

# PHYSICS

## Contact Information

### Division

Sciences and Mathematics

### Dean

Randy Lehr

### Associate Dean

Megan D'Errico

### Division Office

V 211, Rocklin Campus

## Overview

The Physics Department offers coursework satisfying the needs of students wishing to transfer to four-year colleges and other institutions for further study in science and engineering. Those students wishing a basic background in Physics for study in the many fields based upon science and careers in teaching, medicine, agriculture and other sciences will also find coursework.

TRANSFER MAJOR REQUIREMENTS in Physics are available in the Counseling Center. In all cases, students should consult with a counselor for specific transfer requirements. Four-year graduates in Physics are qualified for positions in research, teaching, engineering, medicine and industry.

## Faculty

### Dominic Calabrese

#### Professor, Physics

B.S., DePaul University

M.S., University of Nebraska, Lincoln

Ph.D., University of Nebraska, Lincoln

### Donald C. Harris

#### Professor, Physics

B.S., Ohio State University

Ph.D., Ohio State University

### Aviva Shackell

#### Professor, Physics

B.S., University of California, Santa Barbara

Ph.D., University of California, Los Angeles

## Degrees/Certificates

### Associate Degree for Transfer

- Physics for Transfer (p. 1)
- UC Transfer Pathway (UCTP): Physics (p. 2)

## Physics for Transfer

### AS-T Degree

Physics is a program that provides students of diverse abilities and needs rigorous preparation that affords them opportunities to develop the technical, analytical and critical thinking skills necessary to achieve their wide ranging goals and become lifelong learners. Program curriculum introduces students to the fundamental principles that govern the nature of interactions in the physical world. The curriculum strongly emphasizes both the theoretical and experimental fundamentals in physics. Successful

completion of the curriculum in physics prepares the student for transfer to four-year colleges and universities.

The Associate in Science in Physics for Transfer degree (AS-T) prepares students to transfer into the CSU system to complete a bachelor's degree in Physics or a major deemed similar by a CSU campus. Students earning an associate degree for transfer and meeting the CSU minimum transfer admission requirements are guaranteed admission with junior standing to the CSU system, but not to a particular campus or major. Upon transfer, students will be required to complete no more than 60 additional prescribed units to earn a bachelor's degree.

To earn the Associate in Science in Physics for Transfer degree, students must complete 60 CSU-transferable semester units with a minimum grade point average of 2.0, including both of the following:

- completion of all courses required for the major with grades of "C" or better; and
- completion of the California State University General Education Breadth (CSU GE) (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/california-state-university-general-education-breadth-requirements/>) pattern or the Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc/>) pattern. (Students transferring to a CSU campus using IGETC must complete Area 1C Oral Communication to be eligible for admission.)

The exact wording of the law pertaining to associate degrees for transfer may be found in Education Code Section 66746.

It is highly recommended that, prior to transferring, students complete courses that satisfy the CSU United States History, Constitution and American Ideals graduation requirement. In all cases, students should consult with a counselor for more information on university admission and transfer requirements.

**RESTRICTION:** International coursework from non-United States regionally accredited institutions cannot be applied to associate degrees for transfer.

### Required Courses

Code	Title	Units
PHYS 0205	Principles of Physics: Mechanics	4
PHYS 0205L	Principles of Physics Laboratory: Mechanics	1
PHYS 0210	Principles of Physics: Electricity and Magnetism	3
PHYS 0210L	Principles of Physics Laboratory: Electricity and Magnetism	1
PHYS 0215	Principles of Physics: Heat, Waves and Modern Physics	3
PHYS 0215L	Principles of Physics Laboratory: Heat, Waves and Modern Physics	1
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4
<b>Total Units</b>		<b>25</b>

**Additional Recommended Preparation**

While not required for this degree, completion of these courses will better prepare students for upper-division physics courses.

Code	Title	Units
MATH 0033	Differential Equations and Linear Algebra	6
CHEM 0001A	General Chemistry I	5

**UC Transfer Pathway: Physics****AS-T Degree**

The UC Transfer Pathway in Physics prepares students to transfer into the UC system to complete a bachelor's degree in Physics.

