



Bachelor of Science in Physics

College of Natural Sciences and Mathematics

Why major in a physics-related field?

Physics is the *most fundamental* of the sciences. Physics concepts provide the foundation for all other sciences, as well as the engineering disciplines. The theoretical structures of physics, which are derived from the logical interpretation of experimental data, are immensely powerful. Physics concepts deal with phenomena that range from matter at its smallest scale (i.e., subatomic physics) to the large-scale structure of the universe (i.e., astrophysics).

At the same time, physics is extraordinarily important in our everyday lives. For example, when you take a commercial airline flight, navigational aids such as radar, global positioning satellite systems and instrument landing systems help to keep you safe. Physicists invented and played key roles in the development of each of these systems. Likewise, physicists are responsible for many of the noninvasive diagnostic techniques used in medicine, including X-rays, magnetic resonance imaging, computer-assisted tomography (CAT scans), and positron emission tomography (PET scans). Fiber optics systems developed by physicists are used both in medical diagnostics and microsurgery. In fact, two of the three scientists who discovered the structure of DNA were physicists.

A host of inventions in the area of computers and communications including the transistor, the radio and the Internet were developed by physicists. In fact, 25 percent of the world's economy is said to depend on the physics of silicon. Today's powerful microcomputers owe their existence to the rapidly growing field of condensed matter physics.

Physicists have an exceptionally wide range of career choices in research, development, consulting, and teaching in the basic and applied areas of physics and engineering. In addition, a degree in physics is excellent preparation for careers in law (particularly patent law), business, finance and medicine.

Why choose Cal State Fullerton?

Teaching is our first priority - At many institutions that grant doctorates, the demands of a heavy research schedule can leave faculty members with little time to devote to undergraduate teaching. In contrast, our physics faculty members are known for their teaching skills. We derive our teaching methods from the latest results in physics education research to ensure that students learn the discipline efficiently and effectively. All of our classes,



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including those at the introductory level, are small. Students have ample opportunity to get to know their instructors, and our faculty are eager to help students learn. In addition, we operate a tutorial center that provides one-to-one assistance to all of our students.

National reputation - Although we are primarily a teaching institution, most of our faculty members have active research programs in basic or applied physics research or in physics education research. They have been awarded millions of dollars in grants from such agencies and organizations as the Department of Energy, NASA, the National Science Foundation, the Research Corporation, and the Petroleum Research Fund. In addition our faculty members serve on numerous national committees and boards, including the Council on Undergraduate Research, review panels for the National Science Foundation and NASA, and the selection panel for the prestigious Fulbright Fellowships. We have excellent facilities for research in astronomy, astrophysics, condensed matter physics, optics, atomic physics and computational physics. Our undergraduate physics majors also have many opportunities to work on research projects with faculty members as an integral part of their learning experience.

Preparation for graduate work - Our bachelor of science major in physics is designed to be flexible enough to provide excellent preparation for graduate work in physics and many related fields, such as astrophysics, geophysics, biophysics, as well as many branches of engineering. The majority of our students, including those who work in industry, obtain advanced degrees.

Student participation in research - While we do not have a research requirement as part of our B.S. program, many of our students participate in one or more research projects before graduation. Most grant-supported research in the department includes funds to support undergraduate students. Several of our undergraduate students have co-authored research papers with faculty members.

High quality faculty - Our physics faculty members are known for both their teaching and research skills. In fact, three of our department faculty members have been honored as recipients of Cal State Fullerton's Outstanding Professor Award.

What types of career opportunities are available?

Bachelor of Science in Physics - Our B.S. degree provides excellent preparation for applied research, development, engineering and secondary school teaching positions. The degree also provides excellent preparation for students who plan to pursue careers in business, law, forensics and many of the health professions.

Minors in Physics - A minor in physics often enhances the career opportunities for students with majors in other sciences, engineering, computer science or mathematics. A minor in physics requires the completion of 12 units of fundamental physics courses (Physics 225, 226, 227 and 225L, 226L, 227L) and 9 units of upper-division courses (including Physics 380).

