

# EARTH SYSTEMS

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## Mission of the Undergraduate Program in Earth Systems

The Earth Systems Program is an interdisciplinary environmental science major. Students learn about and independently investigate complex environmental problems caused by human activities in conjunction with natural changes in the Earth system. Earth Systems majors become skilled in those areas of science, economics, and policy needed to tackle the world's most pressing social-environmental problems, becoming part of a generation of scientists, professionals, and citizens who approach and solve problems in a systematic, interdisciplinary way.

For students to be effective contributors to solutions for such problems, their training and understanding must be both broad and deep. To this end, Earth Systems students take fundamental courses in ecology, calculus, chemistry, geology, and physics, as well as economics, policy, and statistics. After completing breadth training, they concentrate on advanced work in one of six focus areas: biology, energy, environmental economics and policy, land systems, sustainable food and agriculture, or oceanography and climate. Tracks are designed to support focus and rigor but include flexibility for specialization. Examples of specialized foci have included but are not limited to environment and human health, sustainable agriculture, energy economics, sustainable development, business and the environment, and marine policy. Along with formal course requirements, Earth Systems students complete a 1-unit (270-hour) internship. The internship provides a hands-on academic experience working on a supervised field, laboratory, government, or private sector project.

The Earth Systems Program provides an advising network that includes faculty, staff, and student peer advisers.

The following is an outline of the sequential topics covered and skills developed in this major.

1. *Fundamentals*: The Earth Systems Program includes courses that describe the natural functioning of the physical and biological components of the Earth and human activities that interact with these components. Training in fundamentals includes introductory course work in geology, biology, chemistry, physics, and economics. Additional training in course work in single and multivariable calculus, linear algebra, and statistics provides students with skills needed for quantifying environmental problems. Training in statistics is specific to the area of focus: geostatistics, biostatistics, econometrics.
2. *System Interactions*: Focus in these courses is on the fundamental interactions among the physical, biological, and human components of the Earth system. Understanding the dynamics between natural variation in and human-imposed influences on the Earth system informs the development of effective solutions to social-environmental challenges.
  - a. Earth Systems courses that introduce students to the dynamic and multiple interactions that characterize social-environmental challenges include:

		Units
EARTHSYS 10	Introduction to Earth Systems	4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 112	Human Society and Environmental Change	4

- b. Competence in understanding system-level interactions is critical to development as an Earth Systems thinker, so additional classes that meet this objective are excellent choices as electives.
3. *Track-Specific Requirements*: After completing a core designed to introduce students to different functional components of the Earth system, undergraduate students focus their studies through one of six tracks: Human Environmental Systems (formerly Anthroposphere); Biosphere; Energy, Science and Technology; Oceans and Climate (formerly Oceans); Land Systems; or Sustainable Food and Agriculture.
4. *Skills Development*: Students take skills courses that help them to recognize, quantify, describe, communicate, and help solve complex problems that face society. For example, field and laboratory methods can help students to recognize the scope and nature of environmental change. Training in satellite remote sensing and geographic information systems allows students to monitor and analyze large-scale spatial patterns of change. This training is either required or recommended for all tracks.
5. *Communication*: Success in building workable solutions to environmental problems is linked to the ability to effectively communicate ideas, data, and results. Writing intensive courses (WIM) help students to communicate complex concepts to expert and non-expert audiences. Other Earth Systems courses also focus on effective written and oral communication and are recommended. All Stanford students must complete one WIM course in their major. Earth Systems students can fulfill the WIM requirement by successfully completing one of the following courses:

		Units
EARTHSYS 191	Concepts in Environmental Communication	3
EARTHSYS 177C	Specialized Writing and Reporting: Health and Science Journalism	4-5
EARTHSYS 149	Wild Writing	3
BIOHOPK 47	Introduction to Research in Ecology and Ecological Physiology	5

6. *Finding solutions*: Effective solutions to environmental problems take into consideration natural processes as well as human needs. Earth Systems emphasizes the importance of interdisciplinary analysis and implementation of workable solutions through:

		Units
EARTHSYS 210A	Senior Capstone and Reflection	3
or EARTHSYS 210B	Senior Capstone and Reflection	
EARTHSYS 210P	Earth Systems Capstone Project (or Honors Thesis)	2
EARTHSYS 260	Internship	1

A comprehensive list of environmental courses (p. 12) is available on the "Related Courses" tab. This list as well as advice on courses that focus on problem solving are available in the program office.

## Learning Outcomes (Undergraduate)

The program expects majors to be able to demonstrate the following learning outcomes. These learning outcomes serve as benchmarks for evaluating students and the program's undergraduate degree. Students are expected to:

1. demonstrate knowledge of foundational skills and concepts in order to advance the interdisciplinary study of the environment.
2. demonstrate the ability to analyze, integrate and apply relevant science and policy perspectives to social-environmental problems.
3. demonstrate the ability to communicate complex concepts and data relevant to social-environmental problems and questions to expert and non-expert audiences.

## Learning Outcomes (Graduate)

The coterminal master's degree in Earth Systems provides the student with enhanced analytical tools to evaluate the disciplines most closely associated with the student's focus area. Specialization is gained through course work and independent research work supervised by the master's faculty adviser.

## Bachelor of Science in Earth Systems

The B.S. in Earth Systems (EARTHSYS) requires the completion of courses divided into three categories:

1. Core
2. Foundation and Breadth
3. Track-specific Requirements.

The student must fulfill the internship requirement, participate in the Senior Capstone and Reflection course (EARTHSYS 210A or EARTHSYS 210B), complete the Earth Systems Capstone Project (EARTHSYS 210P)/(or Honors Thesis), and complete the Writing in the Major (WIM) requirement.

Core courses, track courses, and electives must be taken for a letter grade. The WIM course may not also count towards the track or electives, if counted as a WIM.

### Required Core Courses

		Units
EARTHSYS 10	Introduction to Earth Systems	4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 112	Human Society and Environmental Change	4
Select one of the following:		3
EARTHSYS 210A	Senior Capstone and Reflection	3
	or EARTHSYS 210B Senior Capstone and Reflection	
EARTHSYS 210P	Earth Systems Capstone Project (or HONORS THESIS)	2
EARTHSYS 260	Internship	1
Select one of the following (WIM):		
EARTHSYS 191	Concepts in Environmental Communication	3
EARTHSYS 177C	Specialized Writing and Reporting: Health and Science Journalism	4-5
EARTHSYS 149	Wild Writing	3
BIOHOPK 47	Introduction to Research in Ecology and Ecological Physiology	5

### Tracks

See each track's tab for the required Foundation and Breadth and Track-Specific Courses. All Earth Systems majors must select a track from one of the following:

#### Biosphere Track (p. 3)

Explores biological systems and how human activities affect biological, ecological, and biogeochemical cycles. Coursework investigates ecosystems and society, conservation biology, ecology, and biogeochemistry.

#### Energy, Science and Technology (p. 4)

Investigates renewable and depletable energy resources, technology options for improved efficiency, and policy solutions to energy challenges.

#### Environmental Geoscience (p. 5)

Understand and articulate the ways in which Earth's interior and surface operate, and how these systems are connected to one another and inextricably bound to the evolution of life and current human activities. Apply understanding of earth and human systems to develop workable, scientifically based, human-centered solutions to building resilience to natural hazards, and our planet's most pressing environmental challenges.

#### Human Environmental Systems (p. 5)

Focuses on human interaction with and impact on the environment. Coursework in environmental policy and economics, sustainable development, natural and human-driven change, and social entrepreneurship.

#### Land Systems (p. 5)

Examines terrestrial ecology, land use, and land change driven by human activities and addressed by governmental policy. Students develop expertise in a focus area of land, water, or urban planning.

#### Oceans, Atmosphere, and Climate (p. 8)

Builds understanding of ocean systems through a focus on ocean physics, marine biology and chemistry, and remote sensing. A required and seminal track experience is a quarter away at Hopkins Marine Station, Stanford in Australia, or Stanford@SEA.

#### Sustainable Food and Agriculture Track (p. 8)

Focuses on local and global food and agricultural systems. Students gain a breadth of knowledge on these issues through study in food and society, climate and agriculture, the science of soils, world food economy, and principles and practices of sustainable agriculture.

### Honors Program

The Earth Systems honors program provides students with an opportunity to pursue interdisciplinary research. It consists of a year-long research project that is mentored by one or more Earth Systems-affiliated faculty members, and culminates in a written thesis.

To qualify for the honors program, students must have and maintain a minimum overall GPA of 3.4. Potential honors students should complete the EARTHSYS 111 Biology and Global Change and EARTHSYS 112 Human Society and Environmental Change sequence by the end of the junior year. Qualified students can apply in Spring Quarter of the junior year, or the fourth quarter before graduation (check with program for specific application deadlines) by submitting a detailed research proposal and a brief statement of support from a faculty research adviser. Students who elect to do an honors thesis should begin planning no later than Winter Quarter of the junior year.

A maximum of 9 units is awarded for thesis research through EARTHSYS 199 Honors Program in Earth Systems. Those 9 units may not substitute for any other required parts of the Earth Systems curriculum. All theses are evaluated for acceptance by the thesis faculty adviser, one additional faculty member (who is the second reader), and the Director of Earth Systems. Both the adviser and second reader must be members of the Academic Council. Acceptance into the Honors program is not a guarantee of graduating with the honors designation.

Honors students are required to present their research publicly, preferably through the School of Earth, Energy, and Environmental Sciences' Annual Thesis Symposium which highlights undergraduate and graduate research in the school. Faculty advisers are encouraged to sponsor

presentation of student research results at professional society meetings.

More extensive work in mathematics and physics may be valuable for those planning graduate study. Graduate study in ecology and evolutionary biology and in economics requires familiarity with differential equations, linear algebra, and stochastic processes. Graduate study in geology, oceanography, and geophysics may require more physics and chemistry. Students should consult their adviser for recommendations beyond the requirements specified above.

<sup>1</sup> The Geological Sciences requirement can be fulfilled by completing GEOLSCI 1, GEOLSCI 4, or EARTHSYS 117. GEOLSCI 1A, 1B, and 1C are no longer offered. If taken in previous years, these still fulfill the Earth Systems' Geological Sciences requirement.

## Biosphere

### Learning Objectives:

1. Articulate the interplay of ecology, evolution, and biogeochemistry and understand their connections to the functioning of ecosystems on multiple spatial and temporal scales.
2. Recognize how human activity alters ecological processes, and how ecological changes can interact with human societies at multiple scales.
3. Apply knowledge of natural sciences and human-mediated environmental change to conservation challenges, while considering implications for environmental justice.

### Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

	Units
<b>Additional foundation and breadth courses</b>	
BIO 81 Introduction to Ecology	4
or BIOHOPK 81 Introduction to Ecology	
BIO 82 Genetics	4
Additional Chemistry requirement (in addition to 31A/B or X):	5
ECON 1 Principles of Economics	5
GEOLSCI 1 Introduction to Geology	4-5
or GEOLSCI 4 Coevolution of Earth and Life	
or EARTHSYS 117 Earth Sciences of the Hawaiian Islands	
or EARTHSYS 128 Evolution of Terrestrial Ecosystems	
MATH 19 Calculus	10
& MATH 20 and Calculus	
& MATH 21 and Calculus	
CHEM 33 Structure and Reactivity of Organic Molecules	5
Physics (select one of the following):	4
PHYSICS 41 Mechanics	4
or PHYSICS 45 Light and Heat	
or GEOPHYS 110 Introduction to the Foundations of Contemporary Geophysics	
BIOHOPK 174H Experimental Design and Probability	3
or ECON 102A Introduction to Statistical Methods (Postcalculus) for Social Scientists	
or STATS 101 Data Science 101	
or STATS 110 Statistical Methods in Engineering and the Physical Sciences	
or STATS 116 Theory of Probability	
or STATS 141 Biostatistics	

or CME 106 Introduction to Probability and Statistics for Engineers

Choose two courses from Ecology and Conservation Biology, and one course from each of the remaining sub-categories below, total six required:		
<b>Biogeochemistry</b>		3-4
CEE 177 Aquatic Chemistry and Biology		4
CEE 274A Environmental Microbiology I		3
EARTHSYS 132 Evolution of Earth Systems		4
EARTHSYS 143 Molecular Geomicrobiology Laboratory		4
EARTHSYS 151 Biological Oceanography		3-4
EARTHSYS 152 Marine Chemistry		3-4
EARTHSYS 155 Science of Soils		3-4
EARTHSYS 158 Geomicrobiology		3
<b>Ecology and Conservation Biology</b>		3-12
GEOLSCI 130		
BIO 115 The Hidden Kingdom - Evolution, Ecology and Diversity of Fungi		4
BIO 130 Ecosystems of California		4
BIO 144 Conservation Biology: A Latin American Perspective		3
BIOHOPK 172H Marine Ecology: From Organisms to Ecosystems		5
BIOHOPK 173H Marine Conservation Biology		4
BIOHOPK 177H Dynamics and Management of Marine Populations		4
BIOHOPK 185H Ecology and Conservation of Kelp Forest Communities		5
EARTHSYS 116 Ecology of the Hawaiian Islands		4
EARTHSYS 105A Ecology and Natural History of Jasper Ridge Biological Preserve		4
& EARTHSYS 105B and Ecology and Natural History of Jasper Ridge Biological Preserve		
EARTHSYS 128 Evolution of Terrestrial Ecosystems		4
EARTHSYS 123 Asian Americans and Environmental Justice		3-5
EARTHSYS 128 Evolution of Terrestrial Ecosystems		4
ESS 223 Ecophysiology and Land Surface Processes		4
GEOLSCI 123 Evolution of Marine Ecosystems		3-4
OSPAUSTL 10 Coral Reef Ecosystems		3
OSPAUSTL 30 Coastal Forest Ecosystems		3
OSPSANTG 58 Living Chile: A Land of Extremes		5
OSPSANTG 85 (OSPSANTG 85)		
<b>Ecosystems and Society</b> <sup>2</sup>		3-5
ANTHRO 118 Heritage, Environment, and Sovereignty in Hawaii		4
ANTHRO 166 Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness		3-5
ANTHRO 177		
BIOHOPK 168H Disease Ecology: from parasites evolution to the socio-economic impacts of pathogens on nations		3
EARTHSYS 107 Control of Nature		3
EARTHSYS 136 The Ethics of Stewardship		2-3
EARTHSYS 139 Ecosystem Services: Frontiers in the Science of Valuing Nature		3
EARTHSYS 159 Economic, Legal, and Political Analysis of Climate-Change Policy		5

