

NATURAL SCIENCES

Program in Natural Sciences

School of Natural Sciences, Mathematics, and Engineering

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The Departments of Biology, Chemistry, Geology, and Physics offer a Bachelor of Science in Natural Sciences. This degree program offers the required subject matter content to prepare prospective science teachers to apply for subject matter certification in California by taking the California Subject Matter Examinations for Teachers (CSET) in Science.

The core courses in the BS in Natural Sciences offer a broad foundation in all four of the natural science areas (Biology, Chemistry, Geology, and Physics) and Mathematics. The disciplinary concentrations add depth preparation in one of the four areas, while the foundational science concentration adds credential coursework to this foundation. While this broad foundation has been developed for prospective teachers, it also serves as excellent preparation for employment in any area of business, industry or government where scientific skills are in demand. Please be aware that several courses in the core may require satisfactory scores on placement tests or completion of prerequisite courses.

The disciplinary concentrations in the BS in Natural Sciences consist of two components: I. Core Coursework, which all students complete, includes all four sciences and mathematics. II. A Concentration consisting of additional courses within a specific science discipline (Biology, Chemistry, Geology or Physics).

The disciplinary concentrations prepare the candidate for the CSET Science exams, which consist of three exams: two covering breadth in science (Life Science, Chemistry, Earth and Planetary Science, and Physics), and one covering depth in one of these areas, corresponding to the concentration. Passage of the CSET in science is required to certify subject matter competency before entering a teacher credential program. Consult your advisor or the Department of Education for details on other entry requirements for pursuing a secondary teaching credential.

Students are also encouraged to complete a minor in a second science, mathematics or applied statistics. For students pursuing science minors, 2 courses (eight units) from the core, in the same discipline as the minor, will be counted towards the minor. Minors are highly recommended. Additional subject matter competency can be established via the CSET in the area of the minor, increasing versatility and job prospects of the prospective teacher.

The foundational science concentration requires the same core coursework as the disciplinary concentrations, but the disciplinary concentration is replaced by teaching credential coursework. It has been developed for individuals seeking the Foundational Science Credential for Middle School and Junior High School science teachers.

The Foundational Science Concentration prepares the candidate for the CSET exams in Foundational Science, which consist of 2 exams covering breadth in science (Life Science, Chemistry, Earth and Planetary Science and Physics). This allows students to earn the foundational science credential in a blended, 4-year program including both science and credential coursework. Please be advised that the foundational science credential is intended only for teaching in grades 6-8. Additional appropriate post-baccalaureate coursework and CSET exams can be taken to add an authorization for High School level single subject certification.

Prerequisite/Foundational credential courses should be taken during the junior year. Other credential coursework should not be started until the senior year in most cases. The CSET exams must be passed before beginning Semester 1 credential coursework. Please consult an advisor for help with CSET and credential planning.

Requirements for the Bachelor of Science Degree in Natural Sciences

I. Core Coursework (46-50 units)

Life Science (12 units)

BIOL 2010, 2110, and 2120

Chemistry (11 units)

CHEM 1000, 1001, 1100, 1600, and 2300

Earth and Planetary Science (11 units)

GEOL 2010 and 2040 and one of PHYS 1609 or GEOL 3080

Mathematics (4-10 units)

MATH 1050 or Satisfaction of the Entry Level Mathematics requirement and either (a) a passing score on the PCRT2, or (b) an appropriate score on the UC/CSU MDPT Calculus Readiness Test.

One of MATH 2010¹, 2200 or 2510²

Physics (8-12 units)

One physics sequence: either PHYS 2110 and 2120 or PHYS 2210² and 2220² and 2230²

¹ Required for the Biology and Chemistry Concentrations

² Required for the Physics Concentration

II. Concentrations—Select one

Biology Concentration (32 units)

BIOL 3010, 3020, 3110, 3120, 3410, 4100, and 4910

Human Physiology: BIOL 2220 or 3550

One elective chosen from: MATH (2020 or higher), BIOL 2210, or any BIOL 3220 or Higher (≥ 3 units)

One Biology elective 4200 or Higher (≥ 4 units)

Chemistry Concentration (31 units)

MATH 2020

CHEM 2200, 2400, 2840 and 2900

CHEM 3100, 3300, 3301, 3600, 3900, 4830, 4840 and 4900

Geology Concentration (32 units)

GEOL 3010, 3020, 3030, 3040, 3070, 3090 and 4908

Upper division GEOL electives: ≥ 4 units

Physics Concentration (28 units)

MATH 2520 and 2530

PHYS 2070

PHYS 3010, 3070, 3500, 3510 and 4900

Upper division PHYS electives: ≥ 4 units

Foundational Science Concentration (43-46 units)

Foundational/prerequisite courses: EDTE 3000 or 3100, 3308 and 4100

Semester I: EDSE 5100, 5210, 5300; EDTE 4310 and 4320

Semester II: EDSE 5400, 5500; EDTE 4200, 4330, 4340; and either EDTE 5800 or EDSE 5800

Senior Seminar: SCI 4110

Requirements for the Bachelor of Science Degree in Natural Sciences: Biology Concentration

Total Units Required for Graduation **120 units**

Major Requirements **78 units**

Core Curriculum 46

Biology Concentration 32

Minor Requirement **0 units**

General Education Requirements **39 units**

First-Year Seminar 2

LD Area A Foundational Skills 9*

LD Area B Natural Sciences 0*

LD Area C Arts and Humanities 6

LD Area D Social and Behavioral Sciences 6

American Institutions 6

SELF 0

Junior Year Diversity Requirement 3

UD Thematic Areas C and D 6

Capstone 1

GWAR (Exam) or Class 0-3**

Additional Units **3 units**

*Some major requirements may be used to satisfy GE: GEOL 2010 satisfies Area B1; BIOL 2010 satisfies Area B2; CHEM 1001 Satisfies Area B3; MATH 2010, satisfies the Quantitative Reasoning Foundational Skill (Area A4).

