

# Atmospheric Science

## Bachelor of Arts (BA)

The Atmospheric Science major explores the fundamental natural processes controlling atmospheric composition, circulation dynamics, and climate. Understanding how these processes have changed in the past and may change in the future are among the greatest intellectual and technological challenges of our time. Topics covered will include the physics of climate variability and climate change, changes in stratospheric ozone, coupling of atmospheric chemistry and climate, changes in the oxidation capacity of the troposphere, smog, and the impacts of atmosphere-biosphere exchange on atmospheric composition.

## Declaring the Major

The department strongly encourages students to see the student services advisor as early as possible. Students should take Math 53 and Math 54 before declaring the major. Students are accepted into the major with a C average or better. There are a number of scholarships and research opportunities as well as other benefits available to declared majors.

## Honors Program

Students in the honors program must fulfill the following additional requirements:

1. Maintain a GPA of at least 3.3 in all courses in the major, and an overall GPA of at least 3.3 in the University.
2. Carry out an individual research or study project, involving at least three units of EPS H195. The project is chosen in consultation with a departmental advisor, and a written report is judged by the student's research supervisor and a departmental adviser.

## Minor Program

For information regarding the requirements, please see the Minor Requirements tab. Program planning and confirmation should be done with the undergraduate student services adviser and the Atmospheric Science faculty adviser.

## Other Majors and Minors Offered by the Department of Earth and Planetary Science

Climate Science (<http://guide.berkeley.edu/undergraduate/degree-programs/climate-science/>) (Minor only)

Environmental Earth Science (<http://guide.berkeley.edu/undergraduate/degree-programs/environmental-earth-science/>) (Major and Minor)

Geology (<http://guide.berkeley.edu/undergraduate/degree-programs/geology/>) (Major and Minor)

Geophysics (<http://guide.berkeley.edu/undergraduate/degree-programs/geophysics/>) (Major and Minor)

Marine Science (<http://guide.berkeley.edu/undergraduate/degree-programs/marine-science/>) (Major and Minor)

Planetary Science (<http://guide.berkeley.edu/undergraduate/degree-programs/planetary-science/>) (Major and Minor)

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

## General Guidelines

1. All courses taken to fulfill the major requirements below must be taken for graded credit, other than courses listed which are offered on a *Pass/Fail* basis only. Other exceptions to this requirement are noted as applicable.
2. No more than two upper division courses may be used to simultaneously fulfill requirements for a student's double major and no more one course may be used to fulfill minor program requirements with the exception of minors offered outside of the College of Letters & Science.
3. A minimum grade point average (GPA) of 2.0 must be maintained in both upper and lower division courses used to fulfill the major requirements.

For information regarding residence requirements and unit requirements, please see the College Requirements tab.

## Lower Division Requirements

EPS 50	The Planet Earth	4
MATH 1A	Calculus	4
MATH 1B	Calculus	4
MATH 53	Multivariable Calculus	4
MATH 54	Linear Algebra and Differential Equations or PHYSICS 89Introduction to Mathematical Physics	4
CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory or CHEM 4A General Chemistry and Quantitative Analysis	5

Choose one of the following physics sequences:

PHYSICS 5A	Introductory Mechanics and Relativity & PHYSICS 5B and Introductory Electromagnetism, Waves, and & PHYSICS 5BOptics & PHYSICS 5C and Introduction to Experimental Physics I & PHYSICS 5C and Introductory Thermodynamics and Quantum Mechanics and Introduction to Experimental Physics II
PHYSICS 7A	Physics for Scientists and Engineers & PHYSICS 7B and Physics for Scientists and Engineers & PHYSICS 7C and Physics for Scientists and Engineers

## Upper Division Requirements

EPS 102	History and Evolution of Planet Earth	4
EPS 150	Case Studies in Earth Systems	2
EPS C180	Air Pollution	3
EPS C181	Atmospheric Physics and Dynamics	3
EPS C182	Atmospheric Chemistry and Physics Laboratory	3
Electives, select a minimum of 9 units from the following list of suggested courses:		
EPS 103	Introduction to Aquatic and Marine Geochemistry [4]	
EPS 104	Mathematical Methods in Geophysics [4]	
EPS 109	Computer Simulations with Jupyter Notebooks [4]	
EPS 115	Stratigraphy and Earth History [4]	
EPS 117	Geomorphology [4]	
EPS 125	Stable Isotope Geochemistry [4]	
EPS C129	Biometeorology [3]	
EPS 131	Geochemistry [4]	

EPS C183	Carbon Cycle Dynamics [3]
EPS 230	Radiation and Its Interactions with Climate [3]
CHEM 105	Instrumental Methods in Analytical Chemistry [4]
CHEM 120A & CHEM 120B	Physical Chemistry and Physical Chemistry
CHEM 125	Physical Chemistry Laboratory [3]
GEOG 143	Global Change Biogeochemistry [3]
ENE,RES 102	Quantitative Aspects of Global Environmental Problems [4]
CIV ENG 100	Elementary Fluid Mechanics [4]
CIV ENG 107	Climate Change Mitigation [3]
CIV ENG 200A	Environmental Fluid Mechanics I [3]
CIV ENG 200B	Environmental Fluid Mechanics II [3]
CIV ENG 218B	Atmospheric Aerosols [3]
CIV ENG 218C	Air Pollution Modeling [3]

<sup>1</sup> All elective courses used to fulfill the major requirements must be approved by the faculty adviser. This list is intended as a guide; the suggested courses are not limited to only courses included in this list.

