

Physics

The Field of Physics

The field of physics is fascinating because it is so fundamental: it seeks to understand how the universe operates, at all levels. Physics specifically includes the study of the fundamental particles that make up matter; of electromagnetic, gravitational, atomic and nuclear forces; of energy; of light and heat; and of the interiors of the Earth and the stars.

A solid education in physics offers a wide range of opportunities. A bachelor's degree provides entry to a variety of jobs in industry and to high school teaching. Higher degrees in physics expand the choices, offering more exciting research opportunities and teaching careers at the college and university level. Graduates tell us of their increasingly responsible positions, work at the forefront of knowledge, and entry into management.

Because of the fundamental nature of physics and the exceptional analytical skills developed in the course of a physics education, our graduates have been very successful in postbaccalaureate work in a number of academic disciplines and professions. A degree in physics is an asset when applying for admission to medical and dental schools. A number of our graduates have successful careers in those professions; others have continued their education in the biological and engineering sciences with great success.

The ability to adapt to new information and new ideas

along with the analytical and conceptual skills developed in a physics education are advantages in almost any career.

The Department of Physics

The Fresno State Department of Physics has 11 faculty members, all with doctorates. They are dedicated to teaching; most are very active in research. Students are encouraged to participate in research as well. Minor options in astronomy and medical physics are available. Please see the *General Catalog* for more details about these programs.

Research Areas and Facilities

Areas of research in which our faculty are active include condensed matter theory and experiment: synthesis of nanowires and nanosprings, low temperature and strongly correlated electron physics, superconductivity, and magnetism in rare-earth compounds; classical and quantum field theory, general relativity, and cosmology; studying forces and interactions of fundamental constituents of matter with experiments using the world's most powerful particle accelerators at the European Center for Nuclear Research and at Fermi National Accelerator Laboratory; astronomy, including observations with Hubble Space Telescope, of cataclysmic variable stars, exoplanets, and black holes; radiation medical physics, including application of magnetic resonance spectroscopy in clinical diagnosis of

disease; and physics pedagogy.

We have well-equipped laboratories housing a variety of research equipment. Our modern machine shop is used for the fabrication and repair of instructional and research equipment. Computational support is excellent.

Students enrolled in the Biomedical Physics program get a chance to intern in the finest, state-of-the-art labs across the nation. We have collaboration with the VA MC and St. Agnes MC where students are provided "hands-on" instruction on MR scanners and other imaging equipment. The curriculum includes MRI/MRS, X-ray imaging, nuclear medicine, neuroimaging, radiation, health physics. This program also aims to serve as a feeder program to graduate schools across the nation.

We have received financial support from our college to further improve our machine shop, astronomy program, and both introductory and advanced labs (optics and condensed matter physics).

The Downing Planetarium opened in April 2000 and has received more than 200,000 visitors. This success led to the construction of the Downing Planetarium Museum. The museum features hands-on physics and astronomy exhibits and opened in 2005.

The planetarium features a computer-controlled Minolta MS-8 star projector and a main theater, which seats 74 in reclining seats under a 30-foot dome.

**California State
University, Fresno**

**Department of
Physics**

559.278.2371

B.S. in Physics

**B.S. Biomedical
Physics**

**B.A. in Natural Science
Teaching Credential**

Option:

• **Physics**

M.S. in Physics

Minor in Physics

Minor in Astronomy

**Minor in Medical
Physics**

**Minor in Physical
Science**

**Preprofessional
advising in**

• **Premedical**

• **Preoptometry**

FRESNO STATE

Discovery. Diversity. Distinction.

Physics

A campus observatory is next to the planetarium. Students interested in astronomy carry out observing projects with its 16" telescope and CCD cameras. We also have an off-campus observatory at a superb dark site in the Sierra Nevada Mountains. We operate its 16" telescope primarily by remote control over the Internet.

Our physics department is a collaborating institute on the ATLAS experiment at the Large Hadron Collider (LHC) of the European Organization for Nuclear Research (CERN), located near Geneva, Switzerland. Among all the 23 CSU campuses, Fresno State is the only one on ATLAS or CMS, which is the flagship LHC experiments designed to search for new physics. Our ATLAS program consists of two faculty members, two postdocs (both stationed at CERN), and several students. We are supported by two grants from National Science Foundation (NSF); a three-year \$460,000 grant from NSF's Elementary Particle Physics (EPP), and a two-year \$620,000 grant from NSF's Major Research Instrumentation (MRI). During the summers our ATLAS students have the opportunity to work at CERN, Stanford Linear Accelerator Center (SLAC), and other ATLAS collaboration institutes on ATLAS research projects.

Summer internships through collaborative research programs are available at the European Center for Nuclear Research.

Career Opportunities

Careers can be found in industrial and university research; in teaching at the high school, community college, or university level; and in administrative and managerial areas.

Further Education

Further education is required for university teaching (Ph.D.), for medicine (M.D.), and for community college teaching (M.S., etc.)

General Preparation

Success in physics requires an inquisitive mind, dedication to hard work, and good preparation/ability in mathematics.

High School Preparation

Students should meet California State University's admission requirements in terms of college preparatory course requirements, grade point

average, and test scores. High school preparation should include mathematics through trigonometry and three years of science: biology, chemistry, and physics. Lack of high school physics is not disqualifying, since most beginning college physics courses do not assume prior learning. Of course, highly developed reading, writing, and reasoning skills are necessary.

College Program

Students should consult the university's *General Catalog* for specific major and university requirements. Community college transfers should consult their catalogs to ensure that courses taken are CSU transferable (baccalaureate level).

Students should follow the program of the physics major as indicated in the *General Catalog* and concentrate on completing the specific major courses required for the physics degree during the first years of college.

Course Requirements

Since program changes may occur, students should consult the *General Catalog* and a Fresno State adviser prior to registering for courses.

Lower Division

Freshman-Sophomore level courses
(may be taken at a community college)

Mathematical Analysis

(Fresno State MATH 75, 76, 77, 81)

Mechanics and Wave Motion

(Fresno State PHYS 4A and 4AL)

Electricity, Magnetism, and Heat

(Fresno State PHYS 4B and 4BL)

Light and Modern Physics

(Fresno State PHYS 4C)

General Chemistry I and II

(Fresno State CHEM 1A and 2B)

Electronics

(Fresno State IT 52) *or*

Computer Programming

(C/C++ programming)

(Fresno State CSCI 40)

Upper Division

Junior-Senior level courses
(to be taken at Fresno State)

**For additional
information, write**

**California State
University, Fresno
Department of Physics**

2345 East San Ramon Ave.

M/S MH37

Fresno, California

93740-8031

Visit or call

Department of Physics

McLane Hall, Room 173

559.278.2371

559.278.7741 FAX

www.fresnostate.edu/csm/physics/

www.fresnostate.edu/csm/medicalphysics/

FRESNO
STATE

Discovery. Diversity. Distinction.

PLEASE NOTE: This document is for general informational purposes only. The information is subject to change; consult the appropriate department or an academic adviser. Entering freshmen must follow the revised General Education program effective fall 1999 and thereafter. The university catalog and schedule of courses are available online at www.fresnostate.edu/ClassSchedule and www.fresnostate.edu/catalog.

Revised 5/13