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. GEOG 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 (GEOG 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 their entire Area B, Scientific Inquiry and Quantitative Reasoning in GEOG 101 (Area B1 Physical Science), GEOG 160 (Area B2 Life Science), GEOG 160 lab (Area B3 Laboratory Science), and MATH 226 (Area B4 Quantitative Reasoning). They will also complete three units toward their Area D Social Sciences requirement in GEOG 102.

Electives are distributed into three areas:

1. Environmental Science, 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, GEOG 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.) — 68 units

Lower Division Requirements (27 units)

Code	Title	Units
CHEM 180	Chemistry for the Energy and the Environment	3
GEOG 101	Our Physical Environment	3
GEOG 102	The Human Environment	3
GEOG 160	Introduction to Environmental Science	4
GEOG 205	Geographic Techniques	3
MATH 226	Calculus I	4
Select one of the following:		3
BIOL 150	The World of Plants	
BIOL 170	Animal Diversity	
BIOL 313	Principles of Ecology	
Select one of the following:		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
GEOG 500GW	Physical and Human Dimensions of Climate Change - GWAR	3
GEOG 603	Introduction to Geographic Information Systems	3

Capstone (3 units)

Code	Title	Units
GEOG 690	Senior Seminar in Geography and Environmental Science	3

Upper Division Electives (32 units)

Distributed as 12 units of Environmental Science, 12 units of Environmental Management and eight units of Analytical Methods:

Code	Title	Units
Environmental Science Electives		
Select 12 units of the following:		12
CHEM 380	Chemistry Behind Environmental Pollution	
GEOG 312	Geography of Landforms	
GEOG 313	Earth's Climate System	
GEOG 314	Bioclimatology	
GEOG 316	Biogeography	
GEOG 317	Geography of Soils	
GEOG 342/ ERTH 442	Surface Water Hydrology	
GEOG 644	Water Quality	
Environmental Management Electives		
Select 12 units of the following:		12

GEOG 421	Future Environments
GEOG 427	Agriculture and Food Supply
GEOG/ERTH 642	Watershed Assessment and Restoration
GEOG 646	The Geography of Marine Resources
GEOG 647	Geography of Water Resources
GEOG 648	Management of National Parks and Protected Areas
GEOG/USP 652	Environmental Impact Analysis
GEOG/ENVS 657	Natural Resource Management: Biotic Resources
GEOG 666	Geography of Garbage: Recycling and Waste Reduction

Analytical Methods Electives

Select eight units of the following: 8

BIOL 458	Biometry
GEOG 602	Field Methods in Physical Geography
GEOG 610	Remote Sensing of the Environment I
GEOG 611	Remote Sensing of the Environment II
GEOG 620	Geographical Information Systems
GEOG 621	Geographic Information Systems for Environmental Analysis
GEOG 625	Programming for Geographic Information Science
GEOG 629	Coastal and Marine Applications of GIS

General Education Requirements

Requirement	Course Level	Units	Area Designation
Oral Communication	LD	3	A1
Written English Communication I	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
Social Sciences: US & CA Government	LD	3	D3
Lifelong Learning and Self-Development (LLD)	LD	3	E
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.

Pathway	QR Cat I/II	QR Cat III/IV
ENG 114	Roadmap A (http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/bs-environmental-science/roadmap-i-ii-eng/)	Roadmap C (http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/bs-environmental-science/roadmap-iii-iv-eng/)
ENG 104/ENG 105	Roadmap B (http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/bs-environmental-science/roadmap-i-ii-stretch/)	Roadmap D (http://bulletin.sfsu.edu/colleges/science-engineering/geography-environment/bs-environmental-science/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 an AS-T in **Environmental Science**. This roadmap opens in a new tab (http://bulletin.sfsu.edu/colleges/science-engineering/geography-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 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.