Students who have a strong interest in an area of study outside their major often decide to complete a minor program. These programs have set requirements and are noted officially on the transcript in the memoranda section, but are not noted on diplomas.

## General Guidelines

- All minors must be declared no later than one semester before a student's Expected Graduation Term (EGT). If the semester before EGT is fall or spring, the deadline is the last day of RRR week. If the semester before EGT is summer, the deadline is the final Friday of Summer Sessions. To declare a minor, contact the department advisor for information on requirements, and the declaration process.
- All courses taken to fulfill the minor requirements below must be taken for graded credit.
- A minimum of three of the upper division courses taken to fulfill the minor requirements must be completed at UC Berkeley.
- A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.
- Courses used to fulfill the minor requirements may be applied toward the Seven-Course Breadth requirement, for Letters & Science students.
- No more than one upper division course may be used to simultaneously fulfill requirements for a student's major and minor programs.
- All minor requirements must be completed prior to the last day of finals during the semester in which you plan to graduate. If you cannot finish all courses required for the minor by that time, please see a College of Letters & Science adviser.
- All minor requirements must be completed within the unit ceiling. (For further information regarding the unit ceiling, please see the College Requirements tab.)

## Requirements

### Lower Division

EPS 50	The Planet Earth <sup>1</sup>	4
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### Upper Division

Select a minimum of five of the following:

EPS 102	History and Evolution of Planet Earth [4]
EPS 104	Mathematical Methods in Geophysics [4]
EPS C180	Air Pollution [3]
EPS C181	Atmospheric Physics and Dynamics [3]
EPS C182	Atmospheric Chemistry and Physics Laboratory [3]
EPS C183	Carbon Cycle Dynamics [3]
EPS 230	Radiation and Its Interactions with Climate [3]
GEOG 143	Global Change Biogeochemistry [3]
ENE,RES 102	Quantitative Aspects of Global Environmental Problems [4]
CIV ENG 107	Climate Change Mitigation [3]

<sup>1</sup> Or equivalent.

Undergraduate students must fulfill the following requirements in addition to those required by their major program.

For detailed lists of courses that fulfill college requirements, please review the College of Letters & Sciences (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/>) page in this Guide. For College advising appointments, please visit the L&S Advising (<https://lsadvising.berkeley.edu/home/>) Pages.

## University of California Requirements

Entry Level Writing (<http://writing.berkeley.edu/node/78/>)

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley.

American History and American Institutions (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/american-history-institutions-requirement/>)

The American History and Institutions requirements are based on the principle that a US resident graduated from an American university, should have an understanding of the history and governmental institutions of the United States.

## Berkeley Campus Requirement

American Cultures (<http://americancultures.berkeley.edu/students/courses/>)

All undergraduate students at Cal need to take and pass this course in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses offer students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

## College of Letters & Science Essential Skills Requirements

Quantitative Reasoning (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/quantitative-reasoning-requirement/>)

The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer science. The requirement may be satisfied by exam or by taking an approved course.

Foreign Language (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/foreign-language-requirement/>)

The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work.

Reading and Composition (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/>)

In order to provide a solid foundation in reading, writing, and critical thinking the College requires two semesters of lower division work in composition in sequence. Students must complete parts A & B reading and composition courses by the end of their second semester and a second-level course by the end of their fourth semester.

## College of Letters & Science 7 Course Breadth Requirements

Breadth Requirements (<http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#breadthrequirements>)

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

## Unit Requirements

- 120 total units
- Of the 120 units, 36 must be upper division units
- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

## Residence Requirements

For units to be considered in "residence," you must be registered in courses on the Berkeley campus as a student in the College of Letters & Science. Most students automatically fulfill the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless you go abroad for a semester or year or want to take courses at another institution or through UC Extension during your senior year. In these cases, you should make an appointment to meet an adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

## Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your BA degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley Summer Session to satisfy one semester of the Senior Residence requirement, provided that you successfully complete

6 units of course work in the Summer Session and that you have been enrolled previously in the college.

## Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program (UCDC) may meet a Modified Senior Residence requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

## Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding UCEAP units), 12 of which must satisfy the requirements for your major.

## Mission

The goal of the Earth and Planetary Science (EPS) BA degree is to provide students with a broad and sound education, that provides general and specialized knowledge and is intellectually challenging and stimulating. Upon completion of the degree students are ready to enter graduate school at top-ranking institutions (about half of them choose this path), find employment in the profession (geological and environmental engineering and consulting are major opportunities), continue in public education as teachers, or use their background as a sound basis for a new career such as in public policy, law, or medical sciences.

## Learning Goals for the Major

EPS majors acquire knowledge through course work, laboratory training (expertise in experimental techniques), primary field research, library research, and computer applications, with oral presentations and written reports required in many of our classes.

The undergraduate program provides strong technical training for those who wish to pursue professional careers in the earth, environmental and planetary sciences, as well as training in analytical, creative and critical thinking and communication that serves well those who choose paths in new fields.

The Atmospheric Science track provides students with a strong foundation in the physical sciences as well as an outstanding introduction to atmospheric dynamics and evolution, atmospheric chemistry and biogeochemistry. Students gain a rigorous, quantitative, and predictive (in addition to descriptive) knowledge of the earth system with an emphasis on atmospheric processes.