**The SELF Requirement is met by completing a LD Area B, C or D course with a SELF component. The GWAR may be satisfied by either an exam or by taking a GWAR-approved course.

Requirements for the Bachelor of Science Degree in Natural Sciences: Chemistry Concentration

Total Units Required for Graduation **120 units**

Major Requirements **77 units**

Core Curriculum 46

Chemistry Concentration 31

Minor Requirement **0 units**

General Education Requirements **39 units**

First-Year Seminar 2

LD Area A Foundational Skills 9*

LD Area B Natural Sciences 0*

LD Area C Arts and Humanities 6

LD Area D Social and Behavioral Sciences 6

American Institutions 6

SELF 0**

Junior Year Diversity Requirement 3

UD Thematic Areas C and D 6

Capstone 1

GWAR (Exam) or Class 0-3**

Additional Units **4 units**

*Some major requirements may be used to satisfy GE: GEOL 2010 satisfies Area B1; BIOL 2010 satisfies Area B2; CHEM 1001 satisfies Area B3; MATH 2010 satisfies the Quantitative Reasoning Foundational Skill (Area A4).

**The SELF Requirement is met by completing a LD Area B, C or D course with a SELF component. The GWAR may be satisfied by either an exam or by taking a GWAR-approved course.

Requirements for the Bachelor of Science Degree in Natural Sciences: Geology Concentration

Total Units Required for Graduation **120 units**

Major Requirements **78 units**

Core Curriculum 46

Geology Concentration 32

Minor Requirement **0 units**

General Education Requirements **39 units**

First-Year Seminar 2

LD Area A Foundational Skills 9*

LD Area B Natural Sciences 0*

LD Area C Arts and Humanities 6

LD Area D Social and Behavioral Sciences 6

American Institutions 6

SELF 0**

Junior Year Diversity Requirement 3

UD Thematic Areas C and D 6

Capstone 1

GWAR (Exam) or Class 0-3**

Additional Units **3 units**

*Some major requirements may be used to satisfy GE: GEOL 2010 satisfies Area B1; BIOL 2010 satisfies Area B2; CHEM1001 satisfies Area B3; MATH 2010, 2200 or 2510 satisfies the Quantitative Reasoning Foundational Skill (Area A4).

NATURAL SCIENCES

**The SELF Requirement is met by completing a LD Area B, C or D course with a SELF component. The GWAR may be satisfied by either an exam or by taking a GWAR-approved course.

Requirements for the Bachelor of Science Degree in Natural Sciences: Physics Concentration

Total Units Required for Graduation	120 units
Major Requirements	78 units
Core Curriculum	50
Physics Concentration	28
Minor Requirement	0 units
General Education Requirements	36 units
First-Year Seminar	2
LD Area A Foundational Skills	6*
LD Area B Natural Sciences	0*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	3
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0-3**
Additional Units	6 units

**Some major requirements may be used to satisfy GE: PHYS 2070 satisfies the Critical Reasoning Foundational Skill (Area A3); GEOL 2010 satisfies Area B1; BIOL 2010 satisfies Area B2; CHEM 1001 satisfies Area B3; MATH 2510 satisfies the Quantitative Reasoning Foundational Skill (Area A4).

**The SELF Requirement is met by completing a LD Area B, C or D course with a SELF component. The GWAR may be satisfied by either an exam or by taking a GWAR-approved course

Requirements for the Bachelor of Science Degree in Natural Sciences: Foundational Science Concentration

Total Units Required for Graduation	128 units
Major Requirements	92 units
Core Curriculum	46
Foundational Science Concentration	46
Minor Requirement	0 units
General Education Requirements	36 units
First-Year Seminar	2
LD Area A Foundational Skills	9*
LD Area B Natural Sciences	0*
LD Area C Arts and Humanities	6
LD Area D Social and Behavioral Sciences	6
American Institutions	6
SELF	0**
Junior Year Diversity Requirement	0*
UD Thematic Areas C and D	6
Capstone	1
GWAR (Exam) or Class	0-3**
Additional Units	0 units

*Some major requirements may be used to satisfy GE: GEOL 2010 satisfies Area B1; BIOL 2010 Satisfies Area B2; CHEM 1001 Satisfies Area B3; MATH 2010, 2200 or 2510 satisfies the Quantitative Reasoning Foundational Skill (area A4); EDTE 3308 satisfies the JYDR requirement.

**The SELF Requirement is met by completing a LD Area B, C or D course with a SELF component. The GWAR may be satisfied by either an exam or by taking a GWAR-approved course

See appropriate links at <http://www.csub.edu/academicprograms/> for current lists of courses satisfying university-wide General Education requirements.

Requirements for Optional Minors

Recommended optional minors: The following minors are recommended for prospective science teachers.

Applied Statistics minor (16 units)

Please see the Mathematics department for minor requirements of the minor in applied Statistics.

Biology Minor (8 units).

8 upper division units in Biology. Recommended courses: BIOL 3010, 3020, 3100, 3110 or 4100

Chemistry Minor (8 units)

8 upper division units in Chemistry. Recommended courses: CHEM 3100, 3300, 3301, 3600

Geology Minor: (8 units)

8 upper division units in Geology. Recommended courses: GEOL 3010, 3020, 3030, 3040 or 3070

Mathematics Minor (16 units)

Please see the Mathematics department for requirements of the minor in Mathematics.

Physics Minor¹ (8 units)

8 upper division units in Physics. Please note that the statistics minor requires PHYS 2210, 2220, 2230 and MATH 2530. Recommended courses: PHYS 3010, 3500, 3510