

BACHELOR OF SCIENCE IN EARTH SCIENCES ROADMAP – QUANTITATIVE REASONING CATEGORY III/IV AND ENG 114

120 Total Units Required

Minimum Number of Units in the Major: 67

This roadmap is a suggested plan of study and does not replace meeting with an advisor. Please note that students may need to adjust the actual sequence of courses based on course availability. Please consult an advisor in your major program for further guidance.

Course	Title	Units
First Semester		
ENG 114	Writing the First Year: Finding Your Voice (A2) ¹	3
MATH 197	Prelude to Calculus I (Prerequisite for MATH 226) ^{2,3}	3
GE Area A ⁴		3
GE Area B: Life Science (B2)		3
GE Area C		3
Units		15

Second Semester		
CHEM 115	General Chemistry I: Essential Concepts of Chemistry (Major Science and Math Foundation)	5
MATH 198	Prelude to Calculus II (Prerequisite for MATH 226, B4) ^{2,3}	3
GE Area A		3
GE Area E		3
Units		14

Third Semester		
MATH 226	Calculus I (Major Science and Math Foundation, B4) ^{2,3}	4
GE Area C		3
GE Area D - Take Two		6
Units		13

Fourth Semester		
Select One Set of Courses (Major Science and Math Foundation): ⁵		
PHYS 111 & PHYS 112	General Physics I and General Physics I Laboratory (B1, B3)	

PHYS 220 & PHYS 222	General Physics with Calculus I and General Physics with Calculus I Laboratory (B1, B3)	
GE Area C		3
GE Area F		3
U.S. and California Government (http://bulletin.sfsu.edu/undergraduate-education/american-institutions/#usg)		3

		Units	13
Fifth Semester			
ERTH 400	Earth Systems I (Major Core)		3
Select One Set of Courses (Major Science and Math Foundation): ⁵			4
PHYS 121 & PHYS 122	General Physics II and General Physics II Laboratory		
PHYS 240 & PHYS 242	General Physics with Calculus III and General Physics with Calculus III Laboratory		
Major Emphasis (34 units) - Take Two ⁶			6
GE Area UD-B: Upper-Division Physical and/or Life Sciences (Consider SF State Studies Course)			3
Units			16

Sixth Semester			
ERTH 205	Techniques in Earth Sciences (Major Core)		2
ERTH 500	Earth Systems II (Major Core)		3
ERTH 505	Quantitative Methods in Earth Sciences (Major Core)		3
ERTH 600GW	Earth's Climate History - GWAR (Major Core)		3
Major Emphasis (34 units) - Take Two ⁶			6

Units			17
Seventh Semester			
Major Emphasis (34 units) - Take Four ⁶			12
GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course)			3

		Units	15
Eighth Semester			
ERTH 690	Earth Sciences Capstone Presentation (Major Culminating Experience) ⁷		1

Culminating Experience - Select One ⁷			3-4
Major Emphasis (34 units) - Take Three ⁶			10

GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course)	3
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Units	17-18
Total Units	120-121

- ¹ ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.
- ² QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.
- ³ Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center (<http://cms.sfsu.edu/content/student-center/>). Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website (<http://developmentalstudies.sfsu.edu/>).
- ⁴ To avoid taking additional units, it is recommended that you meet the **SF State Studies** (AERM, GP, ES, SJ) requirements within your GE or major.
- ⁵ PHYS 111/PHYS 112 are prerequisites for PHYS 121/PHYS 122. PHYS 220/PHYS 222 are prerequisites for PHYS 240/PHYS 242.
- ⁶ **Culminating Experience (4-5 units)**
In addition to EARTH 690, students must select one of the following options:
EARTH 695 Senior Project (1-3 units)
or
An honors thesis consisting of:
EARTH 697 Undergraduate Research (2 units)
and
EARTH 698 Senior Thesis (2 units)
or (for Geology emphasis and Hydrology emphasis only):
Field Geology or equivalent (at another institution) for 4 units

⁷ **Major Emphasis (34 units)**

Students must select one of the following emphases

Geology Emphasis

The Geology emphasis provides students with an in-depth understanding of the solid Earth, the processes that shape it, and the skills to conduct field investigations of geologic problems. Students who complete these emphasis requirements will be prepared for graduate school in geology or to enter the workforce directly as a professional geologist. The coursework prepares students to pass the Association of State Board Geology (ASBOG) exam to be a licensed professional geologist.

Required Courses (22–23 units)

ERTH 210 Physical Geology (4 units) (B1, B3, ES)

ERTH 420 Mineralogy and Petrology I (4 units)

ERTH 510 Structural Geology (4 units)

ERTH 620 Field Methods in Geology (2 units)

and either

ERTH 522 Geochemistry (4 units)

or

CHEM 215 General Chemistry II: Quantitative Applications of Chemistry Concepts (3 units)

and CHEM 216 General Chemistry II Laboratory: Quantitative Applications of Chemistry Concepts (2 units)

Electives (11–12 units)

Select additional Geology emphasis elective courses upon advisement, subject to the constraints listed below. Electives plus emphasis requirements must total at least 34 units.

- Electives may be selected from among the following options:
 - Any EARTH course numbered 400 or higher
 - Up to 3 units of any of the following courses:
 - an Historical Geology course (or equivalent) from a community college
 - Any 300-level EARTH course
 - GEOG 312, GEOG 313, GEOG 314, GEOG 316, GEOG 317, GEOG 500GW, GEOG 602, GEOG 603, GEOG 606, GEOG 610, GEOG 611, GEOG 620, GEOG 621, GEOG 625, GEOG 629, or GEOG 642
 - Any BIOL, CHEM, CSC, ENGR, MATH, or PHYS course numbered 200 or higher, or ENGR 103
 - Any one, non-GE course not listed above, with the approval of a Department advisor

(When choosing electives, keep in mind that SF State requires all students to complete at least 40 units of upper-division coursework to graduate.)

Hydrology Emphasis

The Hydrology emphasis provides students with an in-depth understanding of the behavior of water on and beneath Earth's surface, how water shapes the solid earth, and environmental problems associated with water. Students who complete these emphasis requirements will be prepared for graduate school in hydrology or to enter the workforce directly as a professional hydrologist.

Requirements (21–22 units)

Select one of the following (3-4 units):

ERTH 210 Physical Geology (4 units) (B1, B3, ES)

ERTH 230 Environmental Geology (3 units) (B1, B3, ES)

ERTH 330 California Water (3 units) (UD-B, ES)

ERTH 425 Geomorphology (4 units)

ERTH 430 Fluid Dynamics in Earth Systems (3 units)

ERTH 442/GEOG 342 Surface Water Hydrology (4 units)

ERTH 444 Hydrogeology (4 units)

ERTH 544 Groundwater Contamination (3 units)

Electives (12–13 units)