

# PHYSICS

Physics is the science of matter and its motion – the science that deals with concepts such as force, energy, mass and charge. As an experimental science, the goal in understanding physics is to understand the natural world. In one form or another, physics is one of the oldest academic disciplines; through its modern subfield of astronomy, it may be the oldest of all. Advances in physics often translate to the technological sector, and sometimes influence the other sciences, as well as mathematics and philosophy.

The physics program at Oxnard College offers two associate degrees: the Associate in Arts (A.A.) degree and the Associate in Science (A.S.) degree. The courses in this program may prepare students for technician-level jobs or university transfer to Bachelor of Arts or Bachelor of Science degree programs in physics.

To earn an associate degree with a major in physics, students must complete the core courses listed below, plus general education degree requirements. These major requirements help prepare students for upper-division course work for bachelor and advanced degrees in physics offered by four-year institutions. Since the course work in physics and math is sequential, students should give priority to completing major requirements in degree planning.

The core courses listed below for the Associate in Arts degree in physics and the Associate in Science degree in physics help students prepare for transfer to a Bachelor of Arts degree in physics program at the University of California Los Angeles (UCLA), the University of California Santa Barbara (UCSB), California State University Northridge (CSUN) or a Bachelor of Science degree in physics program at California State University Channel Islands (CSUCI), UCLA, UCSB or CSUN. Universities differ slightly in requirements for the Bachelor of Arts degree in physics and the Bachelor of Science degree in physics. Students are advised to refer to the official articulation agreements on [assist.org](http://assist.org) for the most current requirements of their intended transfer institution. The Counseling Department or a member of the Science Department faculty can help plan a student's coursework at Oxnard College so the student has a smooth transition to the University of his or her choice with a major in physics.

## Career Opportunities

(Post-bachelor's degrees are necessary in most cases)

Astronaut	Highway Designer
Astronomer	Laser Specialist
Atmospheric Scientist	Low-Temperature Physicist
Biomedical Engineer	Manufacturing Engineer
Chemical Physicist	Medical Technologist
Electro-Optic Engineer	Meteorologist
Fusion Engineer	Nuclear Physicist
Geochemist	Physical Chemist
Geophysicist	Space Scientist
	Teacher-secondary or college level

## Faculty

### Part-Time

Justin Miller  
Habib Taouk

## ◆ Physics

### Associate in Arts Degree in Physics\*

The requirements for the A.A. degree in physics are satisfactory completion of a minimum of 60 semester units of which 33 units (depending on the option chosen) must be the required core courses shown below. The additional minimum units are to be chosen from the general education degree requirements found in the Oxnard College catalog. Students who plan to transfer to a four-year university should consult the CSU-GE or IGETC pattern for general education. The A.A. degree in physics is designed primarily for students who wish to transfer to CSUCI into the B.S. program in applied physics with a technology emphasis (**Option 1** below) or the B.S. program in applied physics with a physical science emphasis (**Option 2** below). \*Submitted for State Approval.

Choose either **Option 1** or **Option 2**:

#### Option 1: A.A. in Physics with an option in Technology Units

MATH R120	Calculus with Analytic Geometry I	5
MATH R121	Calculus with Analytic Geometry II	5
MATH R122	Calculus with Analytic Geometry III	5
MATH R125	Differential Equations with Linear Algebra	5
PHIL R107	Introduction to Logic	3
PHYS R121	Physics with Calculus 1	5
PHYS R122	Physics with Calculus 2	5
<b>Total Units for Technology Option</b>		<b>33</b>

Proposed plan of study for A.A. degree in Physics with Technology option:

<b>Year 1:</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
	MATH R120	MATH R121 PHIL R107
<b>Year 2:</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
	PHYS R121 MATH R122	PHYS R122 MATH R125

#### Option 2: A.A. in Physics with an option in

Physical Science		Units
MATH R120	Calculus with Analytic Geometry I	5
MATH R121	Calculus with Analytic Geometry II	5
PHYS R121	Physics with Calculus 1	5
PHYS R122	Physics with Calculus 2	5
CHEM R110	Elementary Chemistry	5
BIOL R101	General Biology	3
BIOL R101L	General Biology Laboratory	1
PHSC R170	Physical Science Concepts	4
<b>Total Units for Physical Science Option</b>		<b>33</b>

Proposed plan of study for A.A. degree in Physics with Physical Science option:

<b>Year 1:</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
	CHEM R110 MATH R120	BIOL R101 BIOL R101L MATH R121
<b>Year 2:</b>	<b>Fall Semester</b>	<b>Spring Semester</b>
	PHYS R121	PHYS R122 PHSC R170

**Associate in Science Degree in Physics\***

The requirements for the A.S. degree in physics are satisfactory completion of a minimum of 60 semester units of which 40 semester units must be the required core courses shown below. The additional minimum of 20 units is to be chosen from the general education degree requirements found in the Oxnard College catalog. Students who plan to transfer to a four-year university should consult the CSU-GE or IGETC pattern for general education. The A.S. degree in physics is designed for students who wish to earn a Bachelor of Arts or Bachelor of Science degree in physics at UCLA, UCSB, or CSUN. \*Submitted for State Approval.