In all cases, students should consult with a counselor for more information on university admission and transfer requirements.

Students must fulfill the major requirements with grades of "C" or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete the following general education pattern:

- Intersegmental General Education Transfer Curriculum for Science, Technology, Engineering or Mathematics (IGETC for STEM) (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc/>) pattern.<sup>1</sup>

**Required Courses:**

Code	Title	Units
CHEM 0001A	General Chemistry I	5-6
or CHEM 0003A & CHEM 0003B	General Chemistry I - Part 1 and General Chemistry I - Part 2	
CHEM 0001B	General Chemistry II	5
ENGL 0001A	College Reading, Writing and Research	4
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4
MATH 0033	Differential Equations and Linear Algebra	6
PHYS 0205	Principles of Physics: Mechanics	4
PHYS 0205L	Principles of Physics Laboratory: Mechanics	1
PHYS 0210	Principles of Physics: Electricity and Magnetism	3
PHYS 0210L	Principles of Physics Laboratory: Electricity and Magnetism	1
PHYS 0215	Principles of Physics: Heat, Waves and Modern Physics	3
PHYS 0215L	Principles of Physics Laboratory: Heat, Waves and Modern Physics	1
<b>Select 3 units from the following:</b>		<b>3</b>
ENGL 0001B	Critical Thinking and Writing about Literature	
ENGL 0001C	Critical Thinking and Writing across the Curriculum	
PHIL 0004	Introduction to Critical Thinking	
<b>Select 3-4 units from the following:</b>		<b>3-4</b>

AAD 0012	Visual Communication (Also COMM 0012)
ARHI 0101	Art Appreciation
ARHI 0110	Survey of Western Art I: Prehistory through the Middle Ages
ARHI 0120	Survey of Western Art II: Renaissance Traditions
ARHI 0130	Survey of Western Art III: Modern through Contemporary
ARHI 0132	History of Women in Art
ARHI 0134	History and Aesthetics of Photography (Also PHOT 0010)
ARHI 0140	History of the Arts of Africa, the Americas, and Oceania
ARHI 0150	History of Asian Art
ARHI 0155	History of Islamic Art
COMM 0006	Performance of Diverse Literatures
COMM 0012	Visual Communication (Also AAD 0012)
DFST 0003	American Sign Language III
DFST 0004	American Sign Language IV
DFST 0010	Introduction to Deaf Studies
ENGL 0016	Introduction to LGBTIQ Literature
ENGL 0024	Introduction to Literary Criticism and Critical Concepts
ENGL 0027	Literature by Women
ENGL 0029	Introduction to Drama as Literature
ENGL 0030A	American Literature - Beginnings through Civil War
ENGL 0030B	American Literature - Civil War to the Present
ENGL 0032	Introduction to Poetry
ENGL 0033	Introduction to Shakespeare (The Drama)
ENGL 0034	Introduction to the Novel
ENGL 0035	Introduction to the Short Story
ENGL 0037	American Film Masterpieces
ENGL 0038	International Film Masterpieces
ENGL 0040	The Filmed Novel
ENGL 0042	The Documentary Film
ENGL 0045	Young Adult Literature
ENGL 0046A	English Literature
ENGL 0046B	English Literature
ENGL 0047A	World Literature
ENGL 0047B	World Literature
ENGL 0048	Literature of Science Fiction
ETHN 0050	Ethnic Images in Film
FREN 0002	Elementary French - Level II
FREN 0003	Intermediate French - Level I
FREN 0004	Intermediate French - Level II
HIST 0004A	Western Civilization to 1715
HIST 0004B	Western Civilization since 1715
HIST 0017A	History of the United States to 1877
HIST 0017B	History of the United States since 1865

