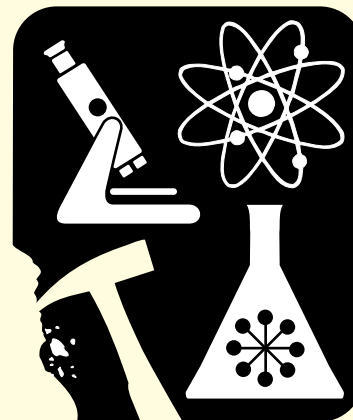


SCIENCE SUBJECT MATTER PROGRAM



BACHELOR OF ARTS

PROGRAM DESCRIPTION

The Science Subject Matter Program, with concentrations in either Biological Sciences, Chemistry, Geosciences or Physics, leads to a BA degree in the area of concentration and meets the latest subject matter requirements of the California Commission on Teacher Credentialing (CTC) for subject-matter preparation of teachers of Natural Science at the general science level and in the student's area of concentration at the advanced high school level. In order to obtain a California Teaching Credential a program of professional Education preparation is required in addition to the Subject Matter Program. A typical credential might read, for example, SCIENCE: Concentration Chemistry.

A grade of at least a "C-" and an overall GPA of 2.7 in all courses in the Science Subject Matter Program are required for admission to the Teacher Education Program. It is recommended that all course work for the Subject Matter Program be completed before starting the Teacher Education Program. At least 15 units of the course work or equivalent work experience must be current, i.e. completed within the past six years.

It is also possible to obtain admission to the Teacher Education program by passing a series of subject-matter examinations specified by the CTC in lieu of this Science Subject Matter Program. For information about this option contact the Teacher Preparation Program Office Education Bldg., room 216.

A student who has completed one or more courses in the previous "waiver" program (refer to the 1994-96 Catalog) before January 1, 1995, may complete that program and qualify for entry to the credential program in the School of Education provided all requirements for the "waiver" program (not education course work) are completed by January 1, 1998. In consultation with an advisor in the department of their major, students should determine whether or not they will be certified under an old "waiver" program or this new Science Subject Matter program, keeping in mind that the January 1, 1998 cut off date is firm and will be strictly enforced by the CTC.

FEATURES

At CSUS all four science departments have strong BA and BS programs supported by an active faculty and with modern laboratory facilities. The departments are committed to the education and development of new science teachers and have a solid record of providing professional activities and support for local experienced teachers through the work of the SCATS (Schools and Colleges for Advancing the Teaching of Science) Center.

This subject matter program is based on the concept that, if well educated science majors pursue teaching careers in K-12 education, science instruction will improve. To this end the CSUS Science Subject Matter Program embodies the following features. The program:

- emphasizes breadth in all four of the sciences. All credential candidates will complete a full year or more of laboratory-based science in each of the natural sciences.
- requires depth of study in one of the natural sciences. All credential candidates must complete the BA requirements in one of the natural sciences. Through deeper study of science, credential candidates become learners in the discipline and develop the ability to be creative teachers and models for their students.
- emphasizes laboratory and field work so that credential candidates learn to use the many tools of science including computers. This will enable them to develop laboratory programs and structure field experiences for students in their schools.
- emphasizes science for all students. The departments recognize the need to have programs which address the needs of underrepresented groups in science; women, African-Americans, American Indians, and Hispanics. The SEE (Science Education Equity) Office and the SCATS Center encourage and enable these student groups to be successful in science and to consider careers in education.

Credential candidates who complete this subject matter program in the sciences will have gained the confidence and ability to do science. They will understand that science is not just a collection of facts to be memorized but a creative and dynamic process which when applied can lead to understanding and appreciation of the natural world. This attitude will be reflected in their classrooms and will make them good models for pre-college students.

FACULTY

Science majors who intend to pursue a teaching credential should see a faculty advisor or the department chair in the department of their academic major. It is recommended that they do so early as it is critical that their science course work be carefully planned and coordinated with the professional teacher preparation program. In addition students are encouraged to become involved with education related activities like grading, assisting in labs, tutoring K-12 students, visiting schools, and actually teaching; all experiences that can be arranged through your advisor and the SCATS Center.

