BACHELOR OF ARTS IN EARTH SCIENCES

The Bachelor of Arts in Earth Sciences program builds a solid conceptual foundation of basic physical sciences, mathematics, and Earth sciences. Students integrate knowledge of these separate disciplines in ways needed to understand and help solve important interdisciplinary problems, such as slowing and adapting to climate change and managing conflicting demands that humans make on the natural environment. It also prepares students to advise and educate others about issues requiring knowledge of how the Earth works.

Beyond the basic foundation, students have great flexibility to adapt the program to satisfy many possible interests in the Earth sciences and prepare for a variety of careers.

Some career possibilities include:

- High school and middle school science teaching.
- Technical support for firms engaged in environmental engineering, environmental monitoring and protection, natural resource analysis and management, hazardous materials and ecological remediation, computer mapping, etc.
- Technical support to city, county, state, and other governmental agencies charged with land use and other planning.
- Preparation for graduate education in such fields as resource management, environmental public policy, and environmental law.
- Science writing, editing, and librarianship.
- Interpretation for park systems, nature centers, museums, and other areas requiring natural science field skills and natural history communication skills.

Prospective majors are encouraged to consult with a departmental advisor to learn about graduation requirements and to plan a program adapted to their particular interests. Students interested in preparing to teach high school or middle school earth sciences and integrated science should consult with the geosciences single-subject subject-matter advisor.

Program Learning Outcomes

Upon completion of the Bachelor of Arts in Earth Sciences the student will be able to:

1. Conceptualize a set of fundamental processes in the physical earth system, including spatial relationships, temporal change, and how components of the earth system (land, air, and sea) interact.
2. Articulate the process of geoscientific investigation and locate, read, interpret, and evaluate presentations of earth science information in the mass media, in government reports, and in the geosciences literature for their relevance and credibility.
3. Explain relations among earth processes and human actions and how humans across cultures and economic levels can live safely and sustainably on the planet.
4. Communicate earth science concepts and information effectively, both orally and in writing.

Earth Sciences (B.A.) — 49–50 Units

Basic Science and Math Foundation (15–16 Units)

Code	Title	Units
CHEM 115	General Chemistry I: Essential Concepts of Chemistry	5
MATH 226	Calculus I (upon advisement)	3-4
or ERTH 505	Quantitative Methods in Earth Sciences	
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory	4
or PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory	
Chemistry, physics, or mathematics elective (may not be a course designed primarily to satisfy a General Education requirement.)		3

Earth Sciences Foundation (11 Units)

Code	Title	Units
ERTH 205	Techniques in Earth Sciences	2
ERTH 400	Earth Systems I	3
ERTH 500	Earth Systems II	3
ERTH 600GW	Earth's Climate History - GWAR	3

Earth Sciences Electives (19 Units)

- Select at least 19 units of Earth & Climate Sciences (ERTH) or closely related course work, with a coherent theme approved by a Department of Earth & Climate Sciences advisor.
- At least 15 elective units must come from upper-division course work. At least 11 elective units must come from ERTH courses.
- *No more than four of the 19 elective units can come from courses designed primarily to satisfy General Education requirements (such as 100 and 300 level ERTH courses).*

Culminating Experience (4 Units)

Code	Title	Units
ERTH 652	Geoscience Partners in K-12 Education	4
or ERTH 690 & ERTH 695	Earth Sciences Capstone Presentation and Senior Project	

Complementary Studies

The B.A. in Earth Sciences automatically satisfies the Complementary Studies requirement with 12 units from the Basic Science and Math Foundation:

Code	Title	Units
CHEM 115	General Chemistry I: Essential Concepts of Chemistry	5
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory	4
or PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory	
MATH 226	Calculus I (or a chemistry, physics, or math elective (3 units))	4

Students in all Bachelor of Arts programs at SF State must complete at least twelve units of complementary studies, comprising coursework with a prefix outside of the primary prefix for the major. (For the B.A. program in Earth Sciences, that prefix is ERTH.) Students who complete the Earth Sciences B.A. program will have met the Complementary Studies

requirement automatically by completing the mathematics, physics, and chemistry coursework required for the degree.