HIST 0018A	The African American Experience in American History to 1877	MUS 0013	Introduction to Music: History of Rock and Roll
HIST 0018B	The African American Experience in American History since 1877	PHOT 0010	History and Aesthetics of Photography
HIST 0019A	History of Traditional East Asia	SPAN 0003	Intermediate Spanish - Level I
HIST 0019B	History of Modern East Asia	SPAN 0004	Intermediate Spanish - Level II
HIST 0020	California History	THEA 0013	Introduction to Theatre
HIST 0021	Contemporary United States History	THEA 0016A	Costume History
HIST 0022	American Military History	WMST 0003	Introduction to Women, Gender and Religion (Also HUM 0009)
HIST 0023	Chicano/Mexican American History	<b>Select 3-4 units from the following:</b> <b>3-4</b>	
HIST 0024	Russian History - 10th Century to Present	ADMJ 0050	Introduction to Administration of Justice
HIST 0025	Native American History	AGRI 0198	Food, Society and the Environment
HIST 0027	Women in American History	AGRI 0215	Introduction to Agricultural Business and Economics
HIST 0050	World History to 1500	ANTH 0002	Cultural Anthropology
HIST 0051	World History since 1500	ANTH 0004	Native Peoples of North America
HUM 0001	Introduction to Humanities I	ANTH 0005	Introduction to Archaeology
HUM 0002	Introduction to Humanities II	ANTH 0006	Introduction to Linguistic Anthropology
HUM 0003	Introduction to Asian Humanities	ANTH 0007	Native Peoples of California
HUM 0005	Classical Roots of the Contemporary Western World	ANTH 0009	Magic, Witchcraft, Ritual, Myth and Religion
HUM 0009	Introduction to Women, Gender and Religion (Also WMST 0003)	ANTH 0014	Global Problems
HUM 0010	World Religions	ANTH 0027	Anthropology of Sex, Gender and Sexuality
HUM 0015	Introduction to Mythology	ARHI 0132	History of Women in Art
HUM 0017	Introduction to Atheism	BUS 0271	Law and Society
HUM 0020	Introduction to the Hebrew Bible	COMM 0007	Intercultural Communication
HUM 0021	Introduction to the New Testament	COMM 0008	Interpersonal Communication
JPN 0002	Elementary Japanese - Level II	COMM 0010	Communication Theory, Methods, and Practice
LGBT 0002	Queer (LGBTIQ) Film History	COMM 0070	Mass Communication: Media and Society
PHIL 0002	Introduction to Philosophy: Ethics	ECON 0001A	Principles of Macroeconomics
PHIL 0006	Introduction to Philosophy: Knowledge and Reality	ECON 0001B	Principles of Microeconomics
PHIL 0010	Philosophy of Religion	ESS 0001	Introduction to Environmental Sciences and Sustainability
PHIL 0013	Introduction to Asian Philosophy	ETHN 0011	Introduction to Ethnic Studies
PHIL 0020	History of Ancient Greek Philosophy	ETHN 0020	Introduction to African American Studies
PHIL 0021	History of Modern Philosophy	ETHN 0045	Native American Cultures and the Impact of Federal Policy
PHIL 0027	Introduction to Philosophy of Women in Western Cultures	ETHN 0050	Ethnic Images in Film
PHIL 0030	Introduction to Social and Political Philosophy	ETHN 0053	Introduction to Native American Studies
PHIL 0060	Introduction to Environmental Ethics	GEOG 0002	Cultural Geography
PHIL 0065	Introduction to the Philosophy of Science	GEOG 0003	Geography of California
MUS 0002	Music Appreciation	GEOG 0005	World Regional Geography
MUS 0006A	Music Theory I	HDEV 0001	Human Development Through the Lifespan
MUS 0009A	Music Theory III	HDEV 0004	Child, Family, and Community
MUS 0010	Music Fundamentals	HDEV 0009	Child Growth and Development
MUS 0011	Introduction and History of Jazz	HDEV 0021	Psychology of Intimate Relationships and Family (Also PSYC 0110)
MUS 0012A	Survey of Music History and Literature to 1750		
MUS 0012B	Survey of Music History and Literature from 1750 to Present		