## Undergraduate Student Services

[epsua@berkeley.edu](mailto:epsua@berkeley.edu)

## Faculty Advisor

Professor David Romps  
[r \(ingram@berkeley.edu\)](mailto:ingram@berkeley.edu)[omps@berkeley.edu](mailto:omps@berkeley.edu) ([romps@berkeley.edu](mailto:romps@berkeley.edu))

## EPS Undergraduate Appointments

To make an appointment, please visit the Contact Undergraduate Advisor website (<http://eps.berkeley.edu/undergraduate/contact-undergraduate-advisor/>). (<http://eps.berkeley.edu/undergraduate/contact-undergraduate-advisor/>)

## Atmospheric Science

Expand all course descriptions [+] Collapse all course descriptions [-]

### EPS 3 The Water Planet 3 Units

Terms offered: Spring 2021, Summer 2020 8 Week Session, Spring 2020

An overview of the processes that control water supply to natural ecosystems and human civilization. Hydrologic cycle, floods, droughts, groundwater. Patterns of water use, threats to water quality, effects of global climate change on future water supplies. Water issues facing California.

The Water Planet: Read More [+]

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 8 weeks - 6 hours of lecture per week

#### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

The Water Planet: Read Less [-]

### EPS 7 Introduction to Climate Change 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

This course covers the physical processes that determine Earth's past, present, and future climate, with a particular focus on the essentially irreversible climate change (a.k.a., global warming) caused by the burning of coal, oil, and natural gas. Topics will also include the estimation of future warming and impacts, the Earth resources that can be used to combat climate change, and the policies being used to shift towards the use of those resources.

Introduction to Climate Change: Read More [+]

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

#### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** David Romps

Introduction to Climate Change: Read Less [-]

### EPS 10 Earth's Greatest Volcanic Eruptions 3 Units

Terms offered: Prior to 2007

A science-based course on the most significant eruptions Earth has produced. Most eruptions discussed will be from within historic time and will involve information from geology (volcanology), geography, archaeology, history, art, and paleoenvironmental records such as tree-rings and ice-cores. After a two-class introduction to volcanoes, volcanic activity, and volcanology, and the hazards vs benefits of eruptions, each class will feature one of more eruptions of different types from around the world. A science-based interpretation of the eruptions and effects on human-kind and the environment, will be presented. Class participants will learn about one type of natural hazard, its causes, and the variability of volcanism on Earth.

Earth's Greatest Volcanic Eruptions: Read More [+]

#### Hours & Format

**Summer:** 6 weeks - 8 hours of lecture per week

#### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Self, Manga

Earth's Greatest Volcanic Eruptions: Read Less [-]

### EPS C12 The Planets 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

A tour of the mysteries and inner workings of our solar system. What are planets made of? Why do they orbit the sun the way they do? How do planets form, and what are they made of? Why do some bizarre moons have oceans, volcanoes, and ice floes? What makes the Earth hospitable for life? Is the Earth a common type of planet or some cosmic quirk? This course will introduce basic physics, chemistry, and math to understand planets, moons, rings, comets, asteroids, atmospheres, and oceans. Understanding other worlds will help us save our own planet and help us understand our place in the universe.

The Planets: Read More [+]

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

**Summer:** 6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week

#### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Jeanloz, Dressing

**Also listed as:** ASTRON C12/L & S C70T

The Planets: Read Less [-]

## EPS W12 The Planets 3 Units

Terms offered: Summer 2022 8 Week Session, Summer 2021 8 Week Session, Summer 2020 8 Week Session

A tour of the mysteries and inner workings of our solar system. What are planets made of? Why do they orbit the sun the way they do? How do planets form, and what are they made of? Why do some bizarre moons have oceans, volcanoes, and ice floes? What makes the Earth hospitable for life? Is the Earth a common type of planet or some cosmic quirk? This course will introduce basic physics, chemistry, and math to understand planets, moons, rings, comets, asteroids, atmospheres, and oceans. Understanding other worlds will help us save our own planet and help us understand our place in the universe. This course is web-based.

The Planets: [Read More](#) [+]

### Hours & Format

**Summer:** 8 weeks - 6 hours of web-based lecture per week

**Online:** This is an online course.

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Militzer

**Formerly known as:** Astronomy W12/Earth and Planetary Science W12

**Also listed as:** ASTRON W12

The Planets: [Read Less](#) [-]

## EPS 20 Earthquakes in Your Backyard 3 Units

Terms offered: Summer 2022 First 6 Week Session, Summer 2022 Second 6 Week Session, Summer 2021 Second 6 Week Session  
Introduction to earthquakes, their causes and effects. General discussion of basic principles and methods of seismology and geological tectonics, distribution of earthquakes in space and time, effects of earthquakes, and earthquake hazard and risk, with particular emphasis on the situation in California.

Earthquakes in Your Backyard: [Read More](#) [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

**Summer:** 6 weeks - 5 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geophysics 20

Earthquakes in Your Backyard: [Read Less](#) [-]

## EPS C20 Earthquakes in Your Backyard 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Introduction to earthquakes, their causes and effects. General discussion of basic principles and methods of seismology and geological tectonics, distribution of earthquakes in space and time, effects of earthquakes, and earthquake hazard and risk, with particular emphasis on the situation in California.

