

# BACHELOR OF SCIENCE IN ENVIRONMENTAL SCIENCE

The Bachelor of Science in Environmental Science is designed for students intending to prepare for graduate school or direct entry into a career as an environmental scientist or environmental manager in industry or government. Entry to the major presupposes prior coursework comprising the high school equivalents of two years of algebra, one year of plane geometry, one-half year of trigonometry, one year of biology, and one year of physics and/or chemistry.

The Environmental Science curriculum comprises a core providing a foundation of science and methods courses—introductory earth systems and environmental science, biology, chemistry, physics, and mathematics—as well as distributed electives in environmental science, environmental management, and analytical methods, and a capstone proseminar. ENV 205 provides introductory research design, statistical and geospatial methods. Geospatial methods are then further developed in GEOG 603, which is a prerequisite for all advanced GIS classes. The GWAR course (ENV 500GW) focuses on the physical and human dimensions of climate change, providing a rich source of topics for composition at the upper-division level.

Student progress toward the degree is aided in that some of these core classes also meet lower-division general education requirements. Students will complete both GE Area 2 (Mathematical Concepts and Quantitative Reasoning) and GE Area 5 (Physical and Biological Sciences) in GEOG 101 or EARTH 112 (Area 5A Physical Science), GEOG 160 (Area 5B Biological Science and Area 5C Laboratory), and MATH 226 (Area 2).

Electives are distributed into three areas:

1. Environmental Systems, including investigations of the atmosphere, hydrosphere, lithosphere, pedosphere (soils), environmental chemistry, and the biosphere;
2. Environmental Management of managed lands and waters, natural resources, threatened species and livable environment; and
3. Analytical Methods, including geographic information science, statistical analysis, and field-based environmental analysis methods.

Through choices in each area, students can tailor their program in a variety of ways, to focus on water, soils and agriculture, biotic systems, restoration science, coastal systems, bioclimatology, pollution management, protected land management, water resources management, or others. The capstone course, ENV 690, prepares students for careers and graduate study.

Students are advised that the CR grade is acceptable in any two courses to be counted for the major. No more than one course counted toward major requirements may be completed with a grade less than a C–.

## Program Learning Outcomes

1. Students will investigate environmental systems from an interdisciplinary perspective including interactions between systems and interactions with human activities.
2. Students will critically evaluate environmental plans, and strategies as well as resource management practices with respect to environmental sustainability and social justice.
3. Students will utilize GIScience techniques to investigate environmental questions.

4. Students will conduct field based sampling and/or observational studies, analyze results and critically evaluate the method.
5. Students will design, conduct and report on independent research projects using appropriate and well-developed methods.

## Environmental Science (B.S.) – 65 units minimum

### Lower-Division Requirements (27-28 units)

Code	Title	Units
Select One:		3
BIOL 150	The World of Plants	
BIOL 170	Animal Diversity	
BIOL 313	Principles of Ecology	
CHEM 180	Chemistry for Energy and the Environment	3
Select One:		3-4
ERTH 112	Our Dynamic Earth Lecture and Lab	
GEOG 101	Our Physical Environment	
Select One:		3
ENVS 130	Environmental Studies	
GEOG 102	The Human Environment	
ENV 205	Our Environment Through Data	3
GEOG 160	Introduction to Environmental Science	4
MATH 226	Calculus I	4
Select One:		4
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory	
PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory	

### Upper-Division Requirements (6 units)

Code	Title	Units
ENV 500GW	Physical and Human Dimensions of Climate Change - GWAR	3
GEOG 603	Introduction to Geographic Information Systems	3

### Capstone (3 units)

Code	Title	Units
ENV 690	Capstone Seminar	3

### Electives (29-32 units)

Distributed between Environmental Systems, Environmental Management, and Analytical Methods:

Code	Title	Units
<b>Environmental Systems</b>		<b>11-12</b>
Select 11-12 units: Allows for one 3-unit course		
CHEM 380	Chemistry Behind Environmental Pollution	3
Select One:		3-4
ERTH 400	Atmosphere and Oceans in the Earth System	
GEOG 313	Earth's Climate System	
ERTH 410	Earthquakes and Volcanoes	3
Select One:		4
ERTH 425	Geomorphology	
GEOG 312	Geography of Landforms	