HDEV 0022	The Family (Also SOC 0004)	SOC 0001	Introduction to Sociology
HIST 0004A	Western Civilization to 1715	SOC 0002	Social Problems
HIST 0004B	Western Civilization since 1715	SOC 0003	Race, Ethnicity and Inequality
HIST 0017A	History of the United States to 1877	SOC 0004	The Family (Also HDEV 22)
HIST 0017B	History of the United States since 1865	SOC 0005	Sociology of Women's Health
HIST 0018A	The African American Experience in American History to 1877	SOC 0009	Introduction to Crime, Deviance, and Social Control
HIST 0018B	The African American Experience in American History since 1877	SOC 0010	Feminism and Social Action
HIST 0019A	History of Traditional East Asia	SOC 0027	Sociology of Gender
HIST 0019B	History of Modern East Asia	SOC 0047	Introduction to Hip Hop and Social Justice
HIST 0020	California History	SOC 0110	Introduction to Social Justice
HIST 0021	Contemporary United States History	WMST 0001	Introduction to Women's Studies
HIST 0022	American Military History	WMST 0002	Introduction to LGBT Studies/Queer Theory (Also LGBT 0001)
HIST 0023	Chicano/Mexican American History	WMST 0003	Introduction to Women, Gender and Religion (Also HUM 0009)
HIST 0024	Russian History - 10th Century to Present	WMST 0004	Feminism and Social Action (Also SOC 0010)
HIST 0025	Native American History	<b>Select 3-5 units from the following: 3-5</b>	
HIST 0027	Women in American History	AGRI 0156	Introduction to Plant Science (Also BIOL 0021)
HIST 0050	World History to 1500	AGRI 0200	Introduction to Animal Science
HIST 0051	World History since 1500	ANTH 0001	Biological Anthropology
HUM 0009	Introduction to Women, Gender and Religion (Also WMST 0003)	ANTH 0010	Introduction to Forensic Anthropology
LGBT 0001	Introduction to LGBT Studies/Queer Theory (Also WMST 0002)	BIOL 0001	General Biology
POLS 0001	American Government	BIOL 0002	Botany
POLS 0002	Comparative Government	BIOL 0003	General Zoology
POLS 0003	International Relations	BIOL 0004	Microbiology
POLS 0004	Russian and East European Political Systems	BIOL 0005	Human Anatomy
POLS 0005	California Politics and Government	BIOL 0006	Human Physiology
POLS 0007	Politics of the Developing World	BIOL 0010	Introduction to Biology
POLS 0008	American Foreign Policy	BIOL 0011	Concepts of Biology
POLS 0009	Politics of the Middle East	BIOL 0014	Natural History, Ecology and Conservation (Also ESS 0014)
POLS 0012	Terrorism	BIOL 0015	Marine Biology
POLS 0016	Introduction to Political Theory	BIOL 0021	Introduction to Plant Science (Also AGRI 0156)
POLS 0017	Introduction to Political Science Research Methods	BIOL 0030	Introduction to Ornithology
POLS 0027	Women and Politics in a Global Society	BIOL 0035	Introduction to Entomology
PSYC 0100	General Principles of Psychology	BIOL 0055	General Human Anatomy and Physiology
PSYC 0103	Social Psychology	BIOL 0056	Biology: A Human Perspective
PSYC 0104	Developmental Psychology	ESS 0014	Natural History, Ecology and Conservation (Also BIOL 0014)
PSYC 0105	Research Methods in Psychology	PSYC 0140	Introduction to Biopsychology
PSYC 0106	Psychology of Adjustment	<b>Select one of the following Language Other Than English 0-5 options:</b>	
PSYC 0107	Abnormal Psychology	DFST 0001	American Sign Language I
PSYC 0108	Psychology of Death and Dying	DFST 0002	American Sign Language II
PSYC 0110	Psychology of Intimate Relationships and Family (Also HDEV 0021)	DFST 0003	American Sign Language III
PSYC 0127	Psychology of Women	FREN 0001	Elementary French - Level I
PSYC 0130	Human Sexuality	FREN 0002	Elementary French - Level II
PSYC 0160	Psychology and Film	FREN 0003	Intermediate French - Level I
PSYC 0170	Environmental Psychology		
PSYC 0180	Cultural Psychology		