EARTHSYS 185	Feeding Nine Billion	4-5	CHEM 31A	Chemical Principles I	5
EARTHSYS 185	Feeding Nine Billion	4-5	& CHEM 31B	and Chemical Principles II	
HUMBIO 118	Theory of Ecological and Environmental Anthropology	5	or CHEM 31X	Chemical Principles Accelerated	
SIW 144	Energy, Environment, Climate and Conservation Policy: A Washington, D.C. Perspective	5	ECON 1	Principles of Economics	5
LAW 2515	Environmental Justice	3	GEOLSCI 1	Introduction to Geology	4-5
<b>Biogeochemistry</b>			or GEOLSCI 4	Coevolution of Earth and Life	
CEE 177	Aquatic Chemistry and Biology	4	or EARTHSYS 117	Earth Sciences of the Hawaiian Islands	
CEE 274A	Environmental Microbiology I	3	or EARTHSYS 128	Evolution of Terrestrial Ecosystems	
EARTHSYS 132	Evolution of Earth Systems	4	MATH 19	Calculus	10
EARTHSYS 143	Molecular Geomicrobiology Laboratory	3-4	& MATH 20	and Calculus	
EARTHSYS 151	Biological Oceanography	3-4	& MATH 21	and Calculus	
EARTHSYS 152	Marine Chemistry	3-4	CME 100	Vector Calculus for Engineers (preferred)	5
EARTHSYS 155	Science of Soils	3-4	or MATH 51	Linear Algebra, Multivariable Calculus, and Modern Applications	
EARTHSYS 158	Geomicrobiology	3	PHYSICS 43	Electricity and Magnetism	4
ESS 256	Soil and Water Chemistry	3	PHYSICS 45	Light and Heat	4
<b>Methods</b>			BIOHOPK 174H	Experimental Design and Probability	3
EARTHSYS 144	Fundamentals of Geographic Information Science (GIS) (REQUIRED)	3-4	or ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	
EARTHSYS 124	Measurements in Earth Systems	3-4	or STATS 101	Data Science 101	
EARTHSYS 142	Remote Sensing of Land	4	or STATS 110	Statistical Methods in Engineering and the Physical Sciences	
EARTHSYS 211	Fundamentals of Modeling	3-5	or STATS 116	Theory of Probability	
ESS 124			or STATS 141	Biostatistics	
ESS 165	Advanced Geographic Information Systems	4	or CME 106	Introduction to Probability and Statistics for Engineers	
ESS 220	Physical Hydrogeology	4	<b>Energy Fundamentals (required for all)</b>		3
GEOLSCI 240	Data science for geoscience	3	ME 30	Engineering Thermodynamics	3
<b>Elective Requirement</b>			CEE 272R	Modern Power Systems Engineering	3
Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units.			or ENERGY 120	Fundamentals of Petroleum Engineering	
			or MATSCI 156	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	

## Energy, Science, and Technology

### Learning Objectives:

1. Apply fundamental engineering principles to assess how transformation of systems of energy production, distribution, and consumption can contribute to achieving greater energy sustainability.
2. Use fundamental engineering principles—together with knowledge of economics, human behavior, energy infrastructure, and earth systems science—to assess and critique policy- and market-based solutions proposed to achieve greater energy sustainability.
3. Apply written, visual, and oral presentation skills to communicate scientific, technological, and policy knowledge to expert and non-expert audiences.

### Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

		Units
<b>Additional Foundation and Breadth Courses</b>		
BIO 81	Introduction to Ecology	4
or BIOHOPK 81	Introduction to Ecology	
or BIO 83	Biochemistry & Molecular Biology	
or HUMBIO 2A	Genetics, Evolution, and Ecology	
& HUMBIO 2B	and Culture, Evolution, and Society	
or EARTHSYS 116	Ecology of the Hawaiian Islands	
EARTHSYS 101	Energy and the Environment	3
EARTHSYS 102	Fundamentals of Renewable Power	3
EARTHSYS 103	Understanding Energy	4-5
Choose at least one course in each of the three sub-categories, total five required. Note that many of these have prerequisite work:		
<b>Energy Resources &amp; Technology</b>		3-5
EARTHSYS 101	Energy and the Environment	3
EARTHSYS 103	Understanding Energy	3-5
CEE 156	Building Systems	4
CEE 176A	Energy Efficient Buildings	3-4
ENERGY 120	Fundamentals of Petroleum Engineering	3
ENERGY 269	Geothermal Reservoir Engineering	3
ENERGY 293B	Fundamentals of Energy Processes	3
MATSCI 156	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	3-4
ENERGY 293C	Energy from Wind and Water Currents	3
ME 250	Internal Combustion Engines	1-5
ME 260	Fuel Cell Science and Technology	3
<b>Sustainable Energy &amp; Development</b>		3-4
CEE 176B	100% Clean, Renewable Energy and Storage for Everything	3-4
CEE 221A	Planning Tools and Methods in the Power Sector	3-4
CEE 226	Life Cycle Assessment for Complex Systems	3-4
CEE 272S	(Not offered in 2018-19.)	

EARTHSYS 102	Fundamentals of Renewable Power	3
EARTHSYS 146A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
ENERGY 153	Carbon Capture and Sequestration	3-4
MATSCI 156	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	3-4
URBANST 165	Sustainable Urban and Regional Transportation Planning	4-5
<b>Energy Policy, Economics &amp; Entrepreneurship</b>		2-4
ENERGY 104	Sustainable Energy for 9 Billion	3
ENERGY 110	Engineering Economics	3
ENERGY 171	Energy Infrastructure, Technology and Economics	3
ENERGY 191	Optimization of Energy Systems	3-4
GSBGEN 336	Energy Markets and Policy	3
MS&E 243	Energy and Environmental Policy Analysis	3
LAW 2503	Energy Law	3
MS&E 294		
MS&E 295		
<b>Elective Requirement</b>		3-5

One additional course at the 100-level or above is required. This course must be a minimum of 3 units. 3 units of approved energy seminars may count as one elective. See Earth Systems staff for the approved seminar list.

## Environmental Geoscience

### Learning Objectives:

1. Understand and articulate the ways in which Earth's interior and surface operate, and how these systems are connected to one another and inextricably bound to the evolution of life and current human activities.
2. Understand and view the current state of, and expected changes within, the earth system in the context of past changes experienced by our planet.
3. Apply understanding of earth and human systems to develop workable, scientifically based, human-centered solutions to building resilience to natural hazards, and our planet's most pressing environmental challenges.

### Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

#### Additional Foundation and Breadth Courses

BIO 81	Introduction to Ecology	4
or BIOHOPK 81	Introduction to Ecology	
or HUMBIO 2A & HUMBIO 2B	Genetics, Evolution, and Ecology and Culture, Evolution, and Society	
or EARTHSYS 116	Ecology of the Hawaiian Islands	
CHEM 31A & CHEM 31B	Chemical Principles I and Chemical Principles II	5-10
or CHEM 31X	Chemical Principles Accelerated	
ECON 1	Principles of Economics	5
GEOLSCI 1	Introduction to Geology	4-5
or GEOLSCI 4	Coevolution of Earth and Life	
or EARTHSYS 117	Earth Sciences of the Hawaiian Islands	
or EARTHSYS 128	Evolution of Terrestrial Ecosystems	

MATH 19 & MATH 20 & MATH 21	Calculus and Calculus and Calculus	10
MATH 51	Linear Algebra, Multivariable Calculus, and Modern Applications	5
or CME 100	Vector Calculus for Engineers	
MATH 52	Integral Calculus of Several Variables	5
PHYSICS 41 & PHYSICS 45	Mechanics and Light and Heat	4
or GEOPHYS 110	Introduction to the Foundations of Contemporary Geophysics	
BIOHOPK 174H	Experimental Design and Probability	3-5
or ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	
or STATS 101	Data Science 101	
or STATS 110	Statistical Methods in Engineering and the Physical Sciences	
or STATS 116	Theory of Probability	
or STATS 141	Biostatistics	
or CME 106	Introduction to Probability and Statistics for Engineers	
ESS 164	Fundamentals of Geographic Information Science (GIS)	3-4

A total of 6 courses are required from the Environmental Geoscience Focus Areas below. In addition, two electives are required for this track. All track courses and electives must be taken for a letter grade (nine courses total).

The Solid Earth (must take 2):

GEOLSCI 90	Introduction to Geochemistry	3-4
GEOLSCI 102	Earth Materials: Introduction to Mineralogy	4
GEOLSCI 180	Igneous Processes	3-4
GEOLSCI 90	Introduction to Geochemistry	3-4
GEOPHYS 90	Earthquakes and Volcanoes	3
GEOPHYS 150	Geodynamics: Our Dynamic Earth	3-5

Earth's Surface (must take 2):

GEOLSCI 106	Sedimentary Geology and Depositional Systems	4
GEOPHYS 70	The Water Course	3
ESS 148	Introduction to Physical Oceanography	4
ESS 224	Remote Sensing of Hydrology	3
ESS 155	Science of Soils	3-4
ESS 220	Physical Hydrogeology	4

Evolution of Life on Earth (must take 1):

GEOLSCI 123	Evolution of Marine Ecosystems	3-4
GEOLSCI 128	Evolution of Terrestrial Ecosystems	4
GEOLSCI 135	Sedimentary Geochemistry and Analysis	1-4
ESS 255	Microbial Physiology	3

Resilient Earth (must take 1):

GEOPHYS 80	The Energy-Water Nexus	3
GEOLSCI 118X	Sustainable Urban Systems Fundamentals	3-5

Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units. See Earth Systems staff for a list of possible electives

## Human Environmental Systems

### Learning Objectives:

1. Apply knowledge of fundamental physical and biological Earth system processes to analyze how human decisions shape environmental outcomes.

2. Apply fundamental principles and frameworks from the social sciences to analyze and understand (a) how humans make environmentally relevant decisions, and (b) how environmental changes shape human outcomes.

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" Tab in addition to the required courses listed below.

