INTRODUCTION

The philosophy of the Science Education Program is based on the belief that teachers play a preeminent role in the science educational process. We prepare teachers to have confidence in their own abilities to access resources and gain the understanding that they need to help individual students become more scientifically literate. We also believe that effective science content preparation is critical in preparing teachers who are able to transform the science content knowledge that they learn in their courses into pedagogical content knowledge that can be taught to others. This process of transformation encompasses all aspects of instruction and evaluation nexus. The science education faculty agrees that teachers must be open and interested in new ideas. They engage in their own inquiry as co-investigators with students who learn science through multiple methods, including inquiry. We support teachers who, as active, alert members of their school community, help the next generation become effective and positive contributors to a diverse society. The Science Subject Matter Preparation Program plays a vital role in preparing future teachers who are steeped in these philosophies and beliefs. The mission of the Science Education Program is to prepare students who are competent in subject matter content to teach science at the elementary and secondary levels. We provide guidance and support for beginning and experienced teachers in the study and use of educational practices developed for teaching science, as well as helping these teachers develop original ideas as they relate to their areas of specialization. The program’s primary goal is to address the special needs of pre-service and in-service science teachers.

MINOR IN NATURAL SCIENCES (21 UNITS)

The Minor in Natural Sciences enables students to gain an understanding in several scientific areas and have a more comprehensive appreciation of the natural sciences by taking courses in at least three different science disciplines. It offers prospective elementary and middle school teachers, as well as majors in other fields such as communications, business and computer science, a program that will familiarize them with the most important ideas and problems in the sciences. The minor also meets the requirements for a supplemental credential for prospective elementary teachers and prepares candidates for the CSET subtests for the Foundational Level General Science Credential. The mission of the Science Education Program is to prepare students who are competent in subject matter content to teach science at the elementary and secondary levels. We provide guidance and support for beginning and experienced teachers in the study and use of educational practices developed for teaching science, as well as helping these teachers develop original ideas as they relate to their areas of specialization. The program’s primary goal is to address the special needs of pre-service and in-service science teachers.

Lower-Division Courses (9-11 units)

Students choose at least three units from each category listed below. The selection must include an asterisk (*) course from Life Science and a second asterisk (**) course from either Physical Sciences or Earth/Astronomical Sciences. (Note that with the exception of GEOL 102, BIOL 102 and PHYS 102, all asterisk courses have either a required prerequisite or corequisite.)

ADMINISTRATIVE CONTACT
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PROGRAMS OFFERED
Master of Arts in Teaching Science (MAT-S)
Single Subject (7-12) Credential in:
- Biological Sciences, Biological Sciences Specialized, Chemistry, Chemistry Specialized, Geosciences, Geosciences Specialized, Physics, Physics Specialized, Foundational Level General Science
Introductory Subject Matter Authorization: Science (K-9)
Minor in Natural Sciences

FACULTY
Joel Abraham (Biological Science), Monica Azimioara (MAT-S), Tara Barnhart (Secondary Education), Galen Carlson (Geological Sciences), Barbara Gonzalez (Chemistry and Biochemistry), Maria Grant (Secondary Education), William Hoese (Biological Science), Phil Janowicz (Chemistry and Biochemistry), Jeff Knott (Geological Sciences) Michael Loverude (Physics), Megan Tommerup (Biological Science), Natalie Tran (Secondary Education), Sean Walker (Biological Science)
Earth/Astronomical Sciences
GEOL 101, 101L*, 102*
PHYS 120

Life Science
BIOL 101, 101L*, 102*

Physical Sciences
CHEM 100, 100L*, 105, 111, 115, 120A*, 120B
CHEM/PHYS 102*
PHYS 101, 101L*, 211, 211L*, 212

Upper-Division Courses (12 units)
Students take at least two units from each of three different course groups. The Natural Sciences Minor adviser must approve course selection.