Required Courses for the A.S. in Physics		Units
CHEM R120*	General Chemistry I*	5
MATH R120	Calculus with Analytic Geometry I	5
MATH R121	Calculus with Analytic Geometry II	5
MATH R122	Calculus with Analytic Geometry III	5
MATH R125	Differential Equations with Linear Algebra	5
PHYS R131	Physics for Scientists and Engineers 1	5
PHYS R132	Physics for Scientists and Engineers 2	5
PHYS R133	Physics for Scientists and Engineers 3	5
<b>Total Required Units for A.S. Degree in Physics</b>		<b>40</b>

\*Note: UC Santa Barbara requires both CHEM R120 and CHEM R122 (General Chemistry II) for either the B.A. in physics or the B.S. in physics. CHEM R122 is offered fall and spring semesters at Oxnard College.

Proposed plan of study for A.S. degree in Physics:

Year 1:	Fall Semester	Spring Semester
	MATH R120	MATH R121
	CHEM R120	PHYS R131
Year 2:	Fall Semester	Spring Semester
	MATH R122	MATH R125
	PHYS R132	PHYS R133

**Program Student Learning Outcomes**

Upon successful completion of the Physics program students will be able to:

- Students will use logic to draw well supported conclusions from information given.
- Students will compute using basic numerical concepts such as: whole numbers, percentages, estimates of math.
- Students will use tables, graphs, charts, and diagrams to explain concepts or ideas.
- Students will conduct research and information gathering using a variety of sources such as: texts, tables, graphs, maps, media, personal communication, observation and electronic databases.

**Physics Courses**

**PHYS R101—College Physics 1** **4 units**  
*Prerequisites: MATH R116, MATH R118, or MATH R118A.*  
*4 hours lecture weekly*  
 This course is an introduction to classical mechanics and thermal physics that is appropriate for non-majors. It assumes a prior knowledge of mathematics through algebra/trigonometry. Central topics include kinematics, vectors, forces, energy, rotational motion, heat, fluids, waves, and sound. The course is designed to meet the needs of students majoring in the biological sciences and science-allied fields such as architecture. Biology majors should consult with a counselor to determine whether to take this course or PHYS R121. Field trips may be required. (2)  
*Transfer credit: UC, CSU*

**PHYS R101L—College Physics 1 Laboratory** **1 unit**  
*Prerequisites: PHYS R101 (may be taken concurrently).*  
*3 hours lab weekly*

This course is the laboratory that complements PHYS R101, which may be taken either previously or concurrently. It provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in that course. It also introduces students to methods of computer-assisted data analysis. This course satisfies the CSU-GE and UC Lab Experience requirements. (2)  
*Transfer credit: UC, CSU*

**PHYS R102—College Physics 2** **4 units**  
*Prerequisites: PHYS R101.*  
*4 hours lecture weekly*

This course is an introduction to electromagnetic theory, optics, and modern physics that is appropriate for non-majors. It assumes a prior knowledge of mathematics through algebra/trigonometry, and of the fundamentals of classical mechanics. Central topics include electricity, magnetism, optics, quantum ideas, atomic and nuclear physics, and special relativity. The course is designed to meet the needs of students majoring in the biological sciences and science-allied fields such as architecture. Biology majors should consult with a counselor to determine whether to take this course or PHYS R122. Field trips may be required. (2)  
*Transfer credit: UC, CSU*

**PHYS R102L—College Physics 2 Laboratory** **1 unit**  
*Prerequisites: PHYS R102 (may be taken concurrently).*  
*3 hours lab weekly*

This course is the laboratory that complements PHYS R102, which may be taken either previously or concurrently. It provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in that course. It also introduces students to methods of computer-assisted data analysis. This course satisfies the CSU-GE and UC Lab Experience requirements. (2)  
*Transfer credit: UC, CSU*  
*NOTE: The UC will give credit for only one Physics series: R101/L and R102/L or R121 and R122 or R131, R132, and R133.*

**PHYS R121—Physics with Calculus 1** **5 units**  
*Prerequisites: MATH R120.*  
*4 hours lecture, 3 hours lab weekly*

This course is an introduction to classical mechanics and thermal physics. Topics include vectors, motion, force, energy, heat, fluids, waves, and sound. The laboratory provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in lecture. It also introduces students to methods of computer-assisted data analysis. The course is designed to meet the needs of students majoring in the biological sciences, although it may also be suitable for students in certain other majors. It is not appropriate for students planning to major in fields such as engineering, mathematics, the physical sciences, or computer science. Field trips may be required.  
*Transfer credit: UC, CSU*

**PHYS R122—Physics with Calculus 2** **5 units**  
*Prerequisites: PHYS R121.*  
*4 hours lecture, 3 hours lab weekly*

This course is an introduction to electromagnetic theory, optics, and modern physics. Topics include electricity, magnetism, optics, quantum ideas, atomic and nuclear physics, and special relativity. The laboratory provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in lecture. It also provides students with additional exposure to methods of computer-assisted data analysis. The course is designed to meet the needs of students majoring in the biological sciences, although it may also be suitable for students in certain other majors. It is not appropriate for students planning to major in fields such as engineering, mathematics, the physical sciences, or computer science. Field trips may be required.  
*Transfer credit: UC, CSU*