		Units
<b>Additional Foundation and Breadth Courses</b>		
<b>Biology</b>		4-10
BIO 81	Introduction to Ecology	4
or BIOHOPK 81	Introduction to Ecology	
or HUMBIO 2A & HUMBIO 2B	Genetics, Evolution, and Ecology and Culture, Evolution, and Society	
or EARTHSYS 116	Ecology of the Hawaiian Islands	
<b>Economics</b>		5
ECON 1	Principles of Economics	5
ECON 50	Economic Analysis I	5
ECON 155	Environmental Economics and Policy	5
<b>Geological Sciences</b> <sup>1</sup>		4-5
Select one of the following:		
EARTHSYS 117	Earth Sciences of the Hawaiian Islands	4
GEOLSCI 1	Introduction to Geology	5
GEOLSCI 4	Coevolution of Earth and Life	4
EARTHSYS 128	Evolution of Terrestrial Ecosystems	4
<b>Mathematics</b>		5-15
MATH 19 & MATH 20 & MATH 21	Calculus and Calculus and Calculus	10
MATH 20	Calculus	3
MATH 21	Calculus	4
MATH 51	Linear Algebra, Multivariable Calculus, and Modern Applications	5
or CME 100	Vector Calculus for Engineers	
CS 106A	Programming Methodology	3-5
<b>Probability and Statistics</b>		3-5
Select one of the following:		
BIOHOPK 174H	Experimental Design and Probability	3
BIO 141	Biostatistics	5
ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	5
STATS 101	Data Science 101	5
STATS 110	Statistical Methods in Engineering and the Physical Sciences	5
STATS 116	Theory of Probability	4
CME 106	Introduction to Probability and Statistics for Engineers	4
<b>SELECT ONE OF THE FOLLOWING</b>		
CS 106B	Programming Abstractions	3-5
ECON 102B	Applied Econometrics	5
<b>Units</b>		
Choose one course in each of the three following sub-categories, with a total of six required. At least one of the six must be a skills/methods course marked with an asterisk (*):		
<b>Economics, Policy, and Sustainable Development</b>		3-5
EARTHSYS 136	The Ethics of Stewardship	2-3

ANTHRO 164	Natural Resource Extraction: Use and Development: Assessing Policies, Practices and Outcomes	3-5
CEE 175A	California Coast: Science, Policy, and Law	3-4
ECON 51	Economic Analysis II	5
ECON 102B	Applied Econometrics (*)	5
ECON 106	World Food Economy (*)	4
CEE 175A	California Coast: Science, Policy, and Law	3-4
ECON 118	Development Economics	5
ECON 121	(Not offered 18-19)	
ECON 150	Economic Policy Analysis	4-5
ECON 159	Economic, Legal, and Political Analysis of Climate-Change Policy	5
ESS 268	Empirical Methods in Sustainable Development (*)	3-5
EARTHSYS 243	Environmental Advocacy and Policy Communication	3
ECON 51	Economic Analysis II	5
ECON 159	Economic, Legal, and Political Analysis of Climate-Change Policy	5
INTNLREL 135A	International Environmental Law and Policy	3-5
IPS 270		3-5
LAW 2504	Environmental Law and Policy	4
MS&E 243	Energy and Environmental Policy Analysis	3
GSBGEN 336	Energy Markets and Policy	3
MS&E 294		
MS&E 295		
<b>Human Behavior and Adaption</b>		2-5
CEE 151	Negotiation	
ANTHRO 116B	Anthropology of the Environment	5
ANTHRO 166	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness	3-5
CEE 124	Sustainable Development Studio	1-5
CEE 126A	(Not offered 18-19)	
CEE 126B	(Not offered 18-19)	
CEE 226	Life Cycle Assessment for Complex Systems	3-4
EARTHSYS 114/214	Environmental Change and Emerging Infectious Diseases	4-5
EARTHSYS 138	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development	4-5
EARTHSYS 185	Feeding Nine Billion	4-5
ESS 360	Social Structure and Social Networks	5
ECON 106	World Food Economy (*)	4
ECON 118	Development Economics (*)	5
ESS 224	Remote Sensing of Hydrology	3
ESS 185	Adaptation	3
HUMBIO 118	Theory of Ecological and Environmental Anthropology	5
OSPSANTG 29	Sustainable Cities: Comparative Transportation Systems in Latin America	5
POLISCI 124A	The American West	5
URBANST 107	Introduction to Urban and Regional Planning	3
URBANST 163	Land Use Control	4
URBANST 164	Sustainable Cities	4-5
URBANST 183	Team Urban Design Studio	5

<b>Data Science and Analysis</b>		3-5
CS 102	Big Data - Tools and Techniques	3-4
CS 106B	Programming Abstractions	3-5
CS 124	From Languages to Information	3-4
ECON 102B	Applied Econometrics (*)	5
EARTHSYS 141	Remote Sensing of the Oceans (*)	3-4
EARTHSYS 142	Remote Sensing of Land (*)	4
EARTHSYS 144	Fundamentals of Geographic Information Science (GIS) (*)	3-4
EARTHSYS 162	Data for Sustainable Development	3-5
ENERGY 240	Data science for geoscience	3
ESS 165	Advanced Geographic Information Systems (*)	4
ESS 214	Introduction to geostatistics and modeling of spatial uncertainty (*)	3-4
ESS 268	Empirical Methods in Sustainable Development (*)	3-5
MS&E 231	Introduction to Computational Social Science	3
STATS 216	Introduction to Statistical Learning	3
<b>Elective Requirement</b>		6-10

Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units.

## Land Systems

### Learning Objectives:

1. Design strategies for using multi-source and multi-scale observations of land surface processes that integrate field, geospatial, and human survey data to describe biophysical and socio-economic impacts of land systems changes.
2. Integrate biophysical and socioeconomic data related to land use and land cover change using geospatial tools to analyze and model complex, multi-scalar human-environmental interactions that determine land use dynamics.
3. Determine remedies to address negative impacts of land changes on human-environmental systems using land-use management tools and interventions.

### Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

	<b>Units</b>
<b>Additional Foundation and Breadth Courses</b>	
BIO 81	4
or BIOHOPK 81	4
or HUMBIO 2A & HUMBIO 2B	4
or EARTHSYS 116	4
CHEM 31A & CHEM 31B	5-10
or CHEM 31X	5-10
ECON 1	5
GEOLSCI 1	4-5
or GEOLSCI 4	4-5
or EARTHSYS 117	4-5
or EARTHSYS 128	4-5

MATH 19 & MATH 20 & MATH 21	Calculus and Calculus and Calculus	10
MATH 51	Linear Algebra, Multivariable Calculus, and Modern Applications	5
or CME 100	Vector Calculus for Engineers	5
PHYSICS 41	Mechanics	4
or PHYSICS 45	Light and Heat	4
or GEOPHYS 110	Introduction to the Foundations of Contemporary Geophysics	4
BIOHOPK 174H	Experimental Design and Probability	3-5
or BIO 202	Ecological Statistics	3-5
or ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	3-5
or STATS 101	Data Science 101	3-5
or STATS 110	Statistical Methods in Engineering and the Physical Sciences	3-5
or STATS 116	Theory of Probability	3-5
or STATS 141	Biostatistics	3-5
or CME 106	Introduction to Probability and Statistics for Engineers	3-5

A total of 7 courses are required from the 4 Land Systems Focus Areas. Concentrating courses in a single focus area below will allow students to deepen their understanding of the chosen system. For breadth considerations, students are required to take a minimum of 1 course from each focus area. In addition, two electives are required for this track. All track courses and electives must be taken for a letter grade (9 courses total).

### Land Ecosystems:

EARTHSYS 155	Science of Soils (recommended)	3-4
EARTHSYS 180	Principles and Practices of Sustainable Agriculture (recommended)	3-4
BIO 144	Conservation Biology: A Latin American Perspective	3
EARTHSYS 105A & EARTHSYS 105B	Ecology and Natural History of Jasper Ridge Biological Preserve and Ecology and Natural History of Jasper Ridge Biological Preserve	8
EARTHSYS 116	Ecology of the Hawaiian Islands	4
EARTHSYS 128	Evolution of Terrestrial Ecosystems	4
ESS 256	Soil and Water Chemistry	3
ESS 223	Ecophysiology and Land Surface Processes	4
OSPSANTG 58	Living Chile: A Land of Extremes	5

### Water:

CEE 166A	Watersheds and Wetlands (recommended)	4
CEE 101B	Mechanics of Fluids	4
CEE 162E	Rivers, Streams, and Canals	3-4
CEE 165C	Water Resources Management	3
CEE 166B	Floods and Droughts, Dams and Aqueducts	4
CEE 177	Aquatic Chemistry and Biology	4
EARTHSYS 104	The Water Course	3
GEOPHYS 190	Near-Surface Geophysics	3
OSPAUSTL 25	Freshwater Systems	3
OSPMADRD 79	Earth and Water Resources' Sustainability in Spain	3-4

### Land Use:

ESS 270	Analyzing land use in a globalized world (recommended)	3
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ANTHRO 166	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness	3-5
CEE 124	Sustainable Development Studio	1-5
CEE 175A	California Coast: Science, Policy, and Law	3-4
CEE 176A	Energy Efficient Buildings	3-4
EARTHSYS 118	Heritage, Environment, and Sovereignty in Hawaii	4
EARTHSYS 185	Feeding Nine Billion	4-5
EARTHSYS 238	Land Use Law	3
ECON 106	World Food Economy	4
ENERGY 101	Energy and the Environment	3
ENERGY 102	Fundamentals of Renewable Power	3
ENERGY 104	Sustainable Energy for 9 Billion	3
ENVRES 250	Environmental Governance	3
OSPSANTG 29	Sustainable Cities: Comparative Transportation Systems in Latin America	5
SIW 144	Energy, Environment, Climate and Conservation Policy: A Washington, D.C. Perspective	5
URBANST 110	Introduction to Urban Studies	4
ECON 106	World Food Economy	4
URBANST 113	Introduction to Urban Design: Contemporary Urban Design in Theory and Practice	5
EARTHSYS 185	Feeding Nine Billion	4-5
URBANST 164	Sustainable Cities	4-5
<b>Methods:</b>		
EARTHSYS 144	Fundamentals of Geographic Information Science (GIS) (required)	3-4
<b>Biogeophysical Dimensions (3 required):</b>		
EARTHSYS 124	Measurements in Earth Systems	3-4
EARTHSYS 142	Remote Sensing of Land	4
EARTHSYS 211	Fundamentals of Modeling	3-5
ESS 165	Advanced Geographic Information Systems	4
ESS 220	Physical Hydrogeology	4
GEOLSCI 240	Data science for geoscience	3
Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units. See Earth Systems staff for a list of possible electives.		

## Oceans, Atmosphere, and Climate

### Learning Objectives:

1. Apply fundamental physical, chemical, and biological principles toward understanding the behavior of the oceans, atmosphere, and climate and the interrelationships of these systems with human society.
2. Apply fundamental principles of ocean, atmospheric, and climate science through field, laboratory, and computer-based research experiences.

### Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

#### Units

#### Additional Foundation and Breadth Courses

BIO 81	Introduction to Ecology	4-10
or BIOHOPK 81	Introduction to Ecology	

or HUMBIO 2A & HUMBIO 2B	Genetics, Evolution, and Ecology and Culture, Evolution, and Society	
or EARTHSYS 116	Ecology of the Hawaiian Islands	
CHEM 31A & CHEM 31B	Chemical Principles I and Chemical Principles II	5
or CHEM 31X	Chemical Principles Accelerated	
MATH 19 & MATH 20 & MATH 21	Calculus and Calculus and Calculus	10
MATH 51 & MATH 52	Linear Algebra, Multivariable Calculus, and Modern Applications and Integral Calculus of Several Variables (CME 100 preferred over MATH 51 and MATH 52)	5-10
or CME 100	Vector Calculus for Engineers	
Physics (select one of the following):		3-4
PHYSICS 41 & PHYSICS 45	Mechanics and Light and Heat	3-8
or GEOPHYS 110	Introduction to the Foundations of Contemporary Geophysics	
BIOHOPK 174H	Experimental Design and Probability	3
or ECON 102A	Introduction to Statistical Methods (Postcalculus) for Social Scientists	
or STATS 101	Data Science 101	
or STATS 110	Statistical Methods in Engineering and the Physical Sciences	
or STATS 116	Theory of Probability	
or STATS 141	Biostatistics	
or CME 106	Introduction to Probability and Statistics for Engineers	

#### The Fundamentals (all courses required):

EARTHSYS 146A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	3
EARTHSYS 146B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	3
EARTHSYS 141	Remote Sensing of the Oceans	3-4
EARTHSYS 151	Biological Oceanography	3-4
EARTHSYS 152	Marine Chemistry	3-4

#### Human Dimensions

Select one of the following:		
BIOHOPK 173H	Marine Conservation Biology	4
BIOHOPK 280	Short Course on Ocean Policy	3
CEE 175A	California Coast: Science, Policy, and Law	3-4
EARTHSYS 243	Environmental Advocacy and Policy Communication	3
LAW 2506	Natural Resources Law and Policy	3

#### Field Experience <sup>1</sup>

Select at least one of the following:

- One quarter abroad at the Stanford in Australia Program
- One quarter at Stanford @ SEA
- One quarter (or more) at the Hopkins Marine Station

#### Elective Requirement

Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units. See Earth Systems staff for a list of possible electives.

# Sustainable Food and Agriculture

## Learning Objectives:

1. Describe the main biophysical and socioeconomic constraints in food systems at global and local scales.
2. Apply knowledge of agricultural soils and plant growth to solve problems related to crop production, soil conservation, and natural resource management.
3. Identify the links between food systems and other aspects of the Earth system, including water, energy, and climate systems.
4. Assess and critique proposed policy or technological solutions that claim to make food systems more sustainable.

## Requirements

All students must complete the Required Core Courses (p. 2) listed under the "Bachelor's (p. 2)" tab in addition to the required courses listed below.