Biological Science
BIOL 305, 306, 310, 311, 318, 319, 330, 352, 360, 409, 453

Chemistry and Biochemistry
CHEM 303A,B,C (1 unit each), 311, 313A,B,C (1 unit each)

Geological Science
GEOL 310T, 410, 420

Physics
PHYS 301

Teacher Education Core Courses
BIOL 453
GEOL 410
SCED 495A

SCIENCE COURSEWORK FOR ELEMENTARY TEACHERS
Science coursework for elementary teachers is designed to deepen the skills and knowledge of future K-8 teachers in the areas of scientific content, scientific processes, and investigation and experimentation in the physical sciences (GEOL 410 Physical Science/Earth Systems and GEOL 420 Earth Science for Science Teachers) and the biological sciences (BIOL 453 Life Science Concepts).

INTRODUCTORY SUBJECT MATTER AUTHORIZATION: SCIENCE
Introductory subject matter authorization: science is an additional authorization that may be added to an existing credential. It authorizes the credential holder to teach introductory courses in science, K-9th grades. It is not a separate credential, but is in addition to a pre-existing Single or Multiple Subject Credential. Non-remedial collegiate coursework in science totaling 32 semester or 48 quarter hours is required, including a minimum of six semester or eight quarter hours in each of four content areas.

SINGLE SUBJECT TEACHING CREDENTIAL
Single Subject Teaching Credential in Biological Sciences, Chemistry, Geosciences, Physics and Foundational Level General Science (7-12) is an interdisciplinary program that connects the three main elements of teacher training (subject matter preparation, pedagogical training and field experience) between the Science Education Program, Department of Secondary Education and local school districts. The Credential Program is organized around the California Teaching Performance Expectations and includes subject matter preparation, prerequisite education coursework and credential coursework.

To earn a secondary science teaching credential, candidates must:
- Demonstrate subject matter competency
- Complete a program of professional preparation

The California Commission on Teacher Credentialing authorizes nine different science credentials that authorize service in pre-school, grades 12 and under, and in classes organized for adults. Each credential requires demonstration of subject matter competence through completion of specific undergraduate or graduate degrees OR successful passage of several subtests of the California Science Examination for Teachers (CSET) in Science. Candidates with a regular credential in a science area are authorized to teach in their specific discipline, as well as general and integrated science, including middle school science. Candidates with a Specialized credential in a science area are authorized to teach only in their specific discipline.

The Single Subject Science Credential Program is administered jointly with the Department of Secondary Education. See additional program information, including the Internship Program, under that Department.

Prerequisite Courses
EDSC 304 Educational Technology for Secondary Teachers (3)
EDSC 310 The Teaching Experience: Participation (3)
EDSC 320 Adolescence and Education (3)
EDSC 330 Developing Literacy in Secondary Schools (3)
EDSC 340 Student Diversity in Secondary Schools (3)

Preservice Course Required of all Intern Candidates
EDSC 400 Methods for Internship Credential Candidates (3)

Extern Semester (First Semester)
EDSC 410 Teaching English Learners in Secondary Schools (3)
EDSC 440F Supervised Fieldwork in Secondary Schools (2)
EDSC 440S General Pedagogy of Secondary School Teaching (4)
SCED 442 Teaching Science in Secondary Schools (3)
SCED 449E Externship in Secondary Teaching – Science (3)

Note: EDSC 440F, EDSC 440S, SCED 442 and SCED 449E must be taken concurrently. Enrollment in these courses is based on admission to the Single Subject Credential Program. Fieldwork associated with these courses requires daily observations and co-teaching in public school classrooms for an 18-week period. See additional information on admission requirements and coursework descriptions under the Department of Secondary Education.

