School of Physical Sciences

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Overview
The School of Physical Sciences offers both professional training and general education in the Departments of Chemistry, Earth System Science, Mathematics, and Physics and Astronomy. The faculty, active in research and graduate education, are at the same time vitally concerned with undergraduate teaching. Curricula of the School are designed to meet the needs of a wide variety of students ranging from those with little technical background who seek insight into the activities and accomplishments of physical scientists to those seeking a comprehensive understanding that will prepare them for creative research in physical science.

Over the course of the past century and a half, physics, chemistry, and mathematics have evolved into interdependent but separate intellectual disciplines. This development is reflected in the departmental structure of the School of Physical Sciences. In the same period, these fundamental disciplines have moved into domains of abstraction unimagined by early scientists. This trend to abstraction with its concomitant increase in understanding of the physical universe provides the major challenge to the student of the physical sciences. Mathematics, physics, and chemistry, while providing the foundation of the technology that dominates contemporary civilization, underlie to an ever-increasing extent the new developments in the biological and social sciences. Earth system science is grounded in the traditional physical sciences while breaking new paths in the quantitative study of changes in the global environment.

Degrees

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<th>Discipline</th>
<th>Degree</th>
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<tbody>
<tr>
<td>Chemistry</td>
<td>B.S., M.S., Ph.D.</td>
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<tr>
<td>Earth System Science</td>
<td>B.S., M.S., Ph.D.</td>
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<tr>
<td>Environmental Science</td>
<td>B.A.</td>
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<tr>
<td>Mathematics</td>
<td>B.S., M.S., Ph.D.</td>
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<tr>
<td>Physics</td>
<td>B.S., M.S., Ph.D.</td>
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Honors
Criteria used by the School of Physical Sciences in selecting candidates for honors at graduation are as follows: Approximately 1 percent will be awarded summa cum laude, 3 percent magna cum laude, and 8 percent cum laude. Honors are awarded on the basis of a student’s performance in research, cumulative grade point average, and performance in upper-division courses in the major. Students considered for honors at graduation must have completed 72 units in residence at the University of California. The student’s cumulative record at the end of the final quarter is the basis for all decisions regarding honors at graduation. Other important factors are considered (see Honors Recognition). The School of Physical Sciences also grants special honors to students who have distinguished themselves by their work in their major subject.

- Preparation for Teaching Science and Mathematics
- Special Programs

Undergraduate Programs
Each department offers courses that are of value to nonmajors and majors in the sciences. The programs for majors are designed to meet the needs of students planning careers in business, education, or industry; of students planning advanced professional study; and of students planning graduate work that continues their major interest. Students who wish to complete a coordinated set of courses beyond the introductory level in Mathematics and in Earth and Atmospheric Sciences may pursue minors in these areas. Students interested in mathematical and computational biology may complete the Mathematics for Biology minor which prepares them for interdisciplinary graduate studies in this area. Introductory courses in chemistry, mathematics, and physics meet the needs of students majoring in the sciences, mathematics, and engineering and are also appropriate for students in other disciplines who seek a rigorous introduction to the physical sciences. In addition, a number of courses within the School have few or no prerequisites and are directed particularly toward students majoring in areas remote from the sciences.

Planning a Program of Study
Students who choose a major in the School of Physical Sciences have a variety of academic advising and counseling resources available to them. In addition to faculty advisors, there is a Chief Academic Advisor in each department who is responsible for interpreting degree requirements, reviewing student petitions, and assisting with special advising problems. An academic advising and counseling staff, employed in the Associate Dean’s Office, is available to serve a broad range of student advising needs. In consultation with their faculty advisor or an academic counselor, students should plan a course of study leading to a major in one of the departments of the School. In carrying out this major, students may often concentrate very heavily in a second department within the School or in some other school. Occasionally students choose to pursue a double major. Permission to do so may be sought by an online application submitted to the Office of the Associate Dean of Physical Sciences.