	<b>Units</b>
<b>Additional Foundation and Breadth Courses</b>	
BIO 81 or BIOHOPK 81 or HUMBIO 2A & HUMBIO 2B or EARTHSYS 116	4
CHEM 31A & CHEM 31B or CHEM 31X	5-10
ECON 1	5
ECON 155	5
GEOLSCI 1 or GEOLSCI 4 or EARTHSYS 117 or EARTHSYS 128	4-5
MATH 19 & MATH 20 & MATH 21	10
MATH 51 or CME 100	5
BIOHOPK 174H	3
PHYSICS 41 or PHYSICS 45 or GEOPHYS 110	4
BIOHOPK 174H or BIO 202 or ECON 102A or STATS 101 or STATS 110 or STATS 116 or STATS 141 or CME 106	3-5

A total of 7 courses are required from the Food and Agriculture Focus Areas. In addition, two electives are required for this track. All track courses and electives must be taken for a letter grade (nine courses total).

## Fundamentals of Agriculture Production and Economics (both required):

ECON 106	World Food Economy	4
EARTHSYS 185	Feeding Nine Billion	4-5

## Biogeophysical Dimensions (3 required):

EARTHSYS 155	Science of Soils	3-4
BIO 115	The Hidden Kingdom - Evolution, Ecology and Diversity of Fungi	4
EARTHSYS 142	Remote Sensing of Land	4
EARTHSYS 256	Soil and Water Chemistry	3
BIO 137	(Not given this year)	
HUMBIO 113	The Human-Plant Connection	3
HUMBIO 130	Human Nutrition	4

## Social Dimensions (choose 1):

ARCHLGY 124	Archaeology of Food: production, consumption and ritual	3-5
BIO 144	Conservation Biology: A Latin American Perspective	3
EARTHSYS 136	The Ethics of Stewardship	2-3
EARTHSYS 187	FEED the Change: Redesigning Food Systems	2-3
ECON 118	Development Economics	5
HUMBIO 113S	Healthy/Sustainable Food Systems: Maximum Sustainability across Health, Economics, and Environment	4
HUMBIO 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context	4
OSPMADRD 79	Earth and Water Resources' Sustainability in Spain	3-4

## Applied Study in the Field

EARTHSYS 180	Principles and Practices of Sustainable Agriculture	3-4
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Two additional courses at the 100-level or above are required. Each must be a minimum of 3 units. See Earth Systems staff for a list of possible electives

## Minor in Earth Systems, Sustainability Subplan

The minor in Earth Systems, Sustainability subplan, provides students with foundational knowledge, skills, and frameworks needed to understand social-environmental systems and address intergenerational sustainability challenges. Students declaring the minor in Earth Systems must also declare the Sustainability subplan.

To minor in Earth Systems, students must take the core courses listed below and approved electives for a minimum of 35 units. Courses that count toward the fulfillment of major requirements may not be counted toward the minor, and all courses must be taken for a letter grade.

Students declaring a minor in Earth Systems must do so no later than two quarters prior to their intended quarter of degree conferral; for example, a student must declare a minor before the end of Autumn Quarter to graduate the following Spring Quarter. The Sustainability subplan must also be declared in Axess when declaring the minor. In addition, students pursuing the minor must complete the Multiple Major/Minor Form (<https://stanford.box.com/v/change-UG-program>) and have it reviewed by all applicable departments/programs. This form must be submitted to the Student Services Center ([https://studentservicescenter.stanford.edu/%22%20%5Ct%20%22\\_blank](https://studentservicescenter.stanford.edu/%22%20%5Ct%20%22_blank)) by the

application to graduate deadline for the term in which the student intends to graduate.

## Required Course Work

### Core

		Units
EARTHSYS 10	Introduction to Earth Systems	4
EARTHSYS 111	Biology and Global Change	4
EARTHSYS 112	Human Society and Environmental Change (ECON 1 recommended as a pre- or corequisite to EARTHSYS 112)	4
EARTHSYS 131	Pathways in Sustainability Careers	1
SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems (prerequisites: EARTHSYS 111, EARTHSYS 112)	3

### Electives

Students must take a minimum of 19 units of electives at the 100-level or above that address dimensions of environmental systems and social-environmental systems in theory or practice, with at least one course taken in each of the following four categories: Earth Systems Science/Engineering; Environmental Justice; Applied Problem Solving; and Skills. Students may double-count courses in these categories (i.e., if a course fulfills both the Environmental Justice and Applied Problem Solving requirements, it can be applied to both categories).

A list of approved electives is available on the Earth Systems website and in the Earth Systems Program office (Y2E2 131). Students may petition to count one relevant freshman or sophomore seminar toward the minor.

## Coterminal Master's Degrees in Earth Systems

The Earth Systems Program offers current Stanford University undergraduates the opportunity to apply to a one-year coterminal master's program. Earth Systems offers a coterminal Master of Science (M.S.) degree in Earth Systems and a coterminal Master of Arts (M.A.) degree in Earth Systems, Environmental Communication. The Environmental Communication subplan prints on both the transcript and the diploma.

### Application and Admission

The Earth Systems Program has quarterly coterminal degree application deadlines: November 6, 2018; February 19, 2019; and May 14, 2019. Seniors must apply by Winter Quarter deadline. To apply, students should submit an online application. The application includes the following:

- The Stanford coterminal application (<https://www.applyweb.com/stanterm>)
- A statement of purpose
- A resume
- A current Stanford unofficial transcript
- Two letters of recommendation, one of which must be from the master's adviser (who must be an Academic Council member; each coterminal M.A. student has two advisers: Thomas Hayden and Kevin Arrigo, or another approved faculty adviser who is an Academic Council member)
- Master's Program Proposal (<https://earth.stanford.edu/esys/program-forms>): A list of courses that fulfill degree requirements signed by the master's adviser

1. Applications must be submitted no later than the quarter prior to the expected completion of the B.S. degree (and within quarterly application deadlines). An application fee is assessed by the

Registrar's Office for coterminal applications, once students are matriculated into the program.

2. Students applying to the coterminal master's program must have completed a minimum of 120 units toward graduation with a minimum overall Stanford GPA of 3.4.
3. All applicants must devise a program of study that shows a level of specialization appropriate to the master's level, as determined in consultation with the master's adviser and the Director of Earth Systems. (See also following sections, Master of Science and Master of Arts in Earth Systems Degree Requirements).
4. Students applying from an undergraduate major other than Earth Systems should review their undergraduate course list with Deana Fabbro-Johnston, Richard Nevle, or Thomas Hayden (M.A. only).
5. The student has the option of receiving the B.S. degree after completing that degree's requirements or receiving the B.S. and M.A./M.S. degrees concurrently at the completion of the master's program.
6. Students must submit a new application to change from the M.S. to the M.A. in Earth Systems, or from the M.A. to the M.S. in Earth Systems. If accepted, the student must submit a Graduate Authorization Petition through Axess; a \$125 fee applies to a successful Graduate Authorization Petition.

### University Coterminal Requirements

Coterminal master's degree candidates are expected to complete all master's degree requirements as described in this bulletin. University requirements for the coterminal master's degree are described in the "Coterminal Master's Program (<http://exploreddegrees.stanford.edu/cotermdegrees>)" section. University requirements for the master's degree are described in the "Graduate Degrees (<http://exploreddegrees.stanford.edu/graduatedegrees/#masterstext>)" section of this bulletin.

After accepting admission to this coterminal master's degree program, students may request transfer of courses from the undergraduate to the graduate career to satisfy requirements for the master's degree. Transfer of courses to the graduate career requires review and approval of both the undergraduate and graduate programs on a case by case basis.

In this master's program, courses taken during or after the first quarter of the sophomore year are eligible for consideration for transfer to the graduate career; the timing of the first graduate quarter is not a factor. No courses taken prior to the first quarter of the sophomore year may be used to meet master's degree requirements.

Course transfers are not possible after the bachelor's degree has been conferred.

The University requires that the graduate adviser be assigned in the student's first graduate quarter even though the undergraduate career may still be open. The University also requires that the Master's Degree Program Proposal be completed by the student and approved by the department by the end of the student's first graduate quarter.

## Coterminal Master of Science in Earth Systems Degree Requirements

The master of science degree in Earth Systems allows specialization through graduate-level course work that may include up to 9 units of research with the master's adviser. This may culminate in the preparation of a M.S. thesis; however, a thesis is not required for the degree. The process of building mastery in the field is enriched through steady communication with a faculty adviser.

The following are required of all M.S. students:

- A minimum of 45 units of course work and/or research credit (upon approval).
- At least 34 units of the student's course work for the master's program must be at the 200-level or above.
- All remaining course work must be at the 100-level or above.
- All courses for the master's program must be taken for a letter grade; courses not taken for a letter grade must be approved by the master's adviser and Director of Earth Systems.
- A minimum overall GPA of 3.4 must be maintained.
- All coterminal master's students are required to take the capstone course, EARTHSYS 290 Master's Seminar.

For the Master of Science degree in Earth Systems, the following courses must be taken if not completed in the undergraduate degree program. These courses do not have to be completed before applying to the coterminal program. These may not be counted as part of the 45-unit master's degree:

	<b>Units</b>
Core (both required):	8
EARTHSYS 111 Biology and Global Change	
EARTHSYS 112 Human Society and Environmental Change	
<b>Biology: One Biology Foundations/Core course pre-approved by Master's adviser, OR select from the following:</b>	4-10
HUMBIO 2A & HUMBIO 2B Genetics, Evolution, and Ecology and Culture, Evolution, and Society	
BIOHOPK 47 Introduction to Research in Ecology and Ecological Physiology	
EARTHSYS 116 Ecology of the Hawaiian Islands	
<b>Chemistry (select one of the following):</b>	5-10
CHEM 31X Chemical Principles Accelerated	
CHEM 31A & CHEM 31B Chemical Principles I and Chemical Principles II	
<b>Physics (select one of the following):</b>	3-4
One physics class from the PHYSICS 20 or 40 series or GEOPHYS 110	
<b>Mathematics (select one of the following):</b>	5
MATH 51 Linear Algebra, Multivariable Calculus, and Modern Applications	
CME 100 Vector Calculus for Engineers	
<b>Statistics (select one of the following):</b>	3-5
BIOHOPK 174H Experimental Design and Probability	
BIO 141 Biostatistics	
ECON 102A Introduction to Statistical Methods (Postcalculus) for Social Scientists	
STATS 110 Statistical Methods in Engineering and the Physical Sciences	
STATS 116 Theory of Probability	
CME 106 Introduction to Probability and Statistics for Engineers	

## Coterminal Master of Arts in Earth Systems, Environmental Communication Degree Requirements

The Earth Systems Program offers current Stanford University undergraduates the opportunity to apply for admission to a 45-unit coterminal Master of Arts (MA) program in Earth Systems, Environmental Communication. The Earth Systems Master of Arts degree provides an overview of the theory, techniques, and challenges of communicating environmental science and policy concepts to diverse audiences and includes hands-on experience with different modalities of communication

including writing, journalism, multimedia production, and informal education. The degree program is built on a set of required Core courses including a weekly seminar, a practicum placement, and a capstone project, enhanced with a range of individually selected Focus courses chosen either to emphasize a particular topic or modality or to provide greater breadth and diversity of study topics within environmental communication. Focus courses are selected in close consultation with the MA Director and a faculty co-adviser.

All Earth Systems Master of Arts students are also required to complete the Earth Systems Core, namely EARTHSYS 10 Introduction to Earth Systems (may be audited), EARTHSYS 111 Biology and Global Change, and EARTHSYS 112 Human Society and Environmental Change.

These courses may be taken concurrently with the MA degree but may not be counted toward the 45 units required for the MA degree. Rarely, additional prerequisites or foundational courses may be required depending on the academic background and intended focus of each student.

The following are required of all M.A. students:

- All M.A. students must declare the Environmental Communication subplan in Axess.
- A minimum of 45 units of course work and/or research credit (upon approval).
- At least 34 units of the student's course work for the master's program must be at the 200-level or above.
- All remaining course work must be at the 100-level or above.
- All courses for the master's program must be taken for a letter grade; courses not taken for a letter grade must be approved by the master's adviser and Director of Earth Systems.
- A minimum overall GPA of 3.4 must be maintained.
- All coterminal master's students are required to take the capstone course, EARTHSYS 290 Master's Seminar.

## Graduate Advising Expectations

The Earth Systems Program is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both the adviser and the advisee are expected to maintain professionalism and integrity.

Faculty advisers guide students in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

For a statement of University policy on graduate advising, see the "Graduate Advising (<http://exploreddegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext>)" section of this bulletin.