Student Teacher Semester (Second Semester)
EDSC 460 Teaching Assessment Seminar (3)
SCED 449I Internship in Secondary Teaching – Science (10)
SCED 449S Seminar in Secondary Teaching – Science (3)

Note: EDSC 460, SCED 449I and SCED 449S must be taken concurrently. Enrollment in these courses is based on successful completion of first semester coursework. Fieldwork associated with these courses requires daily co-teaching in public school classrooms for an 18-week period. See additional information on coursework descriptions under the Department of Secondary Education.

MASTER OF ARTS IN TEACHING SCIENCE (30 UNITS)

The primary objectives of the Master of Arts in Teaching Science are to: provide advanced coursework in science curriculum designs appropriate to the professional responsibilities of science educators; provide research and seminar opportunities in contemporary issues in science education; and enable teachers to become more proficient in science disciplines appropriate to their academic teaching assignments. A secondary track and elementary track are available.

Remaining coursework is selected from the departments of Biological Science, Chemistry and Biochemistry, Computer Science, Geological Sciences, Physics or Science Education and other departments as appropriate. Fifteen units of work are required from the Science Education Program. The graduate work culminates with the student completing a project or thesis in an area of science education that is applicable to the student’s teaching. Faculty from the program and other departments form the committee that guides and evaluates each graduate student.

Admission Requirements

University requirements include a baccalaureate degree from an accredited institution and a grade-point average of at least 2.5 in the last 60 semester units attempted (see section of this catalog on Graduate Admissions for complete statement and procedures). In addition to the university requirements for admission, acceptance in the MAT-S program is contingent upon candidates meeting the following criteria.

1. Candidates must apply to the university through csu.mentor.org, as well as submit the “Application for Admission to the MAT-S Degree Program” to the Science Education Programs Office. The application is available from the Science Education Programs Office at 657-278-2307, MH-527, sciedreceptionist@exchange.fullerton.edu. The Science Education Program application for the MAT-S must include:
   a. two signed letters of recommendation;
   b. a personal resume;
   c. documentation of a teaching credential; and
   d. a Statement of Purpose – one to two pages with information about the candidate’s science area of interest.

2. A teaching credential is normally required for classified standing. In special circumstances, a MAT-S faculty adviser may agree to work with a student who has not completed a teaching credential program. For example, an applicant who teaches in a private school or works in a museum may complete the MAT-S without a teaching credential. In these cases, a MAT-S faculty adviser will write a letter waiving the credential requirement for classified standing.

3. Candidates must complete coursework equivalent to a baccalaureate degree in one of the sciences. (For the elementary track, the baccalaureate degree is not normally in the sciences, but the application must provide evidence of in-depth work within the sciences beyond the minimum requirements for a multiple subject teaching credential.)

4. Candidates must receive acceptance by a faculty project/thesis adviser.

5. The admission decision will be made only after the application file is complete.

Application Deadlines

The deadline for completing online applications is March 1 for the fall semester. (see csumentor.edu) Mailed applications need to be postmarked by the same deadline. However, deadlines may be changed based upon enrollment projections.

Advancement to Candidacy

Advancement to candidacy is attained by requesting a graduation check and receiving subsequent approval of the MAT-S faculty adviser and the MAT-S graduate program adviser on the Grad Check Review Form. This form is mailed to students by the University Graduate Studies Office.
Classified Standing

Students should achieve classified standing as soon as they are eligible. A student who meets the admission standards needs to develop a study plan in consultation with the MAT-S faculty adviser and MAT-S graduate program adviser before nine units of degree coursework has been completed. Classified standing will be granted once the study plan has been reviewed and approved by the MAT-S faculty and the Associate Vice President, Graduate Programs and Research.

Students will be notified by the Graduate Studies Office when the study plan is approved and classified standing is granted. Once the study plan is approved, changes can be made only with the approval of the MAT-S faculty adviser and the MAT-S graduate program adviser.