All initial courses of study for majors include mathematics through calculus, and calculus is a prerequisite for much of the upper-division work in each major. A student interested in any of the physical sciences should continue mathematical training beyond these prerequisite courses. Furthermore, students interested in either physics or chemistry usually will include work in both of these subjects in their undergraduate careers. Students in the physical sciences are urged to acquire a working knowledge of computer programming at an early stage of their University studies. This can be accomplished by taking one of the following:

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>I&amp;C SCI 31</td>
<td>Introduction to Programming</td>
</tr>
<tr>
<td>CHEM 5</td>
<td>Scientific Computing Skills</td>
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<tr>
<td>EECS 10</td>
<td>Computational Methods in Electrical</td>
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<td></td>
<td>and Computer</td>
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<tr>
<td>EECS 12</td>
<td>Introduction to Programming</td>
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<td>ENGRMAE 10</td>
<td>Introduction to Engineering</td>
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<td>Computations</td>
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<td>PHYSICS 53</td>
<td>Introduction to C and Numerical</td>
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<td>Analysis</td>
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Career Opportunities

Many of the School of Physical Sciences graduates continue their education beyond the Bachelor’s degree level. Some pursue advanced academic degrees in preparation for careers in scientific or medical research, engineering, or postsecondary education. Other students will complete a secondary education credential in order to prepare for careers teaching high school mathematics and science. Some students enter professional school in areas such as medicine, dentistry, law, or business administration. Students who choose not to continue their studies beyond the baccalaureate level most frequently find employment in private business or industry. In addition to technical areas directly related to their major fields of study, students often enter careers in less obviously related fields such as computing, systems analysis, engineering, journalism, marketing, or sales.

The UCI Career Center provides services to students and alumni including career counseling, information about job opportunities, a career library, and workshops on resume preparation, job search, and interview techniques. See the Career Center (catalogue.uci.edu/previouseditions/2013-14/informationforadmittedstudents/lifeoncampus/#careerctrtext) section for additional information.

Preparation for Teaching Science and Mathematics

Option 1: Earn a Bachelor’s Degree, Education Concentration, and Teaching Credential

Physical Sciences students who are interested in pursuing a teaching career should consider the UCI Cal Teach Science and Mathematics Program. This program offers Chemistry, Earth System Science, Environmental Science, Mathematics, and Physics majors an option to earn their bachelor’s degree concurrently with a California Preliminary Single Subject Teaching Credential. Individuals who hold this credential are authorized to teach science (chemistry, geosciences, or physics) or math in a middle school or high school.

Students complete the degree requirements for their selected major, the requirements for an optional education concentration offered by the same department, and any additional teacher credentialing course requirements that are not included in the major or the concentration. The following courses are required for the Preliminary Single Subject Teaching Credential:

- **PHY SCI 5**: California Teach 1: Introduction to Science and Mathematics Teaching
- **PHY SCI 105**: California Teach 2: Middle School Science and Mathematics Teaching
- **PHYSICS 193** or **CHEM 193**: Research Methods
- **MATH 8**: Explorations in Functions and Modeling (for mathematics credential candidates only)
- **LPS 60**: The Making of Modern Science (for chemistry, geosciences, and physics credential candidates only)
- **EDUC 55**: Knowing and Learning in Mathematics and Science
- **EDUC 109**: Reading and Writing in Secondary Mathematics and Science Classrooms
- **EDUC 143AW**: Classroom Interactions I
- **EDUC 143BW**: Classroom Interactions II
- **EDUC 148**: Complex Pedagogical Design
- **EDUC 158**: Student Teaching Mathematics and Science in Middle/High School (two quarters)

Beyond course work, some additional requirements for teacher certification are described below.

With careful, early planning, it is possible for students to complete their bachelor’s degree and teacher certification in four years. This is a more time-efficient and cost-effective route than the traditional five-year teacher preparation model, which usually involves a full academic year of teacher education courses and clinical teaching experience after completion of a bachelor’s degree.

After the School of Physical Sciences verifies the completion of all requirements for the bachelor’s degree and education concentration, students are awarded their degree from UC Irvine. The Preliminary Single Subject Teaching Credential is awarded by the California Commission on Teacher Credentialing (CTC) upon completion of a bachelor’s degree and the state-approved UCI teacher education program, which combines course work, student teaching, and a teaching performance assessment.