*Director:* Kevin Arrigo

*Deputy Director:* Richard Nevle

*Associate Director:* Deana Fabbro-Johnston

*Affiliated Faculty and Lecturers:* Michelle Anderson (Law), Patrick Archie (Earth Systems, Earth System Science), Nicole Ardoin (School of Education, Woods Institute for the Environment), Kevin Arrigo

(Earth Systems, Earth System Science), Gregory Asner (Department of Global Ecology, Carnegie Institution), Greg Beroza (Geophysics), Barbara Block (Biology, Hopkins Marine Station, Woods Institute for the Environment), Alexandria Boehm (Civil and Environmental Engineering), Gordon Brown (Geological Sciences), Marshall Burke (Earth System Science), Ken Caldeira (Earth System Science), Liz Carlisle (Earth Systems), Karen Casciotti (Earth System Science), Page Chamberlain (Earth System Science), Larry Crowder (Biology, Woods Institute for the Environment), Danny Cullenward (Earth Systems), Lisa Curran (Anthropology, Woods Institute for the Environment), Gretchen Daily (Biology, Woods Institute for the Environment), Jenna Davis (Civil and Environmental Engineering, Woods Institute for the Environment), Anne Dekas (Earth System Science), Mark Denny (Biology, Hopkins Marine Station), Noah Diffenbaugh (Earth System Science, Woods Institute for the Environment), Rodolfo Dirzo (Biology, Woods Institute for the Environment), Robert Dunbar (Earth System Science, Woods Institute for the Environment), Debra Dunn (Earth Systems, Hasso Plattner Institute of Design), William Durham (Anthropology, Woods Institute for the Environment), Louis Durlofsky (Energy Resources Engineering), Stefano Ermon (Computer Science), Gary Ernst (Geological Sciences, emeritus), Walter Falcon (Freeman Spogli Institute for International Studies, emeritus, Woods Institute for the Environment), Scott Fendorf (Earth System Science, Woods Institute for the Environment, Precourt Institute for Energy), Christopher Field (Woods Institute for the Environment), Christopher Francis (Earth System Science, Woods Institute for the Environment), Zephyr Frank (History, Woods Institute for the Environment), David Freyberg (Civil and Environmental Engineering, Woods Institute for the Environment), Tad Fukami (Biology), Margot Gerritsen (Energy Resources Engineering), Elizabeth Hadly (Biology, Woods Institute for the Environment), Thomas Hayden (Earth Systems), George Hilley (Geological Sciences), Suki Hoagland (Earth Systems), Robert Jackson (Earth System Science, Woods Institute for the Environment), Michael Kahan (Urban Studies), David Kennedy (History, emeritus, Woods Institute for the Environment), Alexandra Konings (Earth System Science), Karl Knapp (Atmosphere and Energy Operations), Rosemary Knight (Geophysics, Woods Institute for the Environment), Jonathan Koomey (Earth Systems), Jeffrey Koseff (Civil and Environmental Engineering), Anthony Kovscek (Energy Resources Engineering), Eric Lambin (Earth System Science, Woods Institute for the Environment), Jim Leape (Center for Ocean Solutions), David Lobell (Earth System Science, Woods Institute for the Environment), Evan Lyons (Earth Systems Science), Gilbert Masters (Civil and Environmental Engineering), Pamela Matson (Dean, School of Earth, Energy & Environmental Sciences, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Anna Michalak (Earth System Science), Fiorenza Micheli (Hopkins Marine Station, Center for Ocean Solutions), Stephen Monismith (Civil and Environmental Engineering, Woods Institute for the Environment), Ian Monroe (Earth Systems), Harold Mooney (Biology, emeritus, Woods Institute for the Environment), Rosamond Naylor (Earth System Science, Freeman Spogli Institute for International Studies, Woods Institute for the Environment), Richard Nevle (Earth Systems), Julia Novy-Hildesley (Sustainability Science and Practice), Michael Osborne (Earth Systems), Stephen Palumbi (Biology, Hopkins Marine Station, Woods Institute for the Environment), Jonathan Payne (Geological Sciences), Kabir Peay (Biology), Emily Polk (Program in Writing and Rhetoric), Thomas Robinson (Medicine), Matt Rothe (Earth Systems, Hasso Plattner Institute of Design, Graduate School of Business), Jennifer Saltzman (Geological Sciences), Dustin Schroeder (Geophysics), Paul Segall (Geophysics), Deborah Sivas (Law), George Somero (Biology, Hopkins Marine Station), Jenny Suckale (Geophysics), James Sweeney (Management Science and Engineering, Woods Institute for the Environment), Leif Thomas (Earth System Science), Barton Thompson, Junior (Law, Woods Institute for the Environment), Sarah Truebe (Earth Systems), Tiziana Vanorio (Geophysics), Peter Vitousek (Biology, Emmett Interdisciplinary Program in Environment and Resources, Woods Institute for the Environment), Virginia Walbot (Biology), Paula Welander (Earth System Science), Cindy Wilber (Jasper Ridge), Michael Wilcox (Anthropology), Mikael Wolfe (History),

Jane Woodward (Atmosphere and Energy Operations), Mark Zoback (Geophysics)

## Overseas Studies Courses in Earth Systems

The Bing Overseas Studies Program (<http://bosp.stanford.edu>) manages Stanford study abroad programs for Stanford undergraduates. Students should consult their department or program's student services office for applicability of Overseas Studies courses to a major or minor program.

The Bing Overseas Studies course search site (<https://undergrad.stanford.edu/programs/bosp/explore/search-courses>) displays courses, locations, and quarters relevant to specific majors.

For course descriptions and additional offerings, see the listings in the Stanford Bulletin's ExploreCourses (<http://explorecourses.stanford.edu>) or Bing Overseas Studies (<http://bosp.stanford.edu>).

		Units
OSPAUSTL 10	Coral Reef Ecosystems	3
OSPAUSTL 25	Freshwater Systems	3
OSPAUSTL 30	Coastal Forest Ecosystems	3
OSPMADR 79	Earth and Water Resources' Sustainability in Spain	3-4
OSPOXFRD 49	Environmental Economics and Policy	3-5
OSPSANTG 58	Living Chile: A Land of Extremes	5

## Environmental Courses List

		Units
AA 115N	The Global Positioning System: Where on Earth are We, and What Time is It?	
AA 116Q	Electric Automobiles and Aircraft	
AA 251	Introduction to the Space Environment	
AA 260	Sustainable Aviation	
AA 272C	Global Positioning Systems	
AA 280	Smart Structures	
AFRICAAM 47	History of South Africa	
AFRICAAM 50B	Nineteenth Century America	
AFRICAAM 58Q	American Landscapes of Segregation	
AFRICAAM 95	Liberation Through Land: Organic Gardening and Racial Justice	
AFRICAAM 100	Grassroots Community Organizing: Building Power for Collective Liberation	
AFRICAAM 111	AIDS, Literacy, and Land: Foreign Aid and Development in Africa	
AFRICAAM 144	Living Free: Embodying Healing and Creativity in The Era of Racial Justice Movements	
AFRICAAM 147	History of South Africa	
AFRICAAM 150B	Nineteenth Century America	
AFRICAAM 189	Black Life and Death in the Neoliberal Era	
AFRICAST 109	Running While Others Walk: African Perspectives on Development	
AFRICAST 112	AIDS, Literacy, and Land: Foreign Aid and Development in Africa	
AFRICAST 114N	Desert Biogeography of Namibia Prefield Seminar	
AFRICAST 209	Running While Others Walk: African Perspectives on Development	
AMSTUD 1B	Media, Culture, and Society	

AMSTUD 10Q	Dystopian California: Imagining the Golden State in Disaster and Science Fiction Film	ANTHRO 160A	Tragedy of the Commons: Human Ecology of Communal Resources
AMSTUD 94	Topics in Food Studies	ANTHRO 161A	Human Ecology: Adaptations to Climate and Climate Change
AMSTUD 124A	The American West	ANTHRO 162	Indigenous Peoples and Environmental Problems
AMSTUD 136X	Indigenous Peoples and Environmental Change in the North American West	ANTHRO 163	Conservation and Evolutionary Ecology
AMSTUD 150X	From Gold Rush to Google Bus: History of San Francisco	ANTHRO 164	Natural Resource Extraction: Use and Development: Assessing Policies, Practices and Outcomes
ANTHRO 11SC	Conservation and Development Dilemmas in the Amazon	ANTHRO 164A	Anthropology of Ecotourism
ANTHRO 15	Sex and Gender	ANTHRO 164B	Anthropology of Tourism
ANTHRO 18	Peopling of the Globe: Changing Patterns of Land Use and Consumption Over the Last 50,000 Years	ANTHRO 165	Parks and Peoples: The Benefits and Costs of Protected Area Conservation
ANTHRO 22	Archaeology of North America	ANTHRO 166	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness
ANTHRO 31	Ecology, Evolution, and Human Health	ANTHRO 167A	A Wilderness Empire: The Political Ecology of California
ANTHRO 34	Animals and Us	ANTHRO 168	Everest: Extreme Anthropology
ANTHRO 39	Sense of Place	ANTHRO 168A	Risky Environments: The Nature of Disaster
ANTHRO 42	Megacities	ANTHRO 169	The Ecology of Cuisine: Food, Nutrition, and the Evolution of the Human Diet
ANTHRO 78A	Disruption and Diffusion: The Archaeology of Innovation	ANTHRO 170	Australian Ecosystems: Human Dimensions and Environmental Dynamics
ANTHRO 90C	Theory of Ecological and Environmental Anthropology	ANTHRO 172	Seminar on Cultural Evolution and Coevolution
ANTHRO 106	Incas and their Ancestors: Peruvian Archaeology	ANTHRO 178	Evolution and Conservation in Galapagos
ANTHRO 109	Archaeology: World Cultural Heritage	ANTHRO 183B	Human Mobility and Adaptability
ANTHRO 110	Environmental Archaeology	ANTHRO 187	Nuclear Cultures
ANTHRO 111A	Archaeology of the Andes of Argentina	ANTHRO 187A	The Anthropology of Race, Nature, and Animality
ANTHRO 111B	Muwekma: Landscape Archaeology and the Narratives of California Natives	ANTHRO 219	Zooarchaeology: An Introduction to Faunal Remains
ANTHRO 112A	Archaeology of Human Rights	ANTHRO 225	Language and the Environment
ANTHRO 114B	Landscape Archaeology and Global Information Systematics	ANTHRO 237	The Politics of Humanitarianism
ANTHRO 116B	Anthropology of the Environment	ANTHRO 247	Nature, Culture, Heritage
ANTHRO 117	Thinking Through Animals	ANTHRO 255	Research Methods in Ecological Anthropology
ANTHRO 117B	Monuments and Landscapes: An Archaeological Perspective	ANTHRO 260	Social and Environmental Sustainability: The Costa Rican Case
ANTHRO 118	Heritage, Environment, and Sovereignty in Hawaii	ANTHRO 262	Indigenous Peoples and Environmental Problems
ANTHRO 119	Zooarchaeology: An Introduction to Faunal Remains	ANTHRO 264	Natural Resource Extraction: Use and Development: Assessing Policies, Practices and Outcomes
ANTHRO 120	The Maya	ANTHRO 266	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness
ANTHRO 123B	Government of Water and Crisis: Corporations, States and the Environment	ANTHRO 270	Australian Ecosystems: Human Dimensions and Environmental Dynamics
ANTHRO 125	Language and the Environment	ANTHRO 278	Evolution and Conservation in Galapagos
ANTHRO 136	The Anthropology of Global Supply Chains	ANTHRO 302	History of Anthropological Theory, Ecology and Environment
ANTHRO 137	The Politics of Humanitarianism	ANTHRO 305	Research Methods in Ecological Anthropology
ANTHRO 140C	Mobilizing Nature	ANTHRO 332A	The Anthropology of Heritage: Concepts, Contexts and Critique
ANTHRO 141A	Science, Technology, and Medicine in Africa	ANTHRO 337B	Anthropological Approaches to Health Issues in Contemporary Latin America
ANTHRO 147	Nature, Culture, Heritage		
ANTHRO 151A	Contemporary Chinese Society Through Independent Documentary Film		
ANTHRO 154C	Animism, Gaia, and Alternative Approaches to the Environment		
ANTHRO 155	Research Methods in Ecological Anthropology		
ANTHRO 156B	Environment, Nature and Race		
ANTHRO 159C	Ecological Humanities		
ANTHRO 160	Social and Environmental Sustainability: The Costa Rican Case		