Biology:

Dr. Laurel Heffernan, *Department Chair*
Department Office, SCI-202, 278-6535

Dr. Tom Kantz, *Advisor*
SCI-532, 278-6125
(ptkantz@csus.edu)

Dr. Gary Meeker, *Advisor*
SCI-214, 278-6707
(gmeeker@csus.edu)

Chemistry:

Dr. James Hill, *Department Chair*
Department Office, SCI-506, 278-6684
(hilljames@csus.edu)

Dr. Londa Borer, *Advisor*
SCI-514, 278-6712
(borerl@csus.edu)

Geology:

Dr. Diane Carlson, *Department Chair*
Department Office, SCI-226, 278-6337

Dr. Judi Kusnick, *Advisor*
SCI-406, 278-6667
(kusnickje@csus.edu)

Dr. Greg Wheeler, *Advisor*
SCI-226, 278-6337
(wheelergr@csus.edu)

Physics:

Dr. Charles Newcomb, *Department Chair*
Department Office, SCI-230, 278-6518
(newcombc@csus.edu)

Dr. Michael Shea, *Advisor*
SCI-139, 278-6540
(sheamj@csus.edu)

School of Education:

Teacher Preparation Program Office,
ED-216, 278-6174

SCATS Center:

Dr. Thomas Smithson, *Director*
SCI-124, 278-5487

CAREER POSSIBILITIES

Middle School Science Teacher, High School Teacher of General Science and Biology, Chemistry, Geoscience, or Physics depending on choice of major.

BIOLOGICAL SCIENCES

SUBJECT MATTER PROGRAM (Pre-Credential Preparation)

Total units required for BA: 124

Total units required for Subject Matter Program: 72

This subject matter program provides the minimum preparation for biology students interested in the single subject teaching credential in the sciences with a concentration in biology. This program meets the standards for academic preparation set by the California Commission on Teacher Credentialing and qualifies students to teach general science covering all four natural sciences and biology at the high school level.

A. Required Lower Division Core Courses (45 units)

- | | | |
|-------|------------------------------|---|
| (3) | BIO 10 | Basic Biological Concepts |
| (4) | BIO 11 | Animal Biology (BIO 10) |
| (4) | BIO 12 | Plant Biology (BIO 10) |
| (5) | CHEM 1A | General Chemistry |
| (5) | CHEM 1B | General Chemistry (CHEM 1A) |
| (3) | CHEM 20 | Organic Chemistry Lecture (CHEM 1B) |
| (4) | PHYS 5A | General Physics: Mechanics, Heat, Sound (MATH 9 or three years high school math or qualifying exam) |
| (4) | PHYS 5B | General Physics: Light, Electricity & Magnetism, Modern Physics (PHYS 5A) |
| (3) | GEOL 10 | Physical Geology |
| (1) | GEOL 10L | Physical Geology Lab |
| (3) | GEOL 12 | Historical Geology |
| (3) | ASTR 4 | Introduction to Astronomy |
| (3-4) | Select one of the following: | |
| | MATH 26A | Calculus I for the Social & Life Sciences (MATH 11 or three years high school math) |
| | MATH 29 | Pre-Calculus Mathematics (MATH 11 or three years high school math) |
| | MATH 30 | Calculus I (MATH 29) |

B. Required Upper Division Core Courses (16 units)

- | | | |
|-----|----------|---|
| (3) | BIO 121 | Cellular Physiology (BIO 11, 12, CHEM 161) |
| (4) | BIO 139 | General Microbiology (BIO 11, 12 and CHEM 20) |
| (3) | BIO 160 | General Ecology (BIO 11 and 12) |
| (3) | BIO 184 | General Genetics (BIO 11, 12 and 139) |
| (3) | CHEM 161 | General Biochemistry (CHEM 20 or 124) |

Notes:

- CHEM 161 is not counted toward the 24 upper division unit requirement in the major.
- CHEM 160A and 160B may be taken in lieu of CHEM 161. Three units may be counted toward the 24 upper division unit requirements for the major.
- BIO 106, 107 and 108 are not acceptable toward a BA in biological sciences.

C. Upper Division Electives (11 units)

Select eleven (11) upper division biology units in consultation with an advisor. Upper division electives in biological sciences must include one course in plant biology and one course in animal biology.

CHEMISTRY

SUBJECT MATTER PROGRAM (Pre-Credential Preparation)

Total units required for the BA: 124

Total units required for the Subject Matter Program: 85

This subject matter program provides the minimum preparation for chemistry majors interested in pursuing the single subject teaching credential in the sciences with a concentration in chemistry. This program meets the standards for academic preparation set by the California Commission on Teacher Credentialing and qualifies students to teach general science in all the four natural sciences and chemistry at the high school level.

Note: A minimum grade "C-" is required in all courses required for the Chemistry major. Grades below "C-" in prerequisite courses do not satisfy prerequisite requirement.