Transfer students who have earned AA-T or AS-T degrees and are pursuing a similar B.A. degree at SF State are required to fulfill Complementary Studies requirements for their major only if these courses are included in the minimum units required for the major.

General Education Requirements

Requirement	Course Level	Units	Area Designation
Oral Communication	LD	3	A1
Written English Communication	LD	3	A2
Critical Thinking	LD	3	A3
Physical Science	LD	3	B1
Life Science	LD	3	B2
Lab Science	LD	1	B3
Mathematics/ Quantitative Reasoning	LD	3	B4
Arts	LD	3	C1
Humanities	LD	3	C2
Arts or Humanities	LD	3	C1 or C2
Social Sciences	LD	3	D1
Social Sciences: US History	LD	3	D2
Lifelong Learning and Self-Development (LLD)	LD	3	E
Ethnic Studies	LD	3	F
Physical and/or Life Science	UD	3	UD-B
Arts and/or Humanities	UD	3	UD-C
Social Sciences	UD	3	UD-D
SF State Studies			
Courses certified as meeting the SF State Studies requirements may be upper or lower division in General Education (GE), a major or minor, or an elective.			
American Ethnic and Racial Minorities	LD or UD	3	AERM
Environmental Sustainability	LD or UD	3	ES
Global Perspectives	LD or UD	3	GP
Social Justice	LD or UD	3	SJ

Note: LD = Lower-Division; UD = Upper-Division.

First-Time Student Roadmap (4 Year)

Find the correct roadmap (A, B, C, or D):

1. Select the row that matches your English Course choice for A2.*
2. Select the column that matches your QR Category (found at your student center under Math Alert).
3. Click the Roadmap that lines up with your row and column.

For example, if you are taking ENG 104 as your first English course and your student center math alert says you are QR Category III, you should choose Roadmap D.

Course Choice	One-Semester Course	Two-Semester Sequence or Support Course
ENG 114	Roadmap A (http://bulletin.sfsu.edu/colleges/science-engineering/earth-climate-science/ba-earth-sciences/roadmap-i-ii-eng/)	Roadmap C (http://bulletin.sfsu.edu/colleges/science-engineering/earth-climate-science/ba-earth-sciences/roadmap-iii-iv-eng/)
ENG 104/ENG 105	Roadmap B (http://bulletin.sfsu.edu/colleges/science-engineering/earth-climate-science/ba-earth-sciences/roadmap-i-ii-stretch/)	Roadmap D (http://bulletin.sfsu.edu/colleges/science-engineering/earth-climate-science/ba-earth-sciences/roadmap-iii-iv-stretch/)

*Composition for Multilingual Students: If taking ENG 209 as your first English course, choose the ENG 114 row. If taking ENG 204 for your first English course, choose the ENG 104/ENG 105 row.

Transfer Student Roadmap (2 Year)

For students with an AS-T in **Geology**. This roadmap opens in a new tab (http://bulletin.sfsu.edu/colleges/science-engineering/earth-climate-science/ba-earth-sciences/adt-roadmap/).

This degree program is an approved pathway ("similar" major) for students earning the ADT in Geology

California legislation SB 1440 (2009) mandated the creation of the Associate Degree for Transfer (ADT) to be awarded by the California Community Colleges. Two types of ADTs are awarded: Associate in Arts for Transfer (AA-T) and Associate in Science for Transfer (AS-T).

Note: no specific degree is required for admission as an upper-division student. However, the ADT includes specific guarantees related to admission and graduation and is designed to clarify the transfer process and strengthen lower-division preparation for the major.

An ADT totals 60 units and in most cases includes completion of all lower-division General Education requirements and at least 18 units in a specific major. (The Biology, Chemistry, and Environmental Science AS-T degrees defer 3 units in lower-division GE area C and 3 units in lower-division GE area D until after transfer.) Students pursuing an ADT are guaranteed admission to the CSU if minimum eligibility requirements are met, though not necessarily to the CSU campus of primary choice.

Upon verification that the ADT has been awarded prior to matriculation at SF State, students are guaranteed B.A. or B.S. completion in 60 units

if pursuing a “similar” major after transfer. Determinations about “similar” majors at SF State are made by faculty in the discipline.