FREN 0004	Intermediate French - Level II
GER 0001	Elementary German - Level I
GER 0002	Elementary German - Level II
ITAL 0001	Elementary Italian - Level I
ITAL 0002	Elementary Italian - Level II
JPN 0001	Elementary Japanese - Level I
JPN 0002	Elementary Japanese - Level II
SPAN 0001	Elementary Spanish - Level I
SPAN 0002	Elementary Spanish - Level II
SPAN 0003	Intermediate Spanish - Level I
SPAN 0004	Intermediate Spanish - Level II

Completion of two years of the same foreign language in high school with grades of "C" or better.

Equivalent proficiency demonstrated by a specified minimum score on College Board SAT II tests in languages other than English; or a score of 3, 4, or 5 on any languages other than English College Board Advanced Placement (AP) Examinations; or a score of 5 or higher on any languages other than English International Baccalaureate (IB) Higher Level Examinations.

Completion of two years of formal schooling at the sixth grade level or higher in an institution where the language of instruction is not English with grades of "C" or better.

**Total Units** 57-67

#### Additional Recommended Preparation:

While not required for this degree, completion of these courses will better prepare students for upper-division physics courses.

Code	Title	Units
CSCI 0012	Programming Concepts and Methodology I	
ENGR 0220	Programming and Problem Solving in Engineering	

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IGETC for STEM is only an option for students earning AS-T degrees in Biology for Transfer, Chemistry for Transfer, UCTP. Chemistry, and/or UCTP. Physics. IGETC for STEM certification requires the following courses *before* transfer:

- All courses in Areas 1 (except 1C for UC-bound students), 2, and 5 of the traditional IGETC;
- Two courses in Area 3 - one course in Area 3A and one course in Area 3B; and
- Two courses in Area 4 from two different disciplines.

The following deferred courses must be completed *after* transfer:

- One remaining lower-division general education course in Area 3;
- One remaining lower-division general education course in Area 4; and
- One course in Area 6 for UC-bound students who have not satisfied the requirement through proficiency.

(The deferred lower-division courses must be replaced with calculus and/or science courses that are required to be taken before transfer to the university.)

## Courses

Understanding course descriptions (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/course-information/understanding-course-descriptions/>)

### PHYS 0000A. Preparation for Calculus-Based Physics

*Units: 4*

Prerequisite: Completion of MATH 27 with grade of "C" or better

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 72 lecture

Intended to provide stronger preparation for Physics 205 than Physics 105. Focuses on measurement and the development of the conceptual and mathematical frameworks necessary for problem-solving in physics. (not transferable)

### PHYS 0010. Basic Concepts in Physics

*Units: 3*

Prerequisite: Eligibility for Math D

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 54 lecture

Introduction to the laws of motion, properties of matter, heat, sound, electricity, magnetism, light, atomic and nuclear physics, and relativity. Emphasis on familiar phenomena in everyday life. Intended for nonscience majors. (CSU, UC-with unit limitation)

### PHYS 0010L. Basic Concepts in Physics Laboratory

*Unit: 1*

Formerly known as PHYS 11

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in PHYS 10

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 54 laboratory

An optional laboratory course taken in conjunction with PHYS 10. Integrates abstract concepts from PHYS 10 into concrete applications through experimentation. Topics include the SI system of measurement; motion; fluids and properties of matter; thermodynamics; waves; sound; electricity and magnetism; and light and optics. (CSU, UC-with unit limitation)

### PHYS 0028. Independent Study

*Units: 1-3*

Designed for students interested in furthering their knowledge at an independent study level in an area where no specific curriculum offering is currently available. Independent study might include, but is not limited to, research papers, special subject area projects, and research projects. See Independent Study page in catalog. (CSU, UC-with unit limitation)

### PHYS 0105. General Physics I

*Units: 4*

Formerly known as PHYS 2A (PHYS 105 and 105L, combined)