Earthquakes in Your Backyard: [Read More](#) [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-3 hours of lecture and 1-0 hours of discussion per week

**Summer:** 6 weeks - 7.5 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Also listed as:** L & S C70Y

Earthquakes in Your Backyard: [Read Less](#) [-]

## EPS 24 Freshman Seminar in Earth and Planetary Sciences 1 Unit

Terms offered: Fall 2022, Spring 2022, Fall 2021

The freshman seminar in earth and planetary science is designed to provide new students with an opportunity to explore a topic in geology or earth sciences with a faculty member in a small seminar setting. Topics will vary from semester to semester but will include such possible topics as great voyages of geologic discovery and the role of atmospheric sciences in geologic study.

Freshman Seminar in Earth and Planetary Sciences: [Read More](#) [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit when topic changes.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1 hour of seminar per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final Exam To be decided by the instructor when the class is offered.

**Formerly known as:** Geology 24

Freshman Seminar in Earth and Planetary Sciences: [Read Less](#) [-]

## EPS 39 Freshman/Sophomore Seminar 2 Units

Terms offered: Spring 2022, Fall 2019, Spring 2019

Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.

Freshman/Sophomore Seminar: Read More [+]

### Rules & Requirements

**Prerequisites:** Priority given to freshmen and sophomores

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final Exam To be decided by the instructor when the class is offered.

**Formerly known as:** Geology 39

Freshman/Sophomore Seminar: Read Less [-]

## EPS 39A Freshman/Sophomore Seminar 2 - 4 Units

Terms offered: Spring 2018, Spring 2017, Spring 2016

Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.

Freshman/Sophomore Seminar: Read More [+]

### Rules & Requirements

**Prerequisites:** Priority given to freshmen and sophomores

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-4 hours of seminar per week

**Summer:** 6 weeks - 5-10 hours of seminar per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final exam required.

**Formerly known as:** Geology 39

Freshman/Sophomore Seminar: Read Less [-]

## EPS 50 The Planet Earth 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

An introduction to the physical and chemical processes that have shaped the earth through time, with emphasis on the theory of plate tectonics. Laboratory work will involve the practical study of minerals, rocks, and geologic maps and exercises on geological processes.

The Planet Earth: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

**Summer:** 8 weeks - 7.5 hours of lecture and 7.5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geology 50

The Planet Earth: Read Less [-]

## EPS 80 Environmental Earth Sciences 3 Units

Terms offered: Fall 2022, Summer 2022 Second 6 Week Session, Summer 2021 Second 6 Week Session

This course focuses on the processes on and in the earth that shape the environment. Humanity's use of land and oceans is examined based on an understanding of these processes.

Environmental Earth Sciences: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for 80 after taking Integrative Biology 80 or Paleontology 15.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

**Summer:** 6 weeks - 7.5 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Environmental Earth Sciences: Read Less [-]

## EPS 81 Extreme Weather and Climate 3 Units

Terms offered: Spring 2020, Spring 2019

This course provides a fundamental understanding of the extreme weather and climate variability that have affected Earth in recent decades. We begin with an overview of fire weather and hurricanes, using these phenomena to explore general principles that are also relevant to drought, tornadoes, and other extreme weather. Then we examine how atmospheric composition, planetary orbits, and radiation control global climate, and how all of these influence extreme weather. Additional topics include prediction of complex systems, chaos theory, feedbacks, instability, atmospheric aerosols, and air pollution. We use the atmospheres of other planets for comparison, learning more about Earth by seeing just how different planetary climate can be.

Extreme Weather and Climate: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Boos

Extreme Weather and Climate: Read Less [-]

## EPS 82 Oceans 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

This course offers multidisciplinary approach to begin answering the question "Why are oceans important to us?" Upon a physical, chemical, and geologic base, we introduce the alien world of sea life, the importance of the ocean to the global carbon cycle, and the principles of ecology with a focus on the important concept of energy flow through food webs. Lectures expand beyond science to include current topics as diverse as music, movies, mythology, biomechanics, policy, and trade.

Oceans: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for EPS 82 after completing EPS N82.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Summer:

6 weeks - 7.5 hours of lecture and 2.5 hours of discussion per week  
8 weeks - 5.5 hours of lecture and 1.5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Bishop, Edwards

**Formerly known as:** Earth and Planetary Science C82/Integrative Biology C82

Oceans: Read Less [-]

## EPS N82 Introduction to Oceans 3 Units

Terms offered: Summer 2022 First 6 Week Session, Summer 2022 Second 6 Week Session, Summer 2021 Second 6 Week Session

The geology, physics, chemistry, and biology of the world oceans. The application of oceanographic sciences to human problems will be explored through special topics such as energy from the sea, marine pollution, food from the sea, and climate change.

Introduction to Oceans: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for Earth and Planetary Science N82 after taking Earth and Planetary Science/Integrative Biology/Geography C82.

### Hours & Format

#### Summer:

6 weeks - 6 hours of lecture per week  
8 weeks - 6 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Introduction to Oceans: Read Less [-]

## EPS 84 Sophomore Seminar 1 or 2 Units

Terms offered: Spring 2013, Fall 2012, Spring 2012

Sophomore seminars are small interactive courses offered by faculty members in departments all across the campus. Sophomore seminars offer opportunity for close, regular intellectual contact between faculty members and students in the crucial second year. The topics vary from department to department and semester to semester. Enrollment limited to 15 sophomores.

