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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS 50</td>
<td>The Planet Earth</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1A</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1B</td>
<td>Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 53</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>MATH 54</td>
<td>Linear Algebra and Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1A</td>
<td>General Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>&amp; 1AL</td>
<td>and General Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>or CHEM 4A</td>
<td>General Chemistry and Quantitative Analysis</td>
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</tr>
</tbody>
</table>

Choose one of the following physics sequences:

Physics 5A: Introductory Mechanics and Relativity

& Physics 5Band Introductory Electromagnetism, Waves, and

& Physics 5BOptics

& Physics 5Can Introductory Thermalodynamics and Quantum

Mechanics

and Introduction to Experimental Physics II

Physics 7A: Physics for Scientists and Engineers

& Physics 7Band Physics for Scientists and Engineers

& Physics 7Can Physics for Scientists and Engineers

Upper Division Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS 102</td>
<td>History and Evolution of Planet Earth</td>
<td>4</td>
</tr>
<tr>
<td>EPS 150</td>
<td>Case Studies in Earth Systems</td>
<td>2</td>
</tr>
<tr>
<td>EPS C180</td>
<td>Air Pollution</td>
<td>3</td>
</tr>
<tr>
<td>EPS C181</td>
<td>Atmospheric Physics and Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EPS C182</td>
<td>Atmospheric Chemistry and Physics Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives, select a minimum of 9 units from the following list of suggested courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS 103</td>
<td>Introduction to Aquatic and Marine Geochemistry</td>
<td>4</td>
</tr>
<tr>
<td>EPS 104</td>
<td>Mathematical Methods in Geophysics</td>
<td></td>
</tr>
<tr>
<td>EPS 109</td>
<td>Computer Simulations with Jupyter Notebooks</td>
<td></td>
</tr>
<tr>
<td>EPS 115</td>
<td>Stratigraphy and Earth History</td>
<td></td>
</tr>
<tr>
<td>EPS 117</td>
<td>Geomorphology</td>
<td></td>
</tr>
<tr>
<td>EPS 125</td>
<td>Stable Isotope Geochemistry</td>
<td></td>
</tr>
<tr>
<td>EPS C129</td>
<td>Biometeorology</td>
<td></td>
</tr>
<tr>
<td>EPS 131</td>
<td>Geochemistry</td>
<td></td>
</tr>
</tbody>
</table>
General Guidelines

1. 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.

2. All courses taken to fulfill the minor requirements below must be taken for graded credit.

3. A minimum of three of the upper division courses taken to fulfill the minor requirements must be completed at UC Berkeley.

4. A minimum grade point average (GPA) of 2.0 is required for courses used to fulfill the minor requirements.

5. Courses used to fulfill the minor requirements may be applied toward the Seven-Course Breadth requirement, for Letters & Science students.

6. No more than one upper division course may be used to simultaneously fulfill requirements for a student’s major and minor programs.

7. 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.

8. 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 ¹ 4

Upper Division

Select a minimum of five of the following:

- EPS 102 History and Evolution of Planet Earth [4]
- EPS 180 Air Pollution [3]
- EPS 181 Atmospheric Physics and Dynamics [3]
- EPS 182 Atmospheric Chemistry and Physics Laboratory [3]
- EPS 183 Carbon Cycle Dynamics [3]
- EPS 230 Radiation and Its Interactions with Climate [3]
- GEOG 142 Climate Dynamics [4]
- GEOG 143 Global Change Biogeochemistry [3]
- ENE,RES 102 Quantitative Aspects of Global Environmental Problems [4]
- CIV ENG 107 Climate Change Mitigation [3]

¹ Or equivalent.

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

University of California Requirements

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

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

American cultures (http://americancultures.berkeley.edu/students/courses/)

Berkeley Campus Requirement

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/#breadthrequirementstext)
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
ggraduate school at top-ranking institutions (about half of them choose this
path), find employment in the profession (geological and environmental
ingeering 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
(experience 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

Faculty Advisor
Professor David Romps
r (ingram@berkeley.edu)romps@berkeley.edu (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 2021, Fall 2020, Fall 2019
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
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.
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 2021, Spring 2020, Spring 2019
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.
Also listed as: ASTRON C12/L & S C70T
The Planets: Read Less [-]
EPS W12 The Planets 3 Units
Terms offered: Summer 2021 8 Week Session, Summer 2020 8 Week Session, Summer 2019 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 2021 First 6 Week Session, Summer 2021 Second 6 Week Session, Summer 2020 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 - 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.
Also listed as: L & S C70Y

