APPLIED PHYSICS, BACHELOR OF SCIENCE

College of Letters & Science

The Major Program

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.

Applied Physics—Atmospheric Physics Concentration

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<td>Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics</td>
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**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 104A | Introductory Methods of Mathematical Physics | 4 |
| PHY 105A | Analytical 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 | 1-4 |

**Laboratory Requirement**

Choose one:

| PHY 116C | Introduction to Computer-Based Experiments in Physics | 4 |
| 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:

| PHY 104B | Computational Methods of Mathematical Physics | 3-4 |
| PHY 116C | Introduction to Computer-Based Experiments in Physics | |
| GEL/ESP 116N | Oceanography | |
| ATM 128 | Radiation & Satellite Meteorology | |
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 105-115

Applied Physics—Chemical Physics Concentration

Preparatory Subject Matter

Physics
Choose a series: 19-25
PHY 009HA Honors Physics & PHY 009HB and Honors Physics & PHY 009HC and Honors Physics & PHY 009HD and Honors Physics & PHY 009HE 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 Physics Computation 4

Chemistry
CHE 002A General Chemistry 5
CHE 002B General Chemistry 5
CHE 002C General Chemistry 5

Preparatory Subject Matter Subtotal 60-66

Depth Subject Matter

Physics
PHY 102 Computational Laboratory in Physics 1
PHY 104A Introductory Methods of Mathematical Physics 4
PHY 105A Analytical 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

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

Chemistry 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 108-114

Applied Physics—Computational Physics Concentration

Preparatory Subject Matter

Physics
Choose a series: 19-25
PHY 009HA Honors Physics & PHY 009HB and Honors Physics & PHY 009HC and Honors Physics & PHY 009HD and Honors Physics & PHY 009HE 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 Introductory Methods of Mathematical Physics 4
PHY 105A Analytical 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
## Applied Physics, Bachelor of Science

**Concentration Courses**

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<td>PHY 116B</td>
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**Physics**

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<td>PHY 104B</td>
<td>Computational Methods of Mathematical Physics</td>
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<td>PHY 116C</td>
<td>Introduction to Computer-Based Experiments in Physics</td>
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<tr>
<td>ECS 036C</td>
<td>Data Structures, Algorithms, &amp; Programming</td>
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<tr>
<td>ECS 122A</td>
<td>Algorithm Design &amp; Analysis</td>
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**Depth Subject Matter**

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<td>PHY 112</td>
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<td>PHY 115A</td>
<td>Foundation of Quantum Mechanics</td>
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**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.

**Total Units**

109-115

## Applied Physics—Physical Electronics Concentration

**Preparatory Subject Matter**

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<td>PHY 009D</td>
<td>and Modern Physics</td>
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**Physics**

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<td>EEC 100</td>
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**Additional Concentration Electives**

Choose four:

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<td>EEC 140A</td>
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<td>Principles of Device Physics II</td>
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**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**

111-117

## Applied Physics—Geophysics Concentration

**Preparatory Subject Matter**

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**Physics**

Choose a series:

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<tr>
<td>PHY 009D</td>
<td>and Modern Physics</td>
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**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**

111-117
**Applied Physics, Bachelor of Science**

**PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE**

**Honors Physics**

**PHY 040**

**Introduction to Physics Computation** 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** 45-51

**Depth Subject Matter**

**Physics**

**PHY 104A**

Introductory Methods of Mathematical Physics 4

**PHY 105A**

Analytical 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:

**PHY 116C**

Introduction to Computer-Based Experiments in Physics 4

**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

**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** 101-109

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**Applied Physics—Materials Science Concentration**

**Preparatory Subject Matter**

**Physics**

Choose a series: 19-25

**PHY 009A & PHY 009B & PHY 009C & PHY 009D**

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 Physics Computation 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** 45-51

**Depth Subject Matter**

**Physics**

**PHY 104A**

Introductory Methods of Mathematical Physics 4

**PHY 105A**

Analytical 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:

**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

Choose one:

**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

Choose one:

**PHY 116C**

Introduction to Computer-Based Experiments in Physics

**PHY 122A**

Advanced Laboratory in Condensed Matter Physics

**PHY 122B**

Advanced Laboratory in Particle Physics
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<td>EMS 180</td>
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**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**  
102-111

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### Applied Physics—Physical Oceanography Concentration

#### Preparatory Subject Matter

**Physics**

Choose a series:

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**Mathematics**

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<td>MAT 022B</td>
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**Preparatory Subject Matter Subtotal**  
45-51

**Depth Subject Matter**

**Physics**

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**Laboratory Requirement**

Choose one:

- PHY 116C | Introduction to Computer-Based Experiments in Physics | 4 |
- PHY 122A | Advanced Laboratory in Condensed Matter Physics    | |
- PHY 122B | Advanced Laboratory in Particle Physics            | |

**Concentration Courses**

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<td>Atmospheric Dynamics</td>
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<tr>
<td>GEL 150A/ESP 116N</td>
<td>Physical &amp; Chemical Oceanography</td>
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**Additional Electives**

Choose one:

- PHY 104B | Computational Methods of Mathematical Physics (Substitutions: Physics 102 is waived for students who take Physics 104B.) | 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**  
60

**Total Units**  
105-111