Study plan

The degree program consists of upper-division or graduate coursework, of which at least half must be 500-level, and be completed with a grade point average of 3.0 or better. Students will choose one of the following tracks:

1. Secondary Track – 15 units will be in the sciences and other departments, in upper-division and graduate courses. At least nine units will be taken in one of the following: biology, chemistry, computer science, geological sciences or physics; or
2. Elementary Track – 15 units in upper-division and graduate courses. Electives will be chosen from biology, chemistry, computer science, geological sciences, physics or science education.

Students must also complete the following 15 units:

Core Courses

SCED 550 Theoretical Designs in Science Education (3)
SCED 552 Review of Research in Science Education (3)*
SCED 554 Issues in Science Education (3)

Culminating Experience

SCED 598 Thesis (6)
OR SCED 597 Project (3) and SCED 599

Independent Graduate Research (3)

For further information and advisement, consult the graduate program adviser or Director of Science Education Programs.

*Meets the Graduate Level Writing Requirement.

SCIENCE EDUCATION COURSES

Courses are designated as SCED in the class schedule.

110 The Teaching Experience: Exploration (2-3)
(Same as EDSC/SPED 110)

412 Processes of Science (3)
Prerequisite: junior or senior standing in a science major or admission to the MAT-Science graduate program. Methodologies (action research), logical procedures and explanatory systems that characterize the various natural sciences. Role of science and technology in society. (2 hours lecture, 1 hour activity, 1 hour to be arranged)

442C Teaching Science in the Secondary School (3)
Prerequisite: appropriate education and science education coursework for credential. Curricular objectives, methods and materials, including audiovisual instruction for teaching science. Required before student teaching for candidates for the single subject teaching credential in either the life sciences or the physical sciences. A "B-" (2.7) or better is required to earn a preliminary Single Subject credential. (2 hours lecture, 2 hours activity) (Same as EDSC 442C)

449E Externship in Secondary Teaching (3)
Prerequisite: SCED 412 (may be taken concurrently) (See description under Secondary Education)

449I Internship in Secondary Teaching (10)
(See description under Secondary Education)

449S Seminar in Secondary Teaching (3)
(See description under Secondary Education)

495A Internship (3)
Prerequisite: consent of instructor. Supervised field experience permitting application of science education in research, industry and educational settings. For current and prospective science teachers. Periodic class meetings and field experience log and summary are required. One or more sections offered online.

495B Internship (3)
Prerequisite: consent of instructor. Supervised field experience permitting application of science education in research, industry and educational settings. For current and prospective science teachers. Periodic class meetings and field experience log and summary are required.

499 Independent Study (1-3)
Special topics in science education, selected by consultation and completed under the supervision of the instructor. May be repeated for credit.
501 Introduction to Graduate Studies in Science Education (1)
Graduate studies in science education. Prepare a program plan. Overview of library and Web-based resources. Must have capacity for electronic communication, including e-mail, attachments and web courseware. Credit/no credit only.

550 Theoretical Designs in Science Education (3)
Review of major directions, designs and assumptions of science education reform such as the nature of science and scientific inquiry, scientific literacy, the National Science Education Standards, state curricular frameworks, standards and international and national science assessment. How reform affects curriculum, major curricular projects and curricular evaluation. One or more sections offered online.

552 Review of Research in Science Education (3)
Prerequisite: graduate standing. Review of relevant literature that provides the foundation for modern reform in science education. Analyses of research design and execution of appropriate experimental or observational procedures to test hypotheses concerning problems in science education.

554 Issues in Science Education (3)
Prerequisite: graduate standing. Major contemporary issues in science education. One or more sections offered online.

597 Project (1-3)
Prerequisites: advancement to candidacy and an appointed thesis committee. Corequisite: SCED 599 (3 units). Selection, investigation and written presentation of a project in science education.

598 Thesis (1-6)
Prerequisites: advancement to candidacy and an appointed thesis committee. Selection, investigation and written presentation of an experimental problem in science education.

599 Independent Graduate Research (1-3)
Graduate student research in a specific area of science education. May be repeated for credit.