Earthquakes in Your Backyard: Read Less [-]

EPS C20 Earthquakes in Your Backyard 3 Units
Terms offered: Fall 2021, Spring 2021, Fall 2020
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 - 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.
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 2021, Fall 2020, Fall 199
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
Summer: 6 weeks - 5 hours of lecture 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: 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
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 2021, Spring 2021, Fall 2020
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: Summer 2021 Second 6 Week Session, Summer 2020 Second 6 Week Session, Fall 2019
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 Atmospheres 3 Units
Terms offered: Spring 2020, Spring 2019
An introductory survey of the atmospheres of Earth and other planets, spanning diverse phenomena such as hurricanes, drought, Martian dust storms, and the exotic winds on planets orbiting other stars. This course introduces the basics of planetary weather and climate, showing through exploration of a diverse set of atmospheres and paleoclimates that the world around us need not always be the way we currently observe it. Topics include atmospheric composition and structure, planetary orbits and radiation, habitability, global patterns of wind, clouds and precipitation, prediction of weather, chaos theory, and vortices such as tropical cyclones, tornadoes, and Jupiter’s great red spot.

Hours & Format
Fall and/or spring: 15 weeks - 2 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: Boos

EPS 82 Oceans 3 Units
Terms offered: 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.

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 per week
8 weeks - 5.5 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.
Instructors: Bishop, Edwards
Formerly known as: Earth and Planetary Science C82/Integrative Biology C82

EPS N82 Introduction to Oceans 3 Units
Terms offered: Summer 2021 First 6 Week Session, Summer 2021 Second 6 Week Session, Summer 2020 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.

Hours & Format
Summer:
6 weeks - 6 hours of lecture per week
8 weeks - 5.5 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.

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.

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 per week
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.
EPS 88 PyEarth: A Python Introduction to Earth Science 2 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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
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 2021, Fall 2020, Fall 2019
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 2021, Spring 2020, Spring 2019
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
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/INTEGBI C100

Communicating Ocean Science: Read Less [-]

EPS 101 Field Geology and Digital Mapping 4 Units
Terms offered: Fall 2021, Fall 2020, Spring 2019
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 2021, Fall 2020, Fall 2019
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 2021, Spring 2019, Spring 2018
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.

EPS 104 Mathematical Methods in Geophysics 4 Units
Terms offered: Spring 2019, Spring 2017, Spring 2015
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

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: 60, 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.
Formerly known as: Geophysics 108

EPS 109 Computer Simulations with Jupyter Notebooks 4 Units
Terms offered: Fall 2021, Fall 2020, Fall 2019
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 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 2020, Spring 2018, Spring 2016
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 [+]

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 2020, Spring 2019, Spring 2018
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 2021, Fall 2019, Fall 2018
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 2021, Spring 2020, Spring 2018
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 2021, Spring 2019, Spring 2018
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 2020, Spring 2018, Spring 2017
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 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 2020, Fall 2018, Fall 2016
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, CO2, 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 2021, Spring 2020, Spring 2019

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 2020, Fall 2019, Fall 2018

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 2021, Spring 2021, Fall 2020
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 [-]

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**EPS C162 Planetary Astrophysics 4**
Units
Terms offered: Fall 2020, Fall 2019, Fall 2018
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 - 2 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.

Instructors: Chiang, de Pater, Marcy

Also listed as: ASTRON C162

Planetary Astrophysics: Read Less [-]

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**EPS C178 Applied Geophysics 3**
Units
Terms offered: Fall 2021, Fall 2020, Fall 2019, Fall 2018
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 [-]

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**EPS C180 Air Pollution 3**
Units
Terms offered: Spring 2021, Spring 2020, Spring 2018
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 greenhouse gases, 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 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.

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 2021, Spring 2020, Spring 2019
Fluid dynamics, radiative transfer, and the kinetics, spectroscopy, and measurement of atmospherically relevant species are explored through laboratory experiments, numerical simulations, and field observations.

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 CO2 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.

Rules & Requirements

Credit Restrictions:

Instructor:

Also listed as: ESPM C170

Atmospheric Chemistry and Physics Laboratory: Read Less [-]

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 2021, Fall 2020, Spring 2015  
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  
**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.  
**Formerly known as:** Geology 198  
Directed Group Study: Read Less [-]  

**EPS 199 Supervised Independent Study and Research 1 - 4 Units**  
Terms offered: Fall 2021, Fall 2020, Fall 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 [-]