Sophomore Seminar: Read More [+]

### Rules & Requirements

**Prerequisites:** At discretion of instructor

**Repeat rules:** Course may be repeated for credit when topic changes.

### Hours & Format

#### Fall and/or spring:

5 weeks - 3-6 hours of seminar per week  
10 weeks - 1.5-3 hours of seminar per week  
15 weeks - 1-2 hours of seminar per week

#### Summer:

6 weeks - 2.5-5 hours of seminar per week  
8 weeks - 1.5-3.5 hours of seminar and 2-4 hours of seminar per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** The grading option will be decided by the instructor when the class is offered. Final exam required.

Sophomore Seminar: Read Less [-]

## EPS 88 PyEarth: A Python Introduction to Earth Science 2 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Earthquakes and El Ninos are examples of natural hazards in California. The course uses Python/Jupyter Notebook and real-world observations to introduce students to these and other Earth phenomena and their underlying physics. The students will learn how to access and visualize the data, extract signals, and make probability forecasts. The final module is a project that synthesizes the course material to make a probabilistic forecast. The course will be co-taught by a team of EPS faculty, and the focus of each semester will depend on the expertise of the faculty in charge.

PyEarth: A Python Introduction to Earth Science: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

**Instructors:** Fung, Boos, Dreger

PyEarth: A Python Introduction to Earth Science: Read Less [-]

## EPS 98 Directed Group Study 1 - 4 Units

Terms offered: Spring 2012, Spring 2009, Spring 2008

Group studies of selected topics which vary from semester to semester.

Directed Group Study: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

**Formerly known as:** Geology and Geophysics 98

Directed Group Study: Read Less [-]

## EPS 100A Minerals: Their Constitution and Origin 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Introduction to structural, compositional, and physical properties of minerals, their analogs and related substances, their genesis in various geological and synthetic processes, and laboratory techniques to identify and investigate minerals. One field trip to selected mineral deposits and visits to laboratories.

Minerals: Their Constitution and Origin: Read More [+]

### Rules & Requirements

**Prerequisites:** Some background in chemistry and physics

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 6 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geology 100A

Minerals: Their Constitution and Origin: Read Less [-]

## EPS 100B Genesis and Interpretation of Rocks 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Introduction to the principal geologic environments where rocks are formed and displayed. Igneous, sedimentary, and metamorphic processes discussed in the context of global tectonics.

Genesis and Interpretation of Rocks: Read More [+]

### Rules & Requirements

**Prerequisites:** 100A

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geology 100B

Genesis and Interpretation of Rocks: Read Less [-]



## EPS C100 Communicating Ocean Science 4 Units

Terms offered: Spring 2020, Spring 2018, Spring 2016, Spring 2015  
For undergraduates interested in improving their ability to communicate their scientific knowledge by teaching ocean science in elementary schools or science centers/aquariums. The course will combine instruction in inquiry-based teaching methods and learning pedagogy with six weeks of supervised teaching experience in a local school classroom or the Lawrence Hall of Science with a partner. Thus, students will practice communicating scientific knowledge and receive mentoring on how to improve their presentations.

Communicating Ocean Science: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** One course in introductory biology, geology, chemistry, physics, or marine science required and interest in ocean science; junior, senior, or graduate standing; consent of instructor required for sophomores

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Rhew

**Formerly known as:** Earth and Planetary Science C100/Geography C146/Integrative Biology C100

**Also listed as:** GEOG C146/INTEG BI C100

Communicating Ocean Science: [Read Less](#) [-]

## EPS 101 Field Geology and Digital Mapping 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020  
Geological mapping, field observation, and problem-solving in the Berkeley hills and environs leading to original interpretation of geological processes and history from stratigraphic, structural, and lithological investigations. Integration of the Berkeley hills geology into the Coast Ranges and California as a whole through field trips to key localities. Training in digital field mapping, global positioning systems, and laser surveying. Interdisciplinary focus encourages participation by nonmajors. Field Geology and Digital Mapping: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 50 or equivalent introductory course in Earth and Planetary Science

### Hours & Format

**Fall and/or spring:** 15 weeks - 7 hours of fieldwork and 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Formerly known as:** Geology 101

Field Geology and Digital Mapping: [Read Less](#) [-]

## EPS 102 History and Evolution of Planet Earth 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020  
Formation and evolution of the earth. Nucleosynthesis; formation of the solar system; planetary accretion; dating the earth and solar system; formation of the core, mantle, oceans, and atmosphere; plate tectonics; heat transfer and internal dynamics; stratigraphic record of environment, and evolution; climate history and climate change. History and Evolution of Planet Earth: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** 50

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

History and Evolution of Planet Earth: [Read Less](#) [-]

## EPS 103 Introduction to Aquatic and Marine Geochemistry 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2019

Introduction to marine geochemistry: the global water cycle; processes governing the distribution of chemical species within the hydrosphere; ocean circulation; chemical mass balances, fluxes, and reactions in the marine environment from global to submicron scales; carbon system equilibrium chemistry and biogeochemistry of fresh and salt water; applications of natural and anthropogenic stable and radioactive tracers; internal ocean processes.