ERTH 500	Earth and Life Through Time	3
ERTH 515	Sedimentary Materials and Environments	4
ERTH 535	Planetary Climate Change	4
GEOG 314	Bioclimatology	4
GEOG 316	Biogeography	4
GEOG 317	Soils	4
GEOG 342/ ERTH 442	Surface Water Hydrology	4
GEOG 644	Water Quality	3
<b>Environmental Management</b>		<b>11-12</b>
Select 11-12 units: <small>Allows for one 3-unit course</small>		
GEOG 421	Future Environments	3
GEOG 427	Agriculture and Food Supply	4
GEOG/ERTH 642	Watershed Assessment and Restoration	4
GEOG 647	Geography of Water Resources	4
GEOG 648	Management of National Parks and Protected Areas	4
GEOG/USP 652	Environmental Impact Analysis	4
GEOG/ENVS 657	Natural Resource Management: Biotic Resources	4
GEOG 666	Geography of Garbage: Recycling and Waste Reduction	3
<b>Analytical Methods</b>		<b>7-8</b>
Select 2 courses:		
BIOL 458	Biometry	4
GEOG 602	Field Methods in Environmental Science & Physical Geography	4
GEOG 604	Environmental Data Science	3
GEOG 610	Remote Sensing of the Environment I	4
GEOG 611	Remote Sensing of the Environment II	4
GEOG 620	Geographical Information Systems	4
GEOG 621	Geographic Information Systems for Environmental Analysis	4

## General Education Requirements

Requirement	Course Level	Units	Area Designation
English Composition	LD	3	1A
Critical Thinking	LD	3	1B
Oral Communication	LD	3	1C
Mathematical Concepts and Quantitative Reasoning	LD	3	2
Arts	LD	3	3A
Humanities	LD	3	3B
Social and Behavioral Sciences	LD	6	4
Physical Science	LD	3	5A
Biological Science	LD	3	5B
Laboratory	LD	1	5C
Ethnic Studies	LD or UD	3	6

Science or Math/ Quantitative Reasoning	UD	3	5UD or 2UD
Arts or Humanities	UD	3	3UD
Social and Behavioral Sciences	UD	3	4UD

### 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 and Climate Action	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)

The roadmaps presented in this Bulletin are intended as suggested plans of study and do not replace meeting with an advisor. For a more personalized roadmap, please use the [Degree Planner \(https://registrar.sfsu.edu/degreeplanner/\)](https://registrar.sfsu.edu/degreeplanner/) tool found in your [Student Center](#).

Students should use their Pathway/Category (<https://gatorsmartstart.sfsu.edu/pathways/>) to determine which roadmap to follow. For directions on how to view your Pathway/Category, visit [how to find your pathway \(https://gatorsmartstart.sfsu.edu/howtofindyourpathways/\)](https://gatorsmartstart.sfsu.edu/howtofindyourpathways/). Questions? Contact Gator Smart Start. (<https://gatorsmartstart.sfsu.edu/>)

First-Time Student Roadmap – QR Pathway 1/2 (<https://bulletin.sfsu.edu/colleges/science-engineering/environment/bs-environmental-science/roadmap-i-ii-eng/>)

First-Time Student Roadmap – QR Pathway 3/4 (<https://bulletin.sfsu.edu/colleges/science-engineering/environment/bs-environmental-science/roadmap-math-pathway/>)

## Transfer Student Roadmap (2 Year)

For students with an AS-T in **Environmental Science**. [ENVS ADT Roadmap \(https://bulletin.sfsu.edu/colleges/science-engineering/environment/bs-environmental-science/adt-roadmap/\)](https://bulletin.sfsu.edu/colleges/science-engineering/environment/bs-environmental-science/adt-roadmap/)

## 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 GE Areas 1A/A2, 1B/A3, 1C/A1, and 2/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 (1B/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 1B/A3 requirement, please visit [bulletin.sfsu.edu/undergraduate-education/general-education/lower-division/#AAEL](http://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.