Physics

College of Letters and Science (http://ls.berkeley.edu)
Department Office: 366 LeConte Hall, (510) 642-7166

Chair: Frances Hellman, PhD
Department Website: Physics (http://physics.berkeley.edu)

Major Requirements

The physics major is designed to give the student a broad and thorough understanding of the fundamentals of physics. The emphasis is, therefore, on this general understanding rather than on specialized skills, although some specialized courses are among the options open to the student. Those considering a physics major are urged to consult a departmental adviser early, in order to discuss the content of the major and also the opportunities after graduation. Recent graduates have entered graduate work in a number of scientific fields, and others have gone on to jobs in academic, industrial, and government laboratories. For information about the major and department, go to the website. (http://physics.berkeley.edu)

Lower Division Courses

1. Physics 7A-7B-7C (regular or honors, *although honors is recommended for students with suitable preparation)*
2. Mathematics 1A-1B and 53, 54.
3. Those who have not taken a substantial chemistry course in high school are urged to take a one-year sequence.
4. Those not familiar with a computer programming language are urged to include an introductory course in Computer Science.

Upper Division Courses

Courses 7A-7B-7C (regular or honors) and differential and integral calculus are prerequisite to all upper division courses except Physics 132.

Upper division courses may have scheduled one additional hour to the three hours of lecture. See the Online Schedule of Classes (http://schedule.berkeley.edu) .

1. Physics 105; 110A; 112; 137A-137B
2. Six units of 111
3. One additional course from the following list chosen with the approval of the major adviser: 110B, 129, 130, 138, 139, 141A-141B, 142, 151, C161 (cross listed with astronomy), 177, C191. These options will give the student an extended introduction to some areas of current research.
4. Physics 110B is strongly recommended for students who plan to continue to graduate school.

Special programs may be worked out in consultation with the adviser. Completion of a physics major program is usually required for admission to graduate work. Additional mathematics from among the courses Mathematics 104, 121A-121B, 185 is recommended. Competence in the use of computers is desirable.

Honors Program

Students with an overall grade point average (GPA) of 3.3 or higher in courses in the major may be admitted to the honors program. A major adviser should be consulted before the student's last year of residence. This program requires completion of the major, at least one semester of Physics H190 and a senior thesis, H195A-H195B.

Biophysics

Students who wish to obtain a broad introduction to the physical sciences and their application to biology are referred to the Department of Physics and the Department of Molecular and Cell Biology. There is no biophysics undergraduate degree major program.

Engineering Physics

The College of Engineering, with the cooperation of the Department of Physics, offers a curriculum in engineering physics leading to the degree of Bachelor of Science. (The Engineering Physics major is open only to students registered in the College of Engineering.)

Minor Requirements

The Department of Physics has adopted a physics minor program. Students in the College of Letters and Science may complete one or more minors of their choice, normally in a field both academically and administratively distinct from their major. The minor will conform to the College of Letters and Science specifications and will consist of the following coursework:

Prerequisites

1. Physics 7A, 7B, 7C (or their equivalent)
2. Math 1A, 1B, 53, 54, (or their equivalent)

These courses must be taken for a letter grade. Physics 7A-7B-7C must each be passed with a letter grade of C or better. The students must achieve a minimum GPA of 2.0 in the seven courses.

Minor Requirements

1. Physics 137A
2. Physics 110A or Physics 105.
3. Three additional upper division physics courses to total at least nine units for an upper division physics unit total of at least 17 units.

The following upper division courses will not count for the minor program: Physics 100, 132, H190, H195A-H195B, 198, or 199. All upper division physics courses must be taken for a letter grade. A minimum of three upper division courses must be completed at Berkeley. An overall minimum GPA of 2.0 is required in upper division courses applied to the minor program.

Students who have completed the requirements for the minor will be required to furnish transcripts (official or unofficial) to the undergraduate adviser (in 368 Le Conte Hall) to show their work and GPA in physics and math. After completing a confirmation of minor program petition (available in 368 Le Conte Hall) the students will be directed to a faculty major adviser who will approve the completion of the minor program.

Students may petition for a minor in physics from the time that the requirements are complete until the student graduates from the College of Letters and Science.

For more information regarding this program, please contact the undergraduate student affairs officer in 368 LeConte Hall.

Graduate Programs

Graduate work leading to the MA and PhD degrees is offered in the Department of Physics with emphasis placed on the PhD. Please note that the department will not consider applications from students who intend to work toward the MA degree only. In addition to applications and transcripts of undergraduate work, applicants must submit scores of the General and Physics Graduate Record Examinations (GRE), and, if applicable, the Test of English as a Foreign Language (TOEFL). For detailed information concerning the physics graduate program, including admissions, go to the website (http://physics.berkeley.edu) (click on "Graduate"), or consult Physics Graduate Student Services at (510) 642-0596.