ANTHRO 339A	Technologies of Extinctions: Ecocides and Genocides	ARTSTUDI 253	ECOLOGY OF MATERIALS
ANTHRO 362	Human Spatial Dynamics: Seminar in Communicating Contemporary Science	ASNAMST 123	Asian Americans and Environmental Justice
ANTHRO 362A	Introduction to Human Evolution, Ecology, Genetics, and Culture	BIO 2N	Ecology and Evolution of Infectious Disease in a Changing World
ANTHRO 363A	Anthropology of Environmental Conservation	BIO 3	Frontiers in Marine Biology
ANTHRO 364	EcoGroup: Current Topics in Ecological, Evolutionary, and Environmental Anthropology	BIO 3N	Views of a Changing Sea: Literature & Science
ANTHRO 364A	EcoGroup: Problems in Ecological and Evolutionary Anthropology	BIO 7N	Introduction to Conservation Photography
ANTHRO 368	Dynamics of Coupled Human-Natural Systems	BIO 8N	Human Origins
ANTHRO 369	Advanced Topics in Human Behavioral	BIO 10SC	Natural History, Marine Biology, and Research
ANTHRO 372	Urban Ecologies	BIO 12N	Sensory Ecology of Marine Animals
ANTHRO 378	Dynamics of Coupled Human-Natural Systems	BIO 13Q	Hacking the Genome
ANTHRO 445	Anthropology Brown Bag Series	BIO 30	Ecology for Everyone
APPPHYS 79Q	Energy Options for the 21st Century	BIO 33N	Conservation Science and Practice
APPPHYS 205	Introduction to Biophysics	BIO 35N	Climate change ecology: Is it too late?
APPPHYS 219	Solid State Physics Problems in Energy Technology	BIO 46	Introduction to Research in Ecology and Evolutionary Biology
APPPHYS 294	Cellular Biophysics	BIO 47	Introduction to Research in Ecology and Evolutionary Biology
ARCHLGY 64	Cultural Heritage and Human Rights	BIO 81	Introduction to Ecology
ARCHLGY 102B	Incas and their Ancestors: Peruvian Archaeology	BIO 105A	Ecology and Natural History of Jasper Ridge Biological Preserve
ARCHLGY 111	Emergence of Chinese Civilization from Caves to Palaces	BIO 105B	Ecology and Natural History of Jasper Ridge Biological Preserve
ARCHLGY 119	Zooarchaeology: An Introduction to Faunal Remains	BIO 115	The Hidden Kingdom - Evolution, Ecology and Diversity of Fungi
ARCHLGY 124	Archaeology of Food: production, consumption and ritual	BIO 116	Ecology of the Hawaiian Islands
ARCHLGY 126	Archaeobotany	BIO 117	Biology and Global Change
ARCHLGY 156	Design of Cities	BIO 130	Ecosystems of California
ARCHLGY 224	Archaeology of Food: production, consumption and ritual	BIO 138	Ecosystem Services: Frontiers in the Science of Valuing Nature
ARCHLGY 226	Archaeobotany	BIO 140	The Science of Extreme Life of the Sea
ARTHIST 144B	Modern Design from the Eiffel Tower to Yves Saint Laurent	BIO 141	Biostatistics
ARTHIST 152	The American West	BIO 142	Molecular Geomicrobiology Laboratory
ARTHIST 156N	Art and the Power of Place: Site, Location, Environment	BIO 144	Conservation Biology: A Latin American Perspective
ARTHIST 188A	The History of Modern and Contemporary Japanese and Chinese Architecture and Urbanism	BIO 145	Ecology and Evolution of Animal Behavior
ARTHIST 190A	Indigenous Cultural Heritage: Protection, Practice, Repatriation	BIO 172	Ecological Dynamics: Theory and Applications
ARTHIST 273	Visual Culture of the Arctic	BIO 182	Modeling Cultural Evolution
ARTHIST 450	Art in the Age of Precarity	BIO 196A	Biology Senior Reflection
ARTSINST 182	Activating Urban Spaces: Materializing Hidden Narratives in the Urban Environment	BIO 196B	Biology Senior Reflection
ARTSTUDI 12AX	Drawing Intensive: Revisiting Nature	BIO 196C	Biology Senior Reflection
ARTSTUDI 141S	Drawing Outdoors	BIO 202	Ecological Statistics
ARTSTUDI 153	Ecology of Materials	BIO 208	Spanish in Science/Science in Spanish
ARTSTUDI 153N	Ecology of Materials	BIO 227	Foundations of Community Ecology
ARTSTUDI 157	Art, Invention, Activism in the Public Sphere	BIO 234	Conservation Biology: A Latin American Perspective
ARTSTUDI 184	Art and Environmental Engagement	BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature
		BIO 245	Ecology and Evolution of Animal Behavior
		BIO 274S	Hopkins Microbiology Course
		BIO 302	Current Topics and Concepts in Population Biology, Ecology, and Evolution
		BIO 303	Current Topics and Concepts in Population Biology, Ecology, and Evolution

BIO 304	Current Topics and Concepts in Population Biology, Ecology, and Evolution	BIOHOPK 250H	Ecological Mechanics
BIO 313	Ethics in the Anthropocene	BIOHOPK 252H	Physiology of Global Change
BIO 327	Research Frontiers in Biodiversity and Ecosystem Services	BIOHOPK 253H	Current Topics and Concepts in Quantitative Fish Dynamics and Fisheries Management
BIO 375	Field Ecology & Conservation	BIOHOPK 255H	Developmental Biology and Evolution
BIO 384	Theoretical Ecology	BIOHOPK 260H	Developmental Biology in the Ocean: Diverse Embryonic & Larval Strategies of marine invertebrates
BIO 459	Frontiers in Interdisciplinary Biosciences	BIOHOPK 261H	Invertebrate Zoology
BIOC 459	Frontiers in Interdisciplinary Biosciences	BIOHOPK 262H	Comparative Animal Physiology
BIOE 44	Fundamentals for Engineering Biology Lab	BIOHOPK 263H	Oceanic Biology
BIOE 80	Introduction to Bioengineering (Engineering Living Matter)	BIOHOPK 266H	Molecular Ecology
BIOE 191	Bioengineering Problems and Experimental Investigation	BIOHOPK 267H	Nerve, Muscle, and Synapse
BIOE 242	LAW, TECHNOLOGY, AND LIBERTY	BIOHOPK 268H	Disease Ecology: from parasites evolution to the socio-economic impacts of pathogens on nations
BIOE 390	Introduction to Bioengineering Research	BIOHOPK 272H	Marine Ecology: From Organisms to Ecosystems
BIOE 459	Frontiers in Interdisciplinary Biosciences	BIOHOPK 273H	Marine Conservation Biology
BIOHOPK 14	Bio-logging and Bio-telemetry	BIOHOPK 274	Hopkins Microbiology Course
BIOHOPK 43	Plant Biology, Evolution, and Ecology	BIOHOPK 274H	Experimental Design and Probability
BIOHOPK 47	Introduction to Research in Ecology and Ecological Physiology	BIOHOPK 276H	Estimates and Errors: The Theory of Scientific Measurement
BIOHOPK 81	Introduction to Ecology	BIOHOPK 277H	Dynamics and Management of Marine Populations
BIOHOPK 85	Evolution	BIOHOPK 279H	Physiological Ecology of Marine Megafauna
BIOHOPK 150H	Ecological Mechanics	BIOHOPK 280	Short Course on Ocean Policy
BIOHOPK 152H	Physiology of Global Change	BIOHOPK 285H	Ecology and Conservation of Kelp Forest Communities
BIOHOPK 153H	Current Topics and Concepts in Quantitative Fish Dynamics and Fisheries Management	BIOHOPK 287H	Sensory Ecology
BIOHOPK 155H	Developmental Biology and Evolution	BIOHOPK 299H	Advanced Topics in Marine Conservation Research
BIOHOPK 159H	Molecular Ecology Lab	BIOHOPK 300H	Research
BIOHOPK 160H	Developmental Biology in the Ocean: Diverse Embryonic & Larval Strategies of marine invertebrates	BIOHOPK 320H	Physical Biology
BIOHOPK 161H	Invertebrate Zoology	BIOHOPK 323H	Stanford at Sea
BIOHOPK 162H	Comparative Animal Physiology	BIOMEDIN 156	Economics of Health and Medical Care
BIOHOPK 163H	Oceanic Biology	BIOMEDIN 256	Economics of Health and Medical Care
BIOHOPK 165H	The Extreme Life of the Sea	BIOS 205	Introduction to R for Data Analysis
BIOHOPK 166H	Molecular Ecology	BIOS 221	Modern Statistics for Modern Biology
BIOHOPK 167H	Nerve, Muscle, and Synapse	BIOS 233	Experimental Metagenomics: Nectar Microbes as a Model System
BIOHOPK 168H	Disease Ecology: from parasites evolution to the socio-economic impacts of pathogens on nations	BIOS 235	Metabolism and Metabolic Ecology: Microbes, Gut and Cancer
BIOHOPK 172H	Marine Ecology: From Organisms to Ecosystems	BIOS 248	Scientific Computing for Ecologists, Biologists and Environmental Scientists
BIOHOPK 173H	Marine Conservation Biology	BIOS 252	Experimental strategies for understanding plant-environmental responses
BIOHOPK 173HA	Marine Conservation Biology - Seminar and Discussion Only	BIOS 253	Discovery and Innovation in Emerging Viral Infections
BIOHOPK 174H	Experimental Design and Probability	BIOS 265	Introduction to Quantitative Reasoning in Biology
BIOHOPK 177H	Dynamics and Management of Marine Populations	BIOS 270	Planetary Health: Socioeconomic & Ecological Links Between Human Health & Earth's Natural Ecosystems
BIOHOPK 179H	Physiological Ecology of Marine Megafauna	BIOS 276	Measuring and Predicting Spatial Patterns
BIOHOPK 181H	Physiology of Global Change	CBIO 243	Principles of Cancer Systems Biology
BIOHOPK 182H	Stanford at Sea	CEE 1	Introduction to Environmental Systems Engineering
BIOHOPK 185H	Ecology and Conservation of Kelp Forest Communities	CEE 29N	Managing Natural Disaster Risk
BIOHOPK 187H	Sensory Ecology		
BIOHOPK 198H	Directed Instruction or Reading		
BIOHOPK 199H	Undergraduate Research		

CEE 32A	Psychology of Architecture	CEE 172A	Indoor Air Quality
CEE 33C	Housing Visions	CEE 173S	Electricity Economics
CEE 63	Weather and Storms	CEE 174A	Providing Safe Water for the Developing and Developed World
CEE 64	Air Pollution and Global Warming: History, Science, and Solutions	CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery
CEE 70	Environmental Science and Technology	CEE 175A	California Coast: Science, Policy, and Law
CEE 70N	Water, Public Health, and Engineering	CEE 175Q	Changing Human Behavior: Drivers and Barriers in Environmental Action
CEE 73	Water: An Introduction	CEE 175S	Environmental Entrepreneurship and Innovation
CEE 80N	Engineering the Built Environment: An Introduction to Structural Engineering	CEE 176A	Energy Efficient Buildings
CEE 100	Managing Sustainable Building Projects	CEE 176B	100% Clean, Renewable Energy and Storage for Everything
CEE 101B	Mechanics of Fluids	CEE 176C	Energy Storage Integration - Vehicles, Renewables, and the Grid
CEE 101D	Computations in Civil and Environmental Engineering	CEE 176G	Sustainability Design Thinking
CEE 102	Legal and Ethical Principles in Design, Construction, and Project Delivery	CEE 177	Aquatic Chemistry and Biology
CEE 107A	Understanding Energy	CEE 177L	Smart Cities & Communities
CEE 107R	E <sup>3</sup> : Extreme Energy Efficiency	CEE 177S	Engineering and Sustainable Development
CEE 107S	Understanding Energy - Essentials	CEE 177X	Engineering and Sustainable Development: Toolkit
CEE 112A	Industry Applications of Virtual Design & Construction	CEE 178	Introduction to Human Exposure Analysis
CEE 112B	Industry Applications of Virtual Design & Construction	CEE 179A	Water Chemistry Laboratory
CEE 112C	Industry Applications of Virtual Design & Construction	CEE 179C	Environmental Engineering Design
CEE 113	Patterns of Sustainability	CEE 179S	Seminar: Issues in Environmental Science, Technology and Sustainability
CEE 124	Sustainable Development Studio	CEE 183	Integrated Civil Engineering Design Project
CEE 124E	Ethics in Urban Systems	CEE 199	Undergraduate Research in Civil and Environmental Engineering
CEE 124S	Sustainable Urban Systems Seminar	CEE 199D	Urban Water Supply and Management
CEE 125	Defining Smart Cities: Visions of Urbanism for the 21st Century	CEE 199L	Independent Project in Civil and Environmental Engineering
CEE 126	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development	CEE 199S	Undergraduate Summer Research in Civil and Environmental Engineering
CEE 126X	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas	CEE 200A	Teaching of Civil and Environmental Engineering
CEE 131B	Financial Management of Sustainable Urban Systems	CEE 200B	Teaching of Civil and Environmental Engineering
CEE 141A	Infrastructure Project Development	CEE 200C	Teaching of Civil and Environmental Engineering
CEE 141B	Infrastructure Project Delivery	CEE 201D	Computations in Civil and Environmental Engineering
CEE 141C	Global Infrastructure Projects Seminar	CEE 206	Decision Analysis for Civil and Environmental Engineers
CEE 144	Design and Innovation for the Circular Economy	CEE 207A	Understanding Energy
CEE 146S	Engineering Economics and Sustainability	CEE 207S	Understanding Energy - Essentials
CEE 151	Negotiation	CEE 212A	Industry Applications of Virtual Design & Construction
CEE 155	Introduction to Sensing Networks for CEE	CEE 213	Patterns of Sustainability
CEE 156	Building Systems	CEE 217	Renewable Energy Infrastructure
CEE 1611	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	CEE 221A	Planning Tools and Methods in the Power Sector
CEE 162D	Introduction to Physical Oceanography	CEE 223	Materials for Sustainable Built Environments
CEE 162E	Rivers, Streams, and Canals	CEE 224A	Sustainable Development Studio
CEE 165C	Water Resources Management	CEE 224X	Sustainable Urban Systems Fundamentals
CEE 166A	Watersheds and Wetlands	CEE 224Y	Sustainable Urban Systems Project
CEE 166B	Floods and Droughts, Dams and Aqueducts	CEE 224Z	Sustainable Urban Systems Project
CEE 171	Environmental Planning Methods		
CEE 171F	New Indicators of Well-Being and Sustainability		
CEE 172	Air Quality Management		

CEE 225	Defining Smart Cities: Visions of Urbanism for the 21st Century	CEE 273	Aquatic Chemistry
CEE 226	Life Cycle Assessment for Complex Systems	CEE 273A	Water Chemistry Laboratory
CEE 226E	Advanced Topics in Integrated, Energy-Efficient Building Design	CEE 273B	The Business of Water
CEE 227	Global Project Finance	CEE 274A	Environmental Microbiology I
CEE 242P	Designing Project Organizations	CEE 274B	Microbial Bioenergy Systems
CEE 243	Intro to Urban Sys Engrg	CEE 274D	Pathogens and Disinfection
CEE 246	Venture Creation for the Real Economy	CEE 274P	Environmental Health Microbiology Lab
CEE 251	Negotiation	CEE 274S	Hopkins Microbiology Course
CEE 252Q	Construction Engineering Fundamentals	CEE 275A	California Coast: Science, Policy, and Law
CEE 255	Introduction to Sensing Networks for CEE	CEE 275B	Process Design for Environmental Biotechnology
CEE 256	Building Systems	CEE 275C	Water, Sanitation and Health
CEE 260A	Physical Hydrogeology	CEE 275K	The Practice of Environmental Consulting
CEE 260C	Contaminant Hydrogeology and Reactive Transport	CEE 275S	Environmental Entrepreneurship and Innovation
CEE 261B	Physics of Wind Energy	CEE 276	Introduction to Human Exposure Analysis
CEE 262A	Hydrodynamics	CEE 276C	Energy Storage Integration - Vehicles, Renewables, and the Grid
CEE 262B	Transport and Mixing in Surface Water Flows	CEE 277F	Advanced Field Methods in Water, Health and Development
CEE 262C	Modeling Environmental Flows	CEE 277L	Smart Cities & Communities
CEE 262D	Introduction to Physical Oceanography	CEE 277S	Engineering and Sustainable Development
CEE 262F	Ocean Waves	CEE 277X	Engineering and Sustainable Development: Toolkit
CEE 263A	Air Pollution Modeling	CEE 278A	Air Pollution Fundamentals
CEE 263B	Numerical Weather Prediction	CEE 278C	Indoor Air Quality
CEE 263C	Weather and Storms	CEE 279S	Seminar: Issues in Environmental Science, Technology and Sustainability
CEE 263D	Air Pollution and Global Warming: History, Science, and Solutions	CEE 287	Earthquake Resistant Design and Construction
CEE 263G	Energy Policy in California and the West	CEE 288	Introduction to Performance Based Earthquake Engineering
CEE 263S	Atmosphere/Energy Seminar	CEE 293	Foundations and Earth Structures
CEE 265A	Sustainable Water Resources Development	CEE 299E	Graduate Summer Research in CEE
CEE 265C	Water Resources Management	CEE 299L	Independent Project in Civil and Environmental Engineering
CEE 265D	Water and Sanitation in Developing Countries	CEE 301	The Energy Seminar
CEE 265E	Adaptation to Sea Level Rise and Extreme Weather Events	CEE 316	Sustainable Built Environment Research
CEE 265F	Environmental Governance and Climate Resilience	CEE 322	Data Analytics for Urban Systems
CEE 266A	Watersheds and Wetlands	CEE 323A	Infrastructure Finance and Governance
CEE 266B	Floods and Droughts, Dams and Aqueducts	CEE 323B	Infrastructure Finance and Governance
CEE 266C	Dams, Reservoirs, and their Sustainability	CEE 323C	Infrastructure Finance and Governance
CEE 267	Applied Data Analysis and Uncertainty Quantification	CEE 324	Industrialized Construction
CEE 269A	Environmental Engineering Seminar	CEE 325	CapaCity Design Studio
CEE 269B	Environmental Engineering Seminar	CEE 341	Virtual Design and Construction
CEE 269C	Environmental Engineering Seminar	CEE 350	Engineering Writing, Reviewing and Presentations
CEE 270	Movement and Fate of Organic Contaminants in Waters	CEE 361	Turbulence Modeling for Environmental Fluid Mechanics
CEE 270B	Environmental Organic Reaction Chemistry	CEE 363A	Mechanics of Stratified Flows
CEE 271A	Physical and Chemical Treatment Processes	CEE 363F	Oceanic Fluid Dynamics
CEE 271B	Environmental Biotechnology	CEE 363G	Field Techniques in Coastal Oceanography
CEE 271D	Introduction to Wastewater Treatment Process Modeling	CEE 365A	Advanced Topics in Environmental Fluid Mechanics and Hydrology
CEE 272	Coastal Contaminants	CEE 365B	Advanced Topics in Environmental Fluid Mechanics and Hydrology
CEE 272R	Modern Power Systems Engineering	CEE 365C	Advanced Topics in Environmental Fluid Mechanics and Hydrology
CEE 272T	SmartGrids and Advanced Power Systems Seminar		

CEE 365D	Advanced Topics in Environmental Fluid Mechanics and Hydrology	CHPR 227	The Science of Community Engagement in Health Research
CEE 370A	Environmental Research	CHPR 231	Diet and Gene Expression
CEE 370B	Environmental Research	CHPR 232	Social Determinants of Health: Achieving Health Equity
CEE 370C	Environmental Research	CLASSICS 14N	Ecology in Philosophy and Literature
CEE 370D	Environmental Research	CLASSICS 358	The Archaeology of Ancient Mediterranean Environments
CEE 374A	Introduction to Physiology of Microbes in Biofilms	CME 211	Software Development for Scientists and Engineers
CEE 374B	Introduction to Physiology of Microbes in Biofilms	COMM 1B	Media, Culture, and Society
CEE 374C	Introduction to Physiology of Microbes in Biofilms	COMM 104W	Reporting, Writing, and Understanding the News
CEE 374D	Introduction to Physiology of Microbes in Biofilms	COMM 108	Media Processes and Effects
CEE 374S	Advanced Topics in Microbial Pollution	COMM 172	Media Psychology
CEE 374W	Advanced Topics in Water, Health and Development	COMM 177C	Specialized Writing and Reporting: Health and Science Journalism
CEE 377	Research Proposal Writing in Environmental Engineering and Science	COMM 272	Media Psychology
CEE 379	Introduction to PHD Studies in Civil and Environmental Engineering	COMM 277C	Specialized Writing and Reporting: Health and Science Journalism
CEE 385	Performance-Based Earthquake Engineering	COMPLIT 172	A History of Nature Through Literature and Art
CHEM 10	Exploring Research and Problem Solving Across the Sciences	COMPLIT 348	US-Mexico Border Fictions: Writing La Frontera, Tearing Down the Wall
CHEM 25N	Science in the News	COMP MED 11SC	Life in the Zoo: Behavior, Welfare and Enrichment
CHEM 28N	Science Innovation and Communication	COMP MED 80N	Animal behavior: sex, death, and sometimes food!
CHEM 459	Frontiers in Interdisciplinary Biosciences	COMP MED 84Q	Globally Emerging Zoonotic Diseases
CHEMENG 25E	Energy: Chemical Transformations for Production, Storage, and Use	CS 22A	The Social & Economic Impact of Artificial Intelligence
CHEMENG 60Q	Environmental Regulation and Policy	CS 325B	Data for Sustainable Development
CHEMENG 70Q	Masters of Disaster	CS 377E	Designing Solutions to Global Grand Challenges
CHEMENG 120B	Energy and Mass Transport	CSP 80	
CHEMENG 162	Polymers for Clean Energy and Water	CSRE 10SC	Inequality and Poverty in the United States
CHEMENG 174	Environmental Microbiology I	CSRE 30SI	Housing Justice and Stratification in the Bay Area
CHEMENG 262	Polymers for Clean Energy and Water	CSRE 31SI	Food + Race
CHEMENG 274	Environmental Microbiology I	CSRE 109A	Federal Indian Law
CHEMENG 432	Electrochemical Energy Conversion	CSRE 109B	Native Nation Building
CHEMENG 456	Microbial Bioenergy Systems	CSRE 125E	Shades of Green: Redesigning and Rethinking the Environmental Justice Movements
CHEMENG 459	Frontiers in Interdisciplinary Biosciences	CSRE 132E	Topics in Writing & Rhetoric: Introduction to Environmental Justice: Race, Class, Gender and Place
CHEMENG 501	Special Topics in Semiconductor Processing	CSRE 156J	Environment, Nature and Race
CHEMENG 516	Special Topics in Energy and Catalysis	CSRE 178	Ethics and Politics of Public Service
CHEMENG 521	Special Topics in Nanostructured Materials for Energy and the Environment	CSRE 187A	The Anthropology of Race, Nature, and Animality
CHILATST 125S	Chicano/Latino Politics	EARTH 1A	Know Your Planet: Research Frontiers
CHINA 118A	Food Culture in China: Past and Present	EARTH 1B	Know Your Planet: Big Earth
CHINA 154Q	Utopia/Dystopia in Chinese Literature and Culture	EARTH 1C	Know Your Planet: Science Outside
CHINA 371	Aesthetics, Politics, and Modernity: Critical Theory and China	EARTH 2	Climate and Society
CHPR 113	Healthy/Sustainable Food Systems: Maximum Sustainability across Health, Economics, and Environment	EARTH 5	Geokids: Earth Sciences Education
CHPR 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context	EARTH 10	Design for a Habitable Planet
CHPR 223	Obesity in America: Clinical and Public Health Implications	EARTH 14	Our National Parks
		EARTH 15	Living on the Edge

EARTH 42	Landscapes and Tectonics of the San Francisco Bay Area	EARTHSYS 101	Energy and the Environment
EARTH 100	Research Preparation for Undergraduates	EARTHSYS 102	Fundamentals of Renewable Power
EARTH 114A	Our National Parks	EARTHSYS 103	Understanding Energy
EARTH 117	Earth Sciences of the Hawaiian Islands	EARTHSYS 104	The Water Course
EARTH 126X	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas	EARTHSYS 105	Food and Community: Food Security, Resilience and Equity
EARTH 126Y	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas	EARTHSYS 105A	Ecology and Natural History of Jasper Ridge Biological Preserve
EARTH 126Z	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas	EARTHSYS 105B	Ecology and Natural History of Jasper Ridge Biological Preserve
EARTH 131	Pathways in Sustainability Careers	EARTHSYS 106	World Food Economy
EARTH 163H	Big Earth Hackathon Water Challenge	EARTHSYS 106C	Why are Scientists Engineering Our Food?
EARTH 183	California Desert Geologic Field Trip	EARTHSYS 106D	New meat: The Science Behind Scalable Alternatives to Animal Products
EARTH 191	Stanford EARTH Field Courses	EARTHSYS 107	Control of Nature
EARTH 193	Natural Perspectives: Geology, Environment, and Art	EARTHSYS 110	Introduction to the Foundations of Contemporary Geophysics
EARTH 202	PhD Students on the PhD	EARTHSYS 111	Biology and Global Change
EARTH 203	Diversity and Inclusion in the Geosciences	EARTHSYS 112	Human Society and Environmental Change
EARTH 214	Software Design in Modern Fortran for Scientists and Engineers	EARTHSYS 113	Earthquakes and Volcanoes
EARTH 218	Communicating Science	EARTHSYS 115	Wetlands Ecology of the Pantanal Prefield Seminar
EARTH 219	OPINION WRITING IN THE SCIENCES	EARTHSYS 115T	Island Biogeography of Tasmania Prefield Seminar
EARTH 251	Negotiation	EARTHSYS 116	Ecology of the Hawaiian Islands
EARTH 305A	Teaching in the field: Basic skills for working with students in the field	EARTHSYS 117	Earth Sciences of the Hawaiian Islands
EARTH 310	Computational Geosciences Seminar	EARTHSYS 118	Heritage, Environment, and Sovereignty in Hawaii
EARTH 400	Directed Research	EARTHSYS 119	Will Work for Food
EARTH 401	Curricular Practical Training	EARTHSYS 121	Building a Sustainable Society: New Approaches for Integrating Human and Environmental Priorities
EARTHSYS 4	Coevolution of Earth and Life	EARTHSYS 122	Evolution of Marine Ecosystems
EARTHSYS 8	The Oceans: An Introduction to the Marine Environment	EARTHSYS 124	Measurements in Earth Systems
EARTHSYS 9	Public Service Internship Preparation	EARTHSYS 125	Shades of Green: Redesigning and Rethinking the Environmental Justice Movements
EARTHSYS 10	Introduction to Earth Systems	EARTHSYS 126	Perspectives in International Development
EARTHSYS 11	Introduction to Geology	EARTHSYS 128	Evolution of Terrestrial Ecosystems
EARTHSYS 13SC	People, Land, and Water in the Heart of the West	EARTHSYS 129	Geographic Impacts of Global Change: Mapping the Stories
EARTHSYS 16SI	Environmental Justice in the Bay Area	EARTHSYS 131	Pathways in Sustainability Careers
EARTHSYS 18	Promoting Sustainability Behavior Change at Stanford	EARTHSYS 132	Evolution of Earth Systems
EARTHSYS 20	The Cuisine of Change: Promoting Child Health and Combating Food Insecurity	EARTHSYS 133	Social Enterprise Workshop
EARTHSYS 36N	Life at the Extremes: From the Deep Sea to Deep Space	EARTHSYS 136	The Ethics of Stewardship
EARTHSYS 41N	The Global Warming Paradox	EARTHSYS 138	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development
EARTHSYS 44N	The Invisible Majority: The Microbial World That Sustains Our Planet	EARTHSYS 141	Remote Sensing of the Oceans
EARTHSYS 46N	Exploring the Critical Interface between the Land and Monterey Bay: Elkhorn Slough	EARTHSYS 142	Remote Sensing of Land
EARTHSYS 46Q	Environmental Impact of Energy Systems: What are the Risks?	EARTHSYS 144	Fundamentals of Geographic Information Science (GIS)
EARTHSYS 58Q	Understanding Our Oceans: Scientific Toys, Tools, & Trips	EARTHSYS 146A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation
EARTHSYS 90	Introduction to Geochemistry	EARTHSYS 146B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation
EARTHSYS 91	Earth Systems Writers Collective	EARTHSYS 148	Grow it, Cook it, Eat it. An Experiential Exploration of How and Why We Eat What We Eat
EARTHSYS 100	Environmental and Geological Field Studies in the Rocky Mountains	EARTHSYS 149	Wild Writing

EARTHSYS 151	Biological Oceanography	EARTHSYS 252	Marine Chemistry
EARTHSYS 152	Marine Chemistry	EARTHSYS 255	Microbial Physiology
EARTHSYS 154	Intermediate Writing: Communicating Climate Change: Navigating the Stories from the Frontlines	EARTHSYS 256	Soil and Water Chemistry
EARTHSYS 155	Science of Soils	EARTHSYS 258	Geomicrobiology
EARTHSYS 158	Geomicrobiology	EARTHSYS 260	Internship
EARTHSYS 160	Sustainable Cities	EARTHSYS 263F	Groundwork for COP21
EARTHSYS 164	Introduction to Physical Oceanography	EARTHSYS 272	Antarctic Marine Geology and Geophysics
EARTHSYS 170	Environmental Geochemistry	EARTHSYS 276	Open Space Management Practicum
EARTHSYS 172	Australian Ecosystems: Human Dimensions and Environmental Dynamics	EARTHSYS 276A	Open Space Practicum Independent Study
EARTHSYS 176	Open Space Management Practicum	EARTHSYS 277C	Specialized Writing and Reporting: Health and Science Journalism
EARTHSYS 176A	Open Space Practicum Independent Study	EARTHSYS 286	Farm and Garden Environmental Education Practicum
EARTHSYS 177C	Specialized Writing and Reporting: Health and Science Journalism	EARTHSYS 288	Social and Environmental Tradeoffs in Climate Decision-Making
EARTHSYS 179S	Seminar: Issues in Environmental Science, Technology and Sustainability	EARTHSYS 289	FEED Lab: Food System Design & Innovation
EARTHSYS 180	Principles and Practices of Sustainable Agriculture	EARTHSYS 289A	FEED Lab: Food System Design & Innovation
EARTHSYS 182A	Ecological Farm Systems	EARTHSYS 289B	FEED Lab: Food System Design & Innovation
EARTHSYS 185	Feeding Nine Billion	EARTHSYS 290	Master's Seminar
EARTHSYS 186	Farm and Garden Environmental Education Practicum	EARTHSYS 291	Concepts in Environmental Communication
EARTHSYS 187	FEED the Change: Redesigning Food Systems	EARTHSYS 292	Multimedia Environmental Communication
EARTHSYS 188	Social and Environmental Tradeoffs in Climate Decision-Making	EARTHSYS 293	Environmental Communication Practicum
EARTHSYS 190	The Multimedia Story	EARTHSYS 294	Environmental Communication Capstone
EARTHSYS 191	Concepts in Environmental Communication	EARTHSYS 295	Environmental Communication Seminar
EARTHSYS 196	Implementing Climate Solutions at Scale	EARTHSYS 297	Directed Individual Study in Earth Systems
EARTHSYS 197	Directed Individual Study in Earth Systems	EARTHSYS 299	M.S. Thesis
EARTHSYS 199	Honors Program in Earth Systems	EARTHSYS 323	Stanford at Sea
EARTHSYS 200	Environmental Communication in Action: The SAGE Project	EARTHSYS 332	Theory and Practice of Environmental Education
EARTHSYS 201	Editing for Publication	EARTHSYS 801	TGR Project
EARTHSYS 205VP	Contested markets in the Brazilian Amazon Rainforest	EASTASN 94	The Rise of China in World Affairs
EARTHSYS 206	World Food Economy	EASTASN 117	Health and Healthcare Systems in East Asia
EARTHSYS 207	Spanish in Science/Science in Spanish	EASTASN 217	Health and Healthcare Systems in East Asia
EARTHSYS 210A	Senior Capstone and Reflection	EASTASN 294	The Rise of China in World Affairs
EARTHSYS 210B	Senior Capstone and Reflection	ECON 15N	The Economics of Immigration in the US: Past and Present
EARTHSYS 210P	Earth Systems Capstone Project	ECON 17N	Energy, the Environment, and the Economy
EARTHSYS 211	Fundamentals of Modeling	ECON 106	World Food Economy
EARTHSYS 219	Will Work for Food	ECON 118	Development Economics
EARTHSYS 225	Shades of Green: Redesigning and Rethinking the Environmental Justice Movements	ECON 126	Economics of Health and Medical Care
EARTHSYS 232	Evolution of Earth Systems	ECON 127	Economics of Health Improvement in Developing Countries
EARTHSYS 235	Podcasting the Anthropocene	ECON 155	Environmental Economics and Policy
EARTHSYS 236	The Ethics of Stewardship	ECON 159	Economic, Legal, and Political Analysis of Climate-Change Policy
EARTHSYS 238	Land Use Law	ECON 206	World Food Economy
EARTHSYS 241	Remote Sensing of the Oceans	ECON 214	Development Economics I
EARTHSYS 242	Remote Sensing of Land	ECON 216	Development Economics III
EARTHSYS 243	Environmental Advocacy and Policy Communication	ECON 231	Analytics of Global Economic Externalities under Uncertainty
EARTHSYS 249	Wild Writing	ECON 250	Environmental Economics
EARTHSYS 250	Directed Research	ECON 251	Natural Resource and Energy Economics
EARTHSYS 251	Biological Oceanography	ECON 341	Public Economics and Environmental Economics Seminar

EDUC 100A	EAST House Seminar: Current Issues and Debates in Education	ENERGY 123	When Technology Meets Reality; An In-depth Look at the Deepwater Horizon Blowout and Oil Spill
EDUC 126A	Ethics and Leadership in Public Service	ENERGY 130	Well Log Analysis I
EDUC 126B	Public Service Leadership Program Practicum	ENERGY 141	Seismic Reservoir Characterization
EDUC 139	Educating Young STEM Thinkers	ENERGY 146	Reservoir Characterization and Flow Modeling with Outcrop Data
EDUC 170	Preparation for Independent Public Service Projects	ENERGY 153	Carbon Capture and Sequestration
EDUC 239	Educating Young STEM Thinkers	ENERGY 155	Undergraduate Report on Energy Industry Training
EDUC 267A	Curriculum and Instruction in Science	ENERGY 160	Uncertainty Quantification in Data-Centric Simulations
EDUC 267B	Curriculum and Instruction in Science	ENERGY 167	Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties
EDUC 267C	Curriculum and Instruction in Science	ENERGY 171	Energy Infrastructure, Technology and Economics
EDUC 267E	Development of Scientific Reasoning and Knowledge	ENERGY 175	Well Test Analysis
EDUC 267F	Development of Scientific Reasoning and Knowledge II	ENERGY 180	Oil and Gas Production Engineering
EDUC 267G	Integrating the Garden into the Elementary Curriculum	ENERGY 191	Optimization of Energy Systems
EDUC 280	Learning & Teaching of Science	ENERGY 192	Undergraduate Teaching Experience
EDUC 302	Behavior Design	ENERGY 193	Undergraduate Research Problems
EDUC 320	Sociology of Science	ENERGY 194	Special Topics in Energy and Mineral Fluids
EDUC 332	Theory and Practice of Environmental Education	ENERGY 199	Senior Project and Seminar in Energy Resources
EDUC 357	Science and Environmental Education in Informal Contexts	ENERGY 201	Laboratory Measurement of Reservoir Rock Properties
EDUC 359C	Science Literacy	ENERGY 203	Stanford Energy Ventures
EDUC 362	The Science Curriculum: Values and Ideology in a Contested Terrain	ENERGY 204	Achieving Universal Energy Access by 2030: Can it be done?
EE 60N	Man versus Nature: Coping with Disasters Using Space Technology	ENERGY 212	Environmental Aspects of Oil and Gas Production
EE 116	Semiconductor Devices for Energy and Electronics	ENERGY 214	The Global Price of Oil
EE 142	Engineering Electromagnetics	ENERGY 216	Entrepreneurship in Energy
EE 151	Sustainable Energy Systems	ENERGY 217	Research Seminar: Energy Development in the Emerging Economy
EE 155	Green Electronics	ENERGY 221	Fundamentals of Multiphase Flow
EE 237	Solar Energy Conversion	ENERGY 222	Advanced Reservoir Engineering
EE 255	Green Electronics	ENERGY 223	Reservoir Simulation
EE 292H	Engineering, Entrepreneurship & Climate Change	ENERGY 224	Advanced Reservoir Simulation
EE 293	Energy storage and conversion: Solar Cells, Fuel Cells, Batteries and Supercapacitors	ENERGY 225	Theory of Gas Injection Processes
EE 293B	Fundamentals of Energy Processes	ENERGY 226	Thermal Recovery Methods
EEES 302	Challenges and Practices in Crossdisciplinary Research and Teaching	ENERGY 227	Enhanced Oil Recovery
EMED 124	Wilderness First Aid	ENERGY 230	Advanced Topics in Well Logging
EMED 126	Wilderness First Responder	ENERGY 240	Data science for geoscience
EMED 128	Wilderness Medicine: Continued practical experience for high-quality care	ENERGY 241	Seismic Reservoir Characterization
EMED 218	Humanitarian Crises: Cities, Refugees and Resilience	ENERGY 246	Reservoir Characterization and Flow Modeling with Outcrop Data
ENERGY 20N	Technology in the Greenhouse	ENERGY 251	Thermodynamics of Equilibria
ENERGY 101	Energy and the Environment	ENERGY 253	Carbon Capture and Sequestration
ENERGY 101A	Energizing California	ENERGY 255	Master's Report on Energy Industry Training
ENERGY 102	Fundamentals of Renewable Power	ENERGY 260	Uncertainty Quantification in Data-Centric Simulations
ENERGY 104	Sustainable Energy for 9 Billion	ENERGY 267	Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties
ENERGY 110	Engineering Economics	ENERGY 269	Geothermal Reservoir Engineering
ENERGY 112	Exploring Geosciences with MATLAB	ENERGY 271	Energy Infrastructure, Technology and Economics
ENERGY 120	Fundamentals of Petroleum Engineering	ENERGY 273	Special Topics in Energy Resources Engineering
ENERGY 121	Fundamentals of Multiphase Flow		

ENERGY 275	Quantitative Methods in Basin and Petroleum System Modeling	ENVRES 225	E-IPER Current Topics Seminar
ENERGY 281	Applied Mathematics in Reservoir