

# 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

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 Physics Computation	4
Preparatory Subject Matter Subtotal		45-51
<b>Depth Subject Matter</b>		
<i>Physics</i>		
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 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 104B	Computational Methods of Mathematical Physics	
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
<b>Total Units</b>	<b>105-115</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 Physics Computation	4
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*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

*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
<b>Total Units</b>	<b>108-114</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
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

PHY 116A	Electronic Instrumentation	4
PHY 116B	Electronic Instrumentation	4
<i>Concentration Courses</i>		
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
<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		60
<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	
PHY 040	Introduction to Physics Computation	4
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	Circuits I	4
Preparatory Subject Matter Subtotal		53-59
<b>Depth Subject Matter</b>		
<i>Physics</i>		
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
<i>Laboratory Requirement</i>		
PHY 122A	Advanced Laboratory in Condensed Matter Physics	4
or PHY 122B	Advanced Laboratory in Particle Physics	
<i>Concentration Courses</i>		
PHY 110C	Electricity & Magnetism	4
PHY 140A	Introduction to Solid State Physics	4
EEC 100	Circuits II	5
<i>Additional Concentration Electives</i>		
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	
<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>111-117</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	4
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PHY 040	Introduction to Physics Computation	4
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*Mathematics*

MAT 021A	Calculus	4
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MAT 021B	Calculus	4
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MAT 021C	Calculus	4
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MAT 021D	Vector Analysis	4
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MAT 022A	Linear Algebra	3
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MAT 022B	Differential Equations	3
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Preparatory Subject Matter Subtotal		45-51
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**Depth Subject Matter***Physics*

PHY 104A	Introductory Methods of Mathematical Physics	4
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PHY 105A	Analytical Mechanics	4
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PHY 110A	Electricity & Magnetism	4
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PHY 110B	Electricity & Magnetism	4
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PHY 112	Thermodynamics & Statistical Mechanics	4
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PHY 115A	Foundation of Quantum Mechanics	4
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PHY 116A	Electronic Instrumentation	4
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PHY 116B	Electronic Instrumentation	4
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*Laboratory Requirement*

Choose one:		4
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PHY 116C	Introduction to Computer-Based Experiments in Physics	
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PHY 122A	Advanced Laboratory in Condensed Matter Physics	
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PHY 122B	Advanced Laboratory in Particle Physics	
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*Concentration Courses*

PHY 104B	Computational Methods of Mathematical Physics	4
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GEL 161	Geophysical Field Methods	3
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GEL 162	Geophysics of the Solid Earth	3
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*Additional Electives*

Choose three:		10-12
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## Choose one:

PHY 105B	Analytical Mechanics	
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PHY 116C	Introduction to Computer-Based Experiments in Physics	
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PHY 151	Stellar Structure & Evolution	
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## Choose one:

GEL 146	Radiogenic Isotope Geochemistry & Cosmochemistry	
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GEL 163	Planetary Geology & Geophysics	
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## Choose one:

ATM 120	Atmospheric Thermodynamics & Cloud Physics	
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ATM 121A	Atmospheric Dynamics	
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ATM 121B	Atmospheric Dynamics	
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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	56-58
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<b>Total Units</b>	<b>101-109</b>
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## Applied Physics—Materials Science Concentration

Code	Title	Units
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**Preparatory Subject Matter***Physics*

Choose a series:		19-25
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PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	
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PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE	Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics	
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PHY 040	Introduction to Physics Computation	4
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*Mathematics*

MAT 021A	Calculus	4
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MAT 021B	Calculus	4
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MAT 021C	Calculus	4
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MAT 021D	Vector Analysis	4
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MAT 022A	Linear Algebra	3
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MAT 022B	Differential Equations	3
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Preparatory Subject Matter Subtotal	45-51
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**Depth Subject Matter***Physics*

PHY 104A	Introductory Methods of Mathematical Physics	4
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PHY 105A	Analytical Mechanics	4
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PHY 110A	Electricity & Magnetism	4
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PHY 110B	Electricity & Magnetism	4
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PHY 112	Thermodynamics & Statistical Mechanics	4
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PHY 115A	Foundation of Quantum Mechanics	4
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PHY 116A	Electronic Instrumentation	4
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PHY 116B	Electronic Instrumentation	4
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PHY 102 or PHY 104B	Computational Laboratory in Physics Computational Methods of Mathematical Physics	1-4
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*Laboratory Requirement*

Choose one:		4
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PHY 116C	Introduction to Computer-Based Experiments in Physics	
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PHY 122A	Advanced Laboratory in Condensed Matter Physics	
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PHY 122B	Advanced Laboratory in Particle Physics	
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*Concentration Courses*

PHY 115B	Applications of Quantum Mechanics	4
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PHY 140A	Introduction to Solid State Physics	4
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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
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<b>Total Units</b>	<b>102-111</b>
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## Applied Physics—Physical Oceanography Concentration

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

*Physics*

Choose a series:	19-25
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PHY 009A & PHY 009B & PHY 009C & PHY 009D	Classical Physics and Classical Physics and Classical Physics and Modern Physics	
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PHY 009HA & PHY 009HB & PHY 009HC & PHY 009HD & PHY 009HE	Honors Physics and Honors Physics and Honors Physics and Honors Physics and Honors Physics	
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PHY 040	Introduction to Physics Computation	4
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*Mathematics*

MAT 021A	Calculus	4
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MAT 021B	Calculus	4
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MAT 021C	Calculus	4
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MAT 021D	Vector Analysis	4
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MAT 022A	Linear Algebra	3
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MAT 022B	Differential Equations	3
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Preparatory Subject Matter Subtotal	45-51
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**Depth Subject Matter***Physics*

PHY 102	Computational Laboratory in Physics	1
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PHY 104A	Introductory Methods of Mathematical Physics	4
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PHY 105A	Analytical Mechanics	4
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PHY 110A	Electricity & Magnetism	4
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PHY 110B	Electricity & Magnetism	4
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PHY 115A	Foundation of Quantum Mechanics	4
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PHY 116A	Electronic Instrumentation	4
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PHY 116B	Electronic Instrumentation	4
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*Laboratory Requirement*

Choose one:	4
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PHY 116C	Introduction to Computer-Based Experiments in Physics	
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PHY 122A	Advanced Laboratory in Condensed Matter Physics	
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PHY 122B	Advanced Laboratory in Particle Physics	
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*Concentration Courses*

PHY 105C	Continuum Mechanics	4
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ATM 120	Atmospheric Thermodynamics & Cloud Physics	4
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ATM 121A	Atmospheric Dynamics	4
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ATM 121B	Atmospheric Dynamics	4
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GEL/ESP 116N	Oceanography	3
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GEL/ESP 150A	Physical & Chemical Oceanography	4
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*Additional Electives*

Choose one:	4
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PHY 104B	Computational Methods of Mathematical Physics (Substitutions: Physics 102 is waived for students who take Physics 104B.)	
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PHY 112	Thermodynamics & Statistical Mechanics	
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PHY 116C	Introduction to Computer-Based Experiments in Physics	
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MAT 118A	Partial Differential Equations: Elementary Methods	
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or MAT 118B	Partial Differential Equations: Eigenfunction Expansions	
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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	60
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<b>Total Units</b>	<b>105-111</b>
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