Prerequisite: Completion of MATH 27 or equivalent with grade of "C" or better

Corequisite: Concurrent enrollment in PHYS 105L

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 72 lecture

Noncalculus introduction to the principles of mechanics, properties of matter and heat. Emphasis on applications relevant to several majors, including premedical, pre dental, optometry, forestry, architecture, and biological science. (combined with PHYS 105L, C-ID PHYS 105) (CSU, UC-with unit limitation)

**PHYS 0105L. General Physics I Laboratory***Unit: 1*

Formerly known as PHYS 2A (PHYS 105 and 105L, combined)  
 Prerequisite: Completion of MATH 27 or high school trigonometry with grade of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 105  
 Advisory: Eligibility for ENGL 11 strongly recommended  
 Hours: 54 laboratory  
 Laboratory portion of PHYS 105. Noncalculus introduction to the principles of mechanics, properties of matter and heat. Emphasis on applications relevant to several majors, including premedical, pre dental, optometry, forestry, architecture, and biological science. (combined with PHYS 105, C-ID PHYS 105) (CSU, UC-with unit limitation)

**PHYS 0110. General Physics II***Units: 4*

Formerly known as PHYS 2B (PHYS 110 and 110L, combined)  
 Prerequisite: Completion of PHYS 105 and 105L with grades of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 110L  
 Hours: 72 lecture  
 Noncalculus introduction to the principles of waves, sound, light, electricity, magnetism, and modern physics. Emphasis on applications relevant to several majors, including premedical, pre dental, optometry, forestry, architecture, and biological science. (combined with PHYS 110L, C-ID PHYS 110) (CSU, UC-with unit limitation)

**PHYS 0110L. General Physics II Laboratory***Unit: 1*

Formerly known as PHYS 2B (PHYS 110 and 110L, combined)  
 Prerequisite: Completion of PHYS 105 and 105L with grades of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 110  
 Hours: 54 laboratory  
 Laboratory portion of PHYS 110. Noncalculus introduction to the principles of waves, sound, light, electricity, magnetism, and modern physics. Emphasis on applications relevant to several majors, including premedical, pre dental, optometry, forestry, architecture, and biological science. (combined with PHYS 110, C-ID PHYS 110) (CSU, UC-with unit limitation)

**PHYS 0140. Survey of Chemistry and Physics***Units: 4*

Also known as CHEM 140  
 Prerequisite: Completion of MATH D with grade of "C" or better, or placement by matriculation assessment process  
 Hours: 108 (54 lecture, 54 laboratory)  
 A conceptual introduction to the basic principles of physics and chemistry including matter, physical and chemical properties, forces and motion, energy, electromagnetism, electromagnetic waves, atomic structure, bonding, solutions and chemical reactions. The interdependence of chemistry and physics will be emphasized. This course is intended for non-science majors. (C-ID PHYS 140) (CSU, UC)

**PHYS 0205. Principles of Physics: Mechanics***Units: 4*

Formerly known as PHYS 4A (PHYS 205 and 205L, combined)  
 Prerequisite: Completion of MATH 30 and 31 with grades of "C" or better (MATH 31 may be taken concurrently); AND PHYS A or PHYS 105 and 105L, or high school physics with grade(s) of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 205L  
 Advisory: Eligibility for ENGL 11 strongly recommended  
 Hours: 72 lecture  
 Calculus-based introduction to the principles of kinematics, dynamics, energy, momentum, rotational motion, gravitation and fluids. The Physics 205/210/215 sequence presents the general principles and analytical methods used in physics for physical science and engineering majors. (combined with PHYS 205L, C-ID PHYS 205) (CSU, UC-with unit limitation)

**PHYS 0205L. Principles of Physics Laboratory: Mechanics***Unit: 1*

Formerly known as PHYS 4A (PHYS 205 and 205L, combined)  
 Prerequisite: Completion of MATH 30 and 31 with grades of "C" or better (MATH 31 may be taken concurrently); AND PHYS A, PHYS 105 and 105L, or high school physics with grade(s) of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 205  
 Advisory: Eligibility for ENGL 11 strongly recommended  
 Hours: 54 laboratory  
 Laboratory portion of PHYS 205. Calculus-based introduction to the principles of kinematics, dynamics, energy, momentum, rotational motion, gravitation and fluids. The Physics 205/210/215 sequence presents the general principles and analytical methods used in physics for physical science and engineering majors. (combined with PHYS 205, C-ID PHYS 205) (CSU, UC-with unit limitation)