### PHYS R131—Physics for Scientists and Engineers 1

5 units

Prerequisites: MATH R120.  
4 hours lecture, 3 hours lab weekly

This course is an introduction to the statics and dynamics of rigid bodies and ideal fluids. Central topics include Newton's laws; conservation of energy, linear momentum, and angular momentum; equilibrium of rigid bodies; and oscillatory motion. Although the course emphasizes conceptual understanding, students also learn to apply mathematical techniques such as vector algebra, differential and integral calculus, Taylor series, and linear differential equations to the solution of problems. The laboratory provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in lecture. The course is appropriate for students majoring in the physical sciences, engineering, mathematics, computer science, and related fields. Field trips may be required.

Transfer credit: UC, CSU

### PHYS R132—Physics for Scientists and Engineers 2

5 units

Prerequisites: PHYS R131 and MATH R121.  
4 hours lecture, 3 hours lab weekly

A continuation of PHYS R131, this course is an introduction to electricity and magnetism, with emphasis on understanding field theory and the behavior of simple electrical circuits. Central topics include gravitational, electric and magnetic fields; the laws of Coulomb, Gauss, Ohm, Kirchhoff, Ampere, Biot-Savart, and Faraday; simple circuit analysis; and the Maxwell equations. Although the course emphasizes conceptual understanding, students also learn to apply mathematical techniques such as vector algebra, vector differentiation and integration, binomial approximations, and linear differential equations to the solution of problems. The laboratory provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in lecture. The course is appropriate for students majoring in the physical sciences, engineering, mathematics, computer science, and related fields. Field trips may be required.

Transfer credit: UC, CSU

### PHYS R133—Physics for Scientists and Engineers 3

5 units

Prerequisites: PHYS R132 and MATH R122.  
4 hours lecture, 3 hours lab weekly

A continuation of PHYS R132, this course is an introduction to wave motion (with emphasis placed on the study of sound and electromagnetic wave phenomena), geometrical and wave optics, thermodynamics, and selected elementary topics on special relativity and quantum mechanics. Central topics include mechanical and electromagnetic waves; heat, entropy, and the thermodynamic laws; geometric optics; interference and diffraction; relativistic kinematics and dynamics; and elementary quantum theory with atomic structure. Although the course emphasizes conceptual understanding, students also learn to apply mathematical techniques such as vector calculus, Fourier analysis, numerical approximations, and multi-variable integration to the solution of problems. The laboratory provides students with opportunities to learn and apply the scientific method through investigations of the phenomena discussed in lecture. The course is appropriate for students majoring in the physical sciences, engineering, mathematics, computer science, and related fields. Field trips may be required.

Transfer credit: UC, CSU

## PHYSIOLOGY

See courses in Biological Sciences

## POLITICAL SCIENCE

Political Science courses offer research into and analysis of the institutions and politics of government. Topics include the interpretation and use of constitutions, the politics of the legislative process, elections and campaigns, the impact of money and lobbying on public policy decisions, the role of political parties, interactions between national, state and local government, the role of executive leadership including the United States President, the impact of bureaucracies on public and personal life, the judicial process and the criminal justice system, comparative government, international relations and a wide range of issues that affect the lives of citizens. Development of skills in research, critical thinking, persuasive argument in debate, and analytical writing are primary goals of instruction in political science. All courses provide a stimulating foundation for the life of an educated citizen. Four political courses offer partial fulfillment of the American Institutions requirement. The requirements for a political science major and the great variety of career options served by a major are listed below.

For more information, contact:

Gloria Guevara, Lead Faculty, [gguevara@vcccd.edu](mailto:gguevara@vcccd.edu)  
(805) 986-5800, ext. 1917

### Career Opportunities

Armed Services	Attorney/Legal Assistant
Judicial Officer/Judge	High School Teacher
College Instructor	Political Consultant
Police Services	Political Scientist/Researcher
Elected Public Official	Community Activist
Journalism/Book Author	Intelligence Agencies/CIA/FBI
Foreign Service/U.S. State Department	
Custom Officer/Import-Export Agent	
Public Relations/Travel Consultant	
International Civil Service/Public Institutions	
Non-Profit Organization Management	
Public Administration/Civil Service	
Human Services/Social Welfare	
Human Services/Criminal Justice System	
Human Services/Child Protective & Domestic Relations	
Human Services/Juvenile Services	

### Faculty

Full-Time	Part-Time
Carolyn Dorrance	Timothy Flynn
Gloria Guevara	Philip Grant
	Steve McHargue

### ◆ Political Science

#### Associate in Arts Degree

Required Courses:	Units
POLS R100	Introduction to Politics 3
POLS R101	Government of the United States: Institutions/Politics 3
POLS R102	Government of the United States: Institutions/Laws 3
POLS R104	International Relations 3
POLS R108	Comparative Politics 3

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