Introduction to Aquatic and Marine Geochemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** Chemistry 1A, Mathematics 1A or 16A. C82 recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Bishop

Introduction to Aquatic and Marine Geochemistry: Read Less [-]

## EPS 104 Mathematical Methods in Geophysics 4 Units

Terms offered: Spring 2022, Spring 2019, Spring 2017

Linear systems. Linear inverse problems, least squares; generalized inverse, resolution; Fourier series, integral transforms; time series analysis, spherical harmonics; partial differential equations of geophysics; functions of a complex variable; probability and significance tests, maximum likelihood methods. Intended for students in geophysics and other physical sciences.

Mathematical Methods in Geophysics: Read More [+]

### Rules & Requirements

**Prerequisites:** Mathematics 53-54

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geophysics 104

Mathematical Methods in Geophysics: Read Less [-]

## EPS 108 Geodynamics 4 Units

Terms offered: Spring 2021, Spring 2019, Fall 2016

Basic principles in studying the physical properties of earth materials and the dynamic processes of the earth. Examples are drawn from tectonics, mechanics of earthquakes, etc., to augment course material.

Geodynamics: Read More [+]

### Rules & Requirements

**Prerequisites:** EPS 50, Physics 7A, or Mathematics 53, 54

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Geodynamics: Read Less [-]

## EPS 109 Computer Simulations with Jupyter Notebooks 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020

Introduction to modern computer simulation methods and their application to selected Earth and Planetary Science problems. In hands-on computer labs, students will learn about numerical algorithms, learn to program and modify provided programs, and display the solution graphically. This is an introductory course and no programming experience is required. Examples include fractals in geophysics, properties of materials at high pressure, celestial mechanics, and diffusion processes in the Earth. Topics range from ordinary and partial differential equations to molecular dynamics and Monte Carlo simulations.

Computer Simulations with Jupyter Notebooks: Read More [+]

### Rules & Requirements

**Prerequisites:** Math 1A or equivalent

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Computer Simulations with Jupyter Notebooks: Read Less [-]

## EPS 113 Biological Oceanography and Biogeochemistry 4 Units

Terms offered: Spring 2022, Spring 2020

We will survey the biological oceanography underlying geochemical transformations in the sea. Students will develop a strong understanding of evolution, the central dogma of molecular biology, cell structure across the domains of life, population ecology, the metabolic strategies employed by marine organisms, and the biomarkers of life in the ocean. These biological concepts will be the foundation for understanding geochemical shifts as the earth was oxygenated, changes in inorganic nutrient pools with depth and location, nitrogen cycling, Southern Ocean silica leakage, the cryptic sulfur cycle, redox chemistry leveraged by organisms at hydrothermal vents, and the biological carbon pump. Biological Oceanography and Biogeochemistry: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

Biological Oceanography and Biogeochemistry: Read Less [-]

## EPS 115 Stratigraphy and Earth History 4 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018

Collecting, analyzing, and presenting stratigraphic data; dating and correlating sedimentary rocks; recognizing ancient environments and reconstructing Earth history; seismic and sequence stratigraphy; event stratigraphy and neocatastrophism; applications of stratigraphy to climate change, petroleum geology, and archaeology. Stratigraphy and Earth History: Read More [+]

Stratigraphy and Earth History: Read More [+]

### Rules & Requirements

**Prerequisites:** 50, 100A, 100B, or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Alvarez

**Formerly known as:** Geology 115

Stratigraphy and Earth History: Read Less [-]

## EPS 116 Structural Geology and Tectonics 3 Units

Terms offered: Fall 2022, Fall 2020, Spring 2019

Introduction to the geometry and mechanics of brittle and ductile geologic structures; their origins and genetic relation to stress fields and their use as kinematic indicators; case histories of selected regions to elucidate tectonic evolution in different plate tectonic settings. Laboratory exercises will focus on analysis of hand specimens and structural relations portrayed on geologic maps. Several trips to observe geologic structures in the field to supplement laboratory exercises.

Structural Geology and Tectonics: Read More [+]

### Rules & Requirements

**Prerequisites:** 50

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Burgmann

Structural Geology and Tectonics: Read Less [-]

## EPS 117 Geomorphology 4 Units

Terms offered: Fall 2022, Fall 2021, Fall 2019

Quantitative examination of landforms, runoff generation, weathering, mechanics of soil erosion by water and wind, mass wasting, glacial and periglacial processes and hillslope evolution.

Geomorphology: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 3 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geology 117

Geomorphology: Read Less [-]

## EPS 118 Advanced Field Course 4 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Advanced geological mapping, intensive field observation, and problem solving in the field areas selected by instructors. Includes preparation of final reports.

Advanced Field Course: Read More [+]

### Rules & Requirements

**Prerequisites:** 50, 100A-100B, 101, or consent of instructor; 119 is strongly recommended

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of discussion per week

**Summer:** 6 weeks - 7.5 hours of lecture and 5 hours of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Instructor:** Brimhall

**Formerly known as:** Geology 118

Advanced Field Course: Read Less [-]

## EPS 119 Geologic Field Studies 2 Units

Terms offered: Fall 2022, Fall 2021, Spring 2019

Two to four weekend field trips to localities of geological interest.

Geologic Field Studies: Read More [+]

### Rules & Requirements

**Prerequisites:** 101 and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Formerly known as:** Geology 119

Geologic Field Studies: Read Less [-]

## EPS 122 Physics of the Earth and Planetary Interiors 3 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018

Gravity field, density distribution, and internal seismic structure of the Earth and planets. Constitution, composition, temperature distribution, and energetics of the Earth's interior. The geomagnetic field and the geodynamo, and concepts in seismic imaging and geophysical fluid dynamics. This

course welcomes physics, computer science, engineering and applied maths majors.

