-Based Experiments in Physics	
PHY 151	Stellar Structure & Evolution	
Choose one:		
EPS 163	Planetary Geology & Geophysics	
or GEL 163	Planetary Geology & Geophysics	
GEL 146	Radiogenic Isotope Geochemistry & Cosmochemistry (Discontinued for fall 2026) **	
or EPS 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.		
Depth Subject Matter Subtotal		57
<b>Total Units</b>		<b>101-107</b>

\*\* Course(s) discontinued; see your advisor for course options.

## Applied Physics—Materials Science Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<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	
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
MAT 022B	Differential Equations	3
Preparatory Subject Matter Subtotal		44-50
<b>Depth Subject Matter</b>		
<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 115B	Applications of Quantum Mechanics	4
PHY 116A	Electronic Instrumentation	4
PHY 116B	Electronic Instrumentation	4
PHY 140A	Introduction to Solid State Physics	4
PHY 140B	Introduction to Solid State Physics	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>Materials Science Engineering</i>		
EMS 174	Mechanical Behavior of Materials	4
EMS 180	Materials in Engineering Design	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.		
Depth Subject Matter Subtotal		57-60
<b>Total Units</b>		<b>101-110</b>

## Applied Physics—Physical Oceanography Concentration

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<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	
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

MAT 022B	Differential Equations	3
Preparatory Subject Matter Subtotal		44-50
<b>Depth Subject Matter</b>		
<i>Physics</i>		
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
<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>Geology</i>		
GEL 116N	Oceanography (Discontinued for fall 2026) **	3
or EPS 116	Oceanography	
GEL/ESP/EPS 150A	Physical & Chemical Oceanography (GEL 150A Discontinued for fall 2026) **	4
<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
<i>Additional Electives</i>		
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	
<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
<b>Total Units</b>		<b>104-110</b>