The UCI School of Education must verify completion of all requirements for the teaching credential and then recommend that the credential be awarded to a candidate by the CTC.

Additional Requirements for Teacher Certification. In addition to the required course work for a California Preliminary Single Subject Teaching Credential, the following additional requirements must be satisfied:

1. The School of Physical Sciences requires a cumulative GPA of 2.0 (C) to graduate with the bachelor’s degree. However, students must earn a grade of C or better in each of the following courses in order to be recommended for the Preliminary Single Subject Credential:
2. The following must be completed and verified prior to the start of student teaching in **EDUC 158**:
   - A. Pass the California Basic Education Skills Test (CBEST), a basic mathematics and literacy skills test. For more information, see http://www.cbest.nesinc.com/.
   - B. Pass the California Subject Exam for Teachers (CSET) in the discipline in which a candidate plans to earn a Preliminary Single Subject Credential (chemistry, geosciences, mathematics, or physics). Although secondary teachers are only required to pass the CSET exam in one discipline, those who pass the CSET exam in more than one disciplinary field (e.g., physics and mathematics) can be authorized to teach classes in each of those disciplines. For more information about the CSET exam, see http://www.cset.nesinc.com/.
   - Mathematics majors have an option to waive the CSET exam by completing prescribed course work, referred to as a subject-matter preparation program (SMPP). More information about the Mathematics SMPP is available at http://www.gse.uci.edu/academic_programs/ap_smpp_math.php.
C. Secondary school science teachers in California are expected to have a broad range of general science knowledge in addition to their discipline of specialization, because their Single Subject Teaching Credential in one of the sciences also authorizes them to teach classes in general or integrated science. The general science subtests of the CSET exam cover foundational topics in astronomy, geodynamics, Earth resources, ecology, genetics and evolution, molecular biology and biochemistry, cell and organismal biology, waves, forces and motion, electricity and magnetism, heat transfer and thermodynamics, and structure and properties of matter. Although students can prepare for the CSET exam’s general science subtests through independent study, Physical Sciences students can also prepare themselves by taking lower-division courses that cover this content. Some suggested courses include BIO SCI 1A or BIO SCI 93 and BIO SCI 94; CHEM 1A-CHEM 1B-CHEM 1C; EARTHSS 1 and EARTHSS 7 and PHYSICS 20A.

D. Obtain a Certificate of Clearance from the State of California.

E. Obtain a TB test with negative results.

3. The following must be completed and verified before the School of Education is able to recommend an individual for the Preliminary Single Subject Credential:

A. Complete a college-level course or pass an examination on the U.S. Constitution. POL SCI 21A satisfies this requirement. Contact the UCI School of Education Student Affairs Office for information about the exam.

B. Obtain a CPR certificate in adult, child, or infant training.

Declaring Intention to Complete the Concentration and Teacher Certification. Prospective teachers who want to complete their degree and a teaching credential in four years are encouraged to start planning early by reviewing the sample programs for the major and the education concentration that they have selected, and to consult with an academic counselor. Interested students are encouraged to get started on the suggested first- and second-year credentialing course work, including PHY SCI 5 and PHY SCI 105, and can do so without officially declaring their intention to complete the concentration or the credential. However, students must declare their intention to complete the optional education concentration and their intention to earn the Preliminary Single Subject Teaching Credential by the end of their second year at the latest, and prior to enrolling in EDUC 55, which they would typically take in fall of their third year. Forms for declaring a selected education concentration and for declaring an intention to complete the teaching credential are available in the Cal Teach Science and Mathematics Resource and Advising Center (137 Bison Modular).