Physics of the Earth and Planetary Interiors: Read More [+]

### Rules & Requirements

**Prerequisites:** Physics 7A-B, Mathematics 53-54, or equivalent

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Physics of the Earth and Planetary Interiors: Read Less [-]

## EPS 124 Isotopic Geochemistry 4 Units

Terms offered: Spring 2021, Spring 2019, Spring 2017

An overview of the use of natural isotopic variations to study earth, planetary, and environmental problems. Topics include geochronology, cosmogenic isotope studies of surficial processes, radiocarbon and the carbon cycle, water isotopes in the water cycle, and radiogenic and stable isotope studies of planetary evolution, mantle dynamics, volcanoes, groundwater, and geothermal systems. The course begins with a short introduction to nuclear processes and includes simple mathematical models used in isotope geochemistry.

Isotopic Geochemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** Chemistry 1A-1B, Mathematics 1A-1B

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** David Shuster

Isotopic Geochemistry: Read Less [-]

## EPS 125 Stable Isotope Geochemistry 4 Units

Terms offered: Spring 2022, Spring 2020, Spring 2018

This course provides an introduction to the principles of stable isotope geochemistry and the application of these principles to problems in Earth and planetary science. This course provides a foundation for the physical, chemical, and biological processes that cause isotopes to fractionate in nature including the kinetic theory of gases, equilibrium thermodynamics, and the kinetics of chemical reactions. These principles will be applied to the study of problems related to the water cycle, paleoclimate, igneous petrology, biogeochemical cycles in the past and present, and planetary science.

Stable Isotope Geochemistry: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Stolper

Stable Isotope Geochemistry: Read Less [-]

## EPS C129 Biometeorology 3 Units

Terms offered: Fall 2022, Fall 2020, Fall 2018

This course describes how the physical environment (light, wind, temperature, humidity) of plants and soil affects the physiological status of plants and how plants affect their physical environment. Using experimental data and theory, it examines physical, biological, and chemical processes affecting transfer of momentum, energy, and material (water, CO<sub>2</sub>, atmospheric trace gases) between vegetation and the atmosphere. Plant biometeorology instrumentation and measurements are also discussed.

Biometeorology: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Baldocchi

**Also listed as:** ESPM C129

Biometeorology: Read Less [-]

## EPS 130 Strong Motion Seismology 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Generation of seismic waves. Synthetic accelerograms. Instrumentation to measure strong ground motion. Estimation of seismic motion at a site. Ground motion spectra. Influence of soils and geologic structures. Seismic risk mapping.

Strong Motion Seismology: Read More [+]

### Rules & Requirements

**Prerequisites:** Mathematics 54, or equivalent and consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Geophysics 130

Strong Motion Seismology: Read Less [-]

## EPS 131 Geochemistry 4 Units

Terms offered: Fall 2022, Spring 2022, Fall 2020

Chemical reactions in geological processes. Thermodynamic methods for predicting chemical equilibria in nature. Isotopic and chemical tracers of transport processes in the earth. Chemistry of the solid earth, oceans, and atmosphere.

Geochemistry: Read More [+]

### Rules & Requirements

**Prerequisites:** 100A-100B, Chemistry 1A-1B

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** David Shuster

Geochemistry: Read Less [-]

## EPS 150 Case Studies in Earth Systems 2 Units

Terms offered: Fall 2022, Spring 2022, Fall 2021

Analysis and discussion of three research problems on the interactions of solid earth, hydrologic, chemical, and atmospheric processes. Emphasis is on the synthesis and application of the student's disciplinary knowledge to a new integrative problem in the earth sciences.

Case Studies in Earth Systems: Read More [+]

### Rules & Requirements

**Prerequisites:** 50, senior standing or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Case Studies in Earth Systems: Read Less [-]

## EPS C162 Planetary Astrophysics 4 Units

Terms offered: Spring 2022, Fall 2020, Fall 2019

Physics of planetary systems, both solar and extra-solar. Star and planet formation, radioactive dating, small-body dynamics and interaction of radiation with matter, tides, planetary interiors, atmospheres, and magnetospheres. High-quality oral presentations may be required in addition to problem sets and a final exam.

Planetary Astrophysics: Read More [+]

### Rules & Requirements

**Prerequisites:** Mathematics 53, 54; Physics 7A-7B-7C

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Chiang, Dressing, Militzer

**Also listed as:** ASTRON C162

Planetary Astrophysics: Read Less [-]

## EPS C178 Applied Geophysics 3 Units

Terms offered: Fall 2022, Fall 2021, Fall 2020, Fall 2019

The theory and practice of geophysical methods for determining the subsurface distribution of physical rock and soil properties.

Measurements of gravity and magnetic fields, electrical and electromagnetic fields, and seismic velocity are interpreted to map the subsurface distribution of density, magnetic susceptibility, electrical conductivity, and mechanical properties.