Research is a major part of the PhD program, and the department offers opportunities in a wide variety of experimental and theoretical fields. Campus research includes atomic physics and spectroscopy, astrophysics, biophysics, cosmic rays, mass spectroscopy, nonlinear optics, condensed matter physics, and statistical mechanics. At the Lawrence Berkeley National Laboratory, extensive opportunities exist for research in astrophysics, elementary particle and nuclear physics, condensed matter physics and materials science, and plasma and nuclear physics. Space physics, interplanetary studies, solar plasma research, physics of the upper atmosphere, and cosmological problems are pursued both in the Physics Department and at the Space Sciences Laboratory.

Course requirements for the PhD include the following: Physics 209, Classical Electromagnetism; 211, Equilibrium Statistical Physics; and 221A-221B, Quantum Mechanics; plus 19 units (five semester courses), approved upper division or graduate elective courses (excluding any upper division courses required for the undergraduate major)—at least 11 units must be in the 200 series courses. Some of the 19 elective units could include courses in mathematics, biophysics, or astrophysics. Consult department postings for elective recommendations. Physics 251, 290, 295, 299, 300, and 602 are excluded from the 19 elective units. Physics 209, 211, and 221A-221B must be completed for letter grades (minimum grade B-). No more than one-third of the 19 elective units may be fulfilled by courses graded *satisfactory,* and then only with approval from the department.

The master's degree is administered according to regulations given in the Graduate Education section of this Bulletin (http://bulletin.berkeley.edu/archive/2013-14/graduateeducation) . The Department of Physics requires a comprehensive examination rather than a thesis; passing the preliminary exams constitutes passing the comprehensive exam. The candidate must complete 35 semester units of upper division and graduate work in physics (or related fields) with an average grade of at least a B. Eighteen of these units must be graduate courses in physics. Neither upper division courses included in the departmental (undergraduate) major requirements nor Physics 251, 290, 295, 299, 300, or 602 may be used to satisfy the 35-unit requirement. No more than five units of the master's program may be fulfilled by courses graded *satisfactory,* and then only if approved by the department. MA petitions are due the fifth week of fall and spring semesters.

PHYSICS 7A Physics for Scientists and Engineers 4 Units
Department: Physics
Course level: Undergraduate
Terms course may be offered: Fall, spring and summer
Grading: Letter grade.
Hours and format: 3 hours of lecture and 4 hours of laboratory/workshop per week.6 hours of lecture and 8 hours of laboratory/workshop per week for 8 weeks.
Prerequisites: High school physics; Math 1A or 1AS; Math 1B or 1BS (which may be taken concurrently).
Mechanics and wave motion.

PHYSICS 7B Physics for Scientists and Engineers 4 Units
Department: Physics
Course level: Undergraduate
Terms course may be offered: Fall, spring and summer
Grading: Letter grade.
Hours and format: 3 hours of lecture and 4 hours of laboratory/workshop per week.6 hours of lecture and 8 hours of laboratory/workshop per week for 8 weeks.
Prerequisites: 7A, Math 1A-1B, Math 53 (may be taken concurrently).
Heat, electricity, and magnetism.

PHYSICS 7C Physics for Scientists and Engineers 4 Units
Department: Physics
Course level: Undergraduate
Terms course may be offered: Fall, spring and summer
Grading: Letter grade.
Hours and format: 3 hours of Lecture, 1 hour of Discussion, and 3 hours of Laboratory per week for 15 weeks. 6 hours of Lecture, 2 hours of Discussion, and 6 hours of Laboratory per week for 8 weeks.
Prerequisites: 7A-7B, Math 1A-1B, Math 53, 54 (Math 54 may be taken concurrently).
Electromagnetic waves, optics, relativity, and quantum physics.

PHYSICS H7A Physics for Scientists and Engineers 4 Units
Department: Physics
Course level: Undergraduate
Terms course may be offered: Fall and spring
Grading: Letter grade.
Hours and format: 3 hours of Lecture, 1 hour of Discussion, and 3 hours of Laboratory per week for 15 weeks.
Prerequisites: High school physics; Math 1A; Math 1B (may be taken concurrently)
Honors sequence corresponding to 7A-7B-7C, but with a greater emphasis on theory as opposed to problem solving. Recommended for those students who have had advanced Physics on the high school level and who are intending to declare a major in physics. Entrance into H7A is decided on the basis of performance on an examination given during the first week of class or the consent of the instructor, and into H7B-H7C on performance in previous courses in a standard sequence.
Students will received no credit for H7A after taking 7A.

PHYSICS H7B Physics for Scientists and Engineers 4 Units
Department: Physics
Course level: Undergraduate
Terms course may be offered: Fall and spring
Grading: Letter grade.
Hours and format: 3 hours of Lecture, 1 hour of Discussion, and 3 hours of Laboratory per week for 15 weeks.
Prerequisites: 7A, Math 1A-1B, Math 53 (may be taken concurrently)
Honors sequence corresponding to 7A-7B-7C, but with a greater emphasis on theory as opposed to problem solving. Recommended for those students who have had advanced Physics on the high school level and who are intending to declare a major in physics. Entrance into H7A is decided on the basis of performance on an examination given during the first week of class or the consent of the instructor, and into H7B-H7C on