Option 2: Earn a Bachelor’s Degree and Education Concentration or Specialization

A second option for students interested in teaching science and mathematics is to earn a teaching credential in a post-baccalaureate teacher preparation program after completing their bachelor’s degree. UCI and other universities offer such programs, which typically require one academic year of education course work and clinical teaching experience. The Departments of Chemistry, Mathematics, and Physics and Astronomy offer the concentration in Chemistry Education, the specialization in Mathematics for Education, and the concentration in Physics Education, respectively, which are well suited for undergraduates who plan to pursue a teaching credential after finishing their degree. These programs offer strong grounding in the fundamentals of one discipline, and at the same time, emphasize the breadth in natural sciences needed by secondary science teachers. Each department’s curriculum includes introductory courses on effective methods of science and mathematics teaching and provides opportunities for practical fieldwork experiences in a secondary school classroom. Detailed requirements for each program are provided in the departmental sections.

Special Programs

Campuswide Honors Program

The Campuswide Honors Program is available to selected high-achieving students from all academic majors from their freshman through senior years. For more information contact the Campuswide Honors Program, 1200 Student Services II; (949) 824-5461; honors@uci.edu ; http://www.honors.uci.edu/.

UC Education Abroad Program

Upper-division students have the opportunity to experience a different culture while making progress toward degree objectives through the University’s Education Abroad Program (EAP). UCEAP is an overseas study program which operates in cooperation with host universities and colleges throughout the world. See http://www.studyabroad.uci.edu for additional information.

Minor in Biomedical Engineering

The minor in Biomedical Engineering is an interdisciplinary curriculum that includes courses from the Schools of Engineering, Physical Sciences, and Biological Sciences. The minor is designed to provide a student in the physical sciences with theintroductory skills needed in the quantitative biomedical arena. See The Henry Samueli School of Engineering (catalogue.uci.edu/previouseditions/2013-14/thethe下面是小段子的文本内容。
Graduate Programs

The School offers M.S. and Ph.D. degree programs in the Departments of Chemistry, Earth System Science, Mathematics, and Physics and Astronomy. See the department sections for detailed information.

Courses

PHY SCI 5. California Teach 1: Introduction to Science and Mathematics Teaching. 3 Units.
First in a series for students interested in becoming middle or high school teachers of mathematics or science. Students gain an understanding of effective, research-based teaching strategies. Includes supervised field experience in a K-12 classroom.

Same as BIO SCI 14.

Restriction: School of Physical Sciences, School of Biological Sciences, School of Information and Computer Sciences, and School of Engineering majors have first consideration for enrollment.

PHY SCI 105. California Teach 2: Middle School Science and Mathematics Teaching. 3 Units.
Second in a series for students interested in becoming middle or high school teachers of mathematics or science. Students gain an understanding of effective, research-based teaching strategies for grades 6-8. Includes supervised field experience in a middle school classroom.

Prerequisite: PHY SCI 5.

Same as BIO SCI 101.

Restriction: School of Physical Sciences, School of Biological Sciences, School of Information and Computer Sciences, and School of Engineering majors have first consideration for enrollment.

PHY SCI 106. California Teach 3: High School Science and Mathematics Teaching. 2 Units.
Capstone of a series of three seminars for students interested in becoming secondary mathematics or science teachers. Meets six times for students to understand effective, research-based teaching strategies. Includes an opportunity to experience teaching in a high school.

Prerequisite: (PHY SCI 5 or BIO SCI 14) and (PHY SCI 105 or BIO SCI 101).

Same as BIO SCI 102.

Restriction: School of Physical Sciences, School of Biological Sciences, School of Information and Computer Sciences, and School of Engineering majors have first consideration for enrollment.

PHY SCI 139. Technical Writing and Communication Skills. 4 Units.
Workshop in writing technical reports, journal articles, proposals. Oral presentations. Communicating with the public. May not be used in satisfaction of any School or departmental requirement.

Prerequisite: Satisfactory completion of the Lower-Division Writing requirement.

Restriction: Upper-division students only. School of Physical Sciences majors have first consideration for enrollment.

PHY SCI 139W. Technical Writing and Communication Skills. 4 Units.
Workshop in writing technical reports, journal articles, proposals. Oral presentations. Communicating with the public. May not be used in satisfaction of any School or departmental requirement.

Prerequisite: Satisfactory completion of the Lower-Division Writing requirement.

Restriction: Upper-division students only. School of Physical Sciences majors have first consideration for enrollment.