A. Required Lower Division Core Courses (61 units)

- (3) ASTR 4 Introduction to Astronomy
- (3) BIO 10 Basic Biological Concepts
- (4) BIO 11 Animal Biology
- (4) BIO 12 Plant Biology
- (5) CHEM 1A General Chemistry
- (5) CHEM 1B General Chemistry
- (3) CHEM 24 Organic Chemistry Lecture
- (3) CHEM 25 Organic Chemistry Lab
- (3) CHEM 31 Inorganic Quantitative Analysis
- (3) GEOL 10 Physical Geology
- (1) GEOL 10L Physical Geology Lab
- (3) GEOL 12 Historical Geology
- (4) MATH 30 Calculus I
- (4) MATH 31 Calculus II
- (4) MATH 32 Calculus III
- (4) PHYS 5A General Physics
- (4) PHYS 5B General Physics

B. Required Upper Division Courses (24 units)

- (3) CHEM 124 Organic Chemistry Lecture
- (3) CHEM 140A Physical Chemistry Lecture
- (3) CHEM 140B Physical Chemistry Lecture
- (3) CHEM 141 Physical Chemistry Lab
- (12) Additional courses to a minimum of 24 upper division units in Chemistry including two lecture courses and two laboratory courses. Elective courses should be selected in consultation with an advisor.

GEOSCIENCES

SUBJECT MATTER PROGRAM (Pre-Credential Preparation)

Total units required for the BA: 124

Total units required for the Subject Matter Program: 79-82

The subject matter program provides the minimum preparation for geology majors interested in pursuing the single subject teaching credential in the sciences with a concentration in the geosciences. This program meets the standards for academic preparation set by the California Commission on Teacher Credentialing and qualifies students to teach all four of the natural sciences and the geosciences at the high school level.

A. Required Lower Division Core Courses (43-46 units)

- (3) ASTR 4 Introduction to Astronomy
- (3) BIO 10 Basic Biological Concepts
- (4) BIO 11 Animal Biology
- (4) BIO 12 Plant Biology
- (5) CHEM 1A General Chemistry
- (5) CHEM 1B General Chemistry
- (3) GEOL 10 Physical Geology
- (1) GEOL 10L Physical Geology Lab
- (3) GEOL 12 Historical Geology
- (4) MATH 30 Calculus I **OR**
- MATH 29 Pre-Calculus **AND**
- MATH 26A Calculus I
- (4) PHYS 5A General Physics
- (4) PHYS 5B General Physics

B. Upper Division Courses (36 units)

- (4) GEOL 100 Mineralogy
- (1) GEOL 101 Techniques in Field Geology
- (3) GEOL 102 Igneous Petrology
- (3) GEOL 103 Sedimentary Petrology
- (2) GEOL 104 Metamorphic Petrology
- (3) GEOL 105 Paleontology
- (3) GEOL 107 Applied Geology
- (3) GEOL 110 Structural Geology
- (2) GEOL 111 Field Methods
- (3) GEOL 112 Basic Principles of Geophysics & Geochemistry
- (3) GEOL 115 Stratigraphy
- (2) GEOL 119 Field Mapping
- (1) GEOL 120 Applied Geomorphology
- (3) Elective

Note: Attendance at 16 colloquia, verified by faculty signature, is required.

PHYSICS

SUBJECT MATTER PROGRAM (Pre-Credential Preparation)

Total units required for the BA: 124

Total units required for the Subject Matter Program: 87

The subject matter program provides the minimum preparation for physics majors interested in pursuing the single subject teaching credential in the sciences with a concentration in physics. This program meets the standards for academic preparation set by the California Commission on Teaching Credentialing and qualifies students to teach all four of the natural sciences and physics at the high school level.

A. Required Lower Division Courses (59 units)

- (3) ASTRO 4 Introduction to Astronomy
- (1) ASTRO 6 Astronomical Observation
- (3) BIO 10 Basic Biological Concepts
- (4) BIO 11 Animal Biology
- (4) BIO 12 Plant Biology
- (5) CHEM 1A General Chemistry
- (5) CHEM 1B General Chemistry
- (3) GEOL 10 Physical Geology
- (1) GEOL 10L Physical Geology Lab
- (3) GEOL 12 Historical Geology
- (4) MATH 30 Calculus I
- (4) MATH 31 Calculus II
- (4)* MATH 32 Calculus III
- (3)* MATH 45 Differential Equations
- (4) PHYS 11A General Physics
- (4) PHYS 11B General Physics
- (4) PHYS 11C General Physics

B. Upper Division Courses (28 units)

- (3) PHYS 105 Mathematical Methods in Physics
- (3) PHYS 106 Modern Physics
- (3) PHYS 110 Intermediate Mechanics
- (4) PHYS 115A Introduction to Electric & Electronic Measurements
- (3) PHYS 124 Thermodynamics & Statistical Mechanics
- (3) PHYS 135 Electricity & Magnetism
- (2) PHYS 175 Advanced Physics Laboratory
- (1) PHYS 190 Seminar
- (6) Electives

Note: Elective courses must be selected in consultation with the credential advisor.