Degree completion in 60 units cannot be guaranteed when a student simultaneously pursues an additional major, a minor, certificate, or credential.

A sample advising roadmap for students who have earned an ADT and continue in a "similar" major at SF State is available on the Roadmaps tab on the degree requirements page for the major. The roadmap displays:

- How many lower-division units required for the major have been completed upon entry based on the award of a specific ADT;
- Which lower-division requirements are considered complete upon entry based on the award of a specific ADT;
- How to complete the remaining 60 units for the degree in four semesters.

Students who have earned an ADT should seek advising in the major department during the first semester of attendance.

General Advising Information for Transfer Students

1. Before transfer, complete as many lower-division requirements or electives for this major as possible.
2. The following courses are not required for admission but are required for graduation. Students are strongly encouraged to complete these units before transfer; doing so will provide more flexibility in course selection after transfer.
    - a course in U.S. History
    - a course in U.S. & California Government

For information about satisfying the requirements described in (1) and (2) above at a California Community College (CCC), please visit http://www.assist.org (http://assist.org). Check any geographically accessible CCCs; sometimes options include more than one college. Use ASSIST to determine:

- Which courses at a CCC satisfy any lower-division major requirements for this major;
- Which courses at a CCC satisfy CSU GE, US History, and US & CA Government requirements.

Remedial courses are not transferable and do not apply to the minimum 60 semester units/90 quarter units required for admission.

Additional units for courses that are repeated do not apply to the minimum 60 units required for upper-division transfer (for example, if a course was not passed on the first attempt or was taken to earn a better grade).

Before leaving the last California Community College of attendance, obtain a summary of completion of lower-division General Education units (IGETC or CSU GE Breadth). This is often referred to as a GE certification worksheet. SF State does not require delivery of this certification to Admissions, but students should retain this document for verifying degree progress after transfer.

Credit for Advanced Placement, International Baccalaureate, or College-Level Examination Program courses: AP/IB/CLEP credit is not automatically transferred from the previous institution. Units are transferred only when an official score report is delivered to SF State. Credit is based on the academic year during which exams were taken. Refer to the University Bulletin in effect during the year of AP/IB/CLEP examination(s) for details regarding the award of credit for AP/IB/CLEP.

Students pursuing majors in science, technology, engineering, and mathematics (STEM) disciplines often defer 6-9 units of lower-division General Education in Areas C and D until after transfer to focus on preparation courses for the major. This advice does not apply to students pursuing associate degree completion before transfer.

Transferring From Institutions Other Than CCCs or CSUs

Review SF State's lower-division General Education requirements. Note that, as described below, the four basic skills courses required for admission meet A1, A2, A3, and B4 in the SF State GE pattern. Courses that fulfill the remaining areas of SF State’s lower-division GE pattern are available at most two-year and four-year colleges and universities.

Of the four required basic skills courses, a course in critical thinking (A3) may not be widely offered outside the CCC and CSU systems. Students should attempt to identify and take an appropriate course no later than the term of application to the CSU. To review more information about the A3 requirement, please visit bulletin.sfsu.edu/undergraduate-education/general-education/lower-division/#AAEL.

Waiting until after transfer to take a single course at SF State that meets both US and CA/local government requirements may be an appropriate option, particularly if transferring from outside of California.

All Students Must Meet the Transfer Eligibility Requirements Outlined Below for Admission.

For more information, visit the Undergraduate Admissions section (http://bulletin.sfsu.edu/undergraduate-admissions/).

- Complete 60 or more transferable semester units or 90 or more quarter units.
- Earn a college grade point average of 2.0 or better in all transferable courses. Non-local area residents may be held to a higher GPA standard.
- Be in good standing at the last college or university attended.
- Complete 30-semester units (45-quarter units) of General Education, including four basic skills courses:
    a. One course in oral communication (same as CSU GE Area A1)
    b. One course in written composition (same as CSU GE Area A2)
    c. One course in critical thinking (same as CSU GE Area A3)
    d. One course in mathematics or quantitative reasoning (same as CSU GE Area B4)
- The four basic skills courses and a minimum of 60 transferable semester units (90-quarter units) must be completed by the spring semester prior to fall admission, or by the fall semester prior to spring admission. Earn a C- or better grade in each basic skills course.