B.S. in Physics with an Emphasis in Business - The Dan Black Program in Physics and Business provides a fundamental background in business for physics majors who are interested in starting a technology-related business or joining the management staff of small to medium size technology-related businesses.

What courses are required?

Course requirements for the major in physics include:

Lower-Division Courses (31-32 units)

General Chemistry (Chem 120A, 125) (8)

Mathematics (Math 150A,B and 250A) (12)

Fundamental Physics (Physics 225, 226, 227, and 225L, 226L, 227L) (12)

Note: Students may take Chemistry 120B in place of Chemistry 125.

Upper-Division Courses (21 units)

Physics 300 Survey of Mathematical Physics (3)

Physics 310 Thermodynamics, Kinetic Theory and Statistical Physics (3)

Physics 320 Classical Mechanics (4)

Physics 330 Electromagnetic Theory (4)

Physics 340 Modern Physics (4)

Physics 380 Methods of Experimental Physics (3)

Upper-Division Physics Electives (14-15 units)

Additional adviser-approved upper-division units in physics, one of which must be a laboratory course.

Upper-Division Science and Engineering Electives (3 units)

Additional upper-division courses in mathematics, science, engineering and/or computer science approved by the department.

Upper-Division Writing Requirement (3 units)

English 301 Advanced College Writing (3) or

English 360 Scientific and Technical Writing

Emphasis in Business

Students who pursue this program do not take Physics 227L and substitute Accounting 201A Financial Accounting for Chemistry 125 in lower-division major requirements. The Business Emphasis requires the same upper-division physics courses (21 units) shown above, and students complete the following 21 units in physics and business electives in place of the upper-division physics/science and engineering electives and upper-division writing requirement (21 units) shown above:

Finance 320 Business Finance (3)

Management 340 Organizational Behavior (3)

Management 465A New Venture Creation & Funding (3)

Management 465B New Venture Launch (3)

OR Business Admin 495 Internship (3)

Marketing 351 Principles of Marketing (3)

Physics 481 Experimental Physics (3)

OR Physics 482 Modern Optics Laboratory (3)

Business Admin 301 Advanced Business Communication (3) (satisfies upper-division writing requirement)

Other Requirements

Each course in physics, mathematics, chemistry and English that is required for the major must be completed with grade of C or better. Equivalent courses taken at community colleges, other CSU campuses, and UC campuses are fully transferable. Consult our department or your school's articulation document for details.

What's special at Cal State Fullerton?

An outstanding feature of Cal State Fullerton's physics program is the active student participation in faculty research projects. We have excellent facilities in experimental astrophysics, experimental condensed matter physics and optics, and experimental atomic physics. In addition, our outstanding computational physics facilities are available to students interested in theoretical projects. The Dr. Robert W. Kedzie tutorial room, which is staffed by faculty and graduate students, provides a quiet, comfortable environment for study and homework preparation. In addition, a large student lounge provides opportunities for students to interact with other physics majors and graduate students.

How can students get involved?

Club Physics is our undergraduate physics club, which is open to all physics majors. Participants enjoy a variety of social and professional activities, including food sales, movie nights and astronomy observation trips. In addition, the Physics Department also provides undergraduate students with part-time employment opportunities as graders, laboratory assistants and tutors.

Who advises me?

The Physics Department at Cal State Fullerton uses a centralized advising system. A single faculty member advises all undergraduate physics majors. Because of the structured nature of the major, it is very important for each physics major to schedule an appointment with the undergraduate adviser before the start of his or her first semester at Cal State Fullerton. To arrange for an advising appointment, please call our department office at (714) 278-3366.

Where is additional information available?

To learn more about our program, contact our department chair, Dr. Murtadha Khakoo at (714) 278-3366 or by e-mail, mkhakoo@fullerton.edu; or our undergraduate adviser, Dr. Patricia Cheng at (714) 278-3366 or by email, kcheng@fullerton.edu. Visit the Department of Physics, California State University, Fullerton, McCarthy Hall 611, Fullerton, California, 92834-6868.

We also invite you to visit our award-winning website (<http://physics.fullerton.edu>) for additional information about our programs, students and faculty members.