Applied Geophysics: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Rector

**Also listed as:** CIV ENG C178

Applied Geophysics: Read Less [-]

## EPS C180 Air Pollution 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

This course is an introduction to air pollution and the chemistry of earth's atmosphere. We will focus on the fundamental natural processes controlling trace gas and aerosol concentrations in the atmosphere, and how anthropogenic activity has affected those processes at the local, regional, and global scales. Specific topics include stratospheric ozone depletion, increasing concentrations of green house gasses, smog, and changes in the oxidation capacity of the troposphere.

Air Pollution: Read More [+]

### Rules & Requirements

**Prerequisites:** CHEM 1A, CHEM 1B, and PHYSICS 8A or consent of instructor

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructor:** Goldstein

**Also listed as:** CIV ENG C106/ESPM C180

Air Pollution: Read Less [-]

## EPS C181 Atmospheric Physics and Dynamics 3 Units

Terms offered: Fall 2022, Spring 2022, Fall 2020, Fall 2019, Fall 2018

This course examines the processes that determine the structure and circulation of the Earth's atmosphere. The approach is deductive rather than descriptive: to figure out the properties and behavior of the Earth's atmosphere based on the laws of physics and fluid dynamics. Topics will include interaction between radiation and atmospheric composition; the role of water in the energy and radiation balance; governing equations for atmospheric motion, mass conservation, and thermodynamic energy balance; geostrophic flow, quasigeostrophic motion, baroclinic instability and dynamics of extratropical cyclones.

Atmospheric Physics and Dynamics: Read More [+]

### Rules & Requirements

**Prerequisites:** Mathematics 53, 54; Physics 7A-7B-7C

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Chiang, Fung

**Also listed as:** GEOG C139

Atmospheric Physics and Dynamics: Read Less [-]

## EPS C182 Atmospheric Chemistry and Physics Laboratory 3 Units

Terms offered: Spring 2022, Spring 2021, Spring 2020

Fluid dynamics, radiative transfer, and the kinetics, spectroscopy, and measurement of atmospherically relevant species are explored through laboratory experiments, numerical simulations, and field observations. Atmospheric Chemistry and Physics Laboratory: Read More [-]

### Rules & Requirements

**Prerequisites:** Earth and Planetary Science 50 and 102 with grades of C- or higher (one of which may be taken concurrently) or two of the following: Chemistry 120A, 120B, C130, or 130B with grades of C- or higher (one of which may be taken concurrently)

**Credit Restrictions:** Deficiency in C182 may be removed by successfully completing 125. Consent of instructor is required to enroll in C182 after completing 125.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1.5 hours of lecture and 5 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Chemistry C182/Earth and Planetary Science C182

**Also listed as:** CHEM C182

Atmospheric Chemistry and Physics Laboratory: Read Less [-]

## EPS C183 Carbon Cycle Dynamics 3 Units

Terms offered: Fall 2021, Spring 2019, Spring 2016

The focus is the (unsolved) puzzle of the contemporary carbon cycle. Why is the concentration of atmospheric CO<sub>2</sub> changing at the rate observed? What are the terrestrial and oceanic processes that add and remove carbon from the atmosphere? What are the carbon management strategies under discussion? How can emission protocols be verified? Students are encouraged to gain hands-on experience with the available data, and learn modeling skills to evaluate hypotheses of carbon sources and sinks.

Carbon Cycle Dynamics: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

**Instructor:** Fung

**Also listed as:** ESPM C170

Carbon Cycle Dynamics: Read Less [-]

## EPS H195 Senior Honors Course 3 Units

Terms offered: Fall 2014, Spring 2013, Fall 2012

Original research and preparation of an acceptable thesis. May be taken during two consecutive semesters of senior year and may be substituted for six units of the upper division requirement with consent of major adviser.

Senior Honors Course: Read More [+]

### Rules & Requirements

**Prerequisites:** Limited to honors candidates

**Repeat rules:** Course may be repeated for credit up to a total of 6 units.

### Hours & Format

**Fall and/or spring:** 15 weeks - 0-0 hours of independent study per week

### Summer:

6 weeks - 0-0 hours of independent study per week

8 weeks - 0-0 hours of independent study per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam not required.

Senior Honors Course: Read Less [-]

## EPS 197 Field Study 1 - 4 Units

Terms offered: Fall 2010

Written proposal signed by faculty sponsor and approved by major faculty advisor. Supervised experience relevant to specific aspects of students' EPS specialization in off-campus organization. Regular meetings with faculty sponsor and written report required.

Field Study: Read More [+]

### Rules & Requirements

**Prerequisites:** Upper division standing and declared major in Earth and Planetary Science

**Credit Restrictions:** Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-12 hours of fieldwork per week

### Summer:

6 weeks - 7.5-30 hours of fieldwork per week

8 weeks - 6-24 hours of fieldwork per week

10 weeks - 4.5-18 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Field Study: Read Less [-]

## EPS 198 Directed Group Study 1 - 4 Units

Terms offered: Spring 2022, Spring 2021, Fall 2020

Group studies of selected topics which vary from semester to semester.

Directed Group Study: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

**Formerly known as:** Geology 198

Directed Group Study: Read Less [-]

## EPS 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Fall 2020, Fall 2015, Spring 2015

Enrollment is restricted by regulations.

Supervised Independent Study and Research: Read More [+]

### Rules & Requirements

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of independent study per week

### Summer:

6 weeks - 2.5-10 hours of independent study per week

8 weeks - 1.5-7.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Earth and Planetary Science/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

**Formerly known as:** Geology 199

Supervised Independent Study and Research: Read Less [-]