**PHYS 0210. Principles of Physics: Electricity and Magnetism***Units: 3*

Formerly known as PHYS 4B (PHYS 210 and 210L, combined)  
 Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 210L  
 Advisory: Eligibility for ENGL 11 strongly recommended  
 Hours: 54 lecture  
 Electrostatics, AC and DC circuits, magnetism, Maxwell's Equations, electromagnetic waves, and the electric and magnetic properties of matter. The 205-210-215 sequence presents general principles and analytical methods used in physics for physical science and engineering majors. (combined with PHYS 210L, C-ID PHYS 210) (CSU, UC-with unit limitation)

**PHYS 0210L. Principles of Physics Laboratory: Electricity and Magnetism***Unit: 1*

Formerly known as PHYS 4B (PHYS 210 and 210L, combined)  
 Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better  
 Corequisite: Concurrent enrollment in PHYS 210  
 Advisory: Eligibility for ENGL 11 strongly recommended  
 Hours: 54 laboratory  
 Laboratory portion of PHYS 210. Electrostatics, AC and DC circuits, magnetism, Maxwell's Equations, electromagnetic waves, and the electric and magnetic properties of matter. The 205-210-215 sequence presents general principles and analytical methods used in physics for physical science and engineering majors. (combined with PHYS 210, C-ID PHYS 210) (CSU, UC-with unit limitation)

**PHYS 0210R. Problem Solving for Physics 210***Unit: 1*

Formerly known as PHYS 4Y

Corequisite: Concurrent enrollment in PHYS 210

Hours: 18 lecture

Optional problem solving course to accompany PHYS 210. Includes electric forces and fields, electrical potential, capacitors and dielectrics, magnetism, electromagnetic waves, and DC and AC circuits. (CSU, UC-with unit limitation)

**PHYS 0215. Principles of Physics: Heat, Waves and Modern Physics***Units: 3*

Formerly known as PHYS 4C (PHYS 215 and 215L, combined)

Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better

Corequisite: Concurrent enrollment in PHYS 215L

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 54 lecture

Thermodynamics, kinetic theory of gases, waves, geometrical and physical optics, sound, and modern physics. The 205-210-215 sequence presents general principles and analytical methods used in physics for physical science and engineering majors. (combined with PHYS 215L, C-ID PHYS 215) (CSU, UC-with unit limitation)

**PHYS 0215L. Principles of Physics Laboratory: Heat, Waves and Modern Physics***Unit: 1*

Formerly known as PHYS 4C (PHYS 215 and 215L, combined)

Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better

Corequisite: Concurrent enrollment in PHYS 215

Advisory: Eligibility for ENGL 11 strongly recommended

Hours: 54 laboratory

Laboratory portion of PHYS 215. Covers topics of thermodynamics, kinetic theory of gases, waves, geometrical and physical optics, sound, and modern physics. (combined with PHYS 215, C-ID PHYS 215) (CSU, UC-with unit limitation)

**PHYS 0215R. Problem Solving for Physics 215***Unit: 1*

Formerly known as PHYS 4Z

Corequisite: Concurrent enrollment in PHYS 215

Hours: 18 lecture

Optional problem solving course to accompany PHYS 215. Includes thermodynamics, mechanical waves, optics, and modern physics. (CSU, UC-with unit limitation)

**Program Student Learning Outcomes (PSLOs)**

- Correctly apply the appropriate mathematical tools and physical concepts to solve problems and model physical systems at a level commensurate with the level of mathematics required.
- Apply basic physical principles conceptually to explain simple physical systems and everyday phenomena at a level commensurate with the level of mathematics required.
- Utilize technology as an experimental tool at a level commensurate with the curriculum.
- Evaluate, analyze, and interpret scientific data and utilize verbal and written communication skills to share results of physical measurements at a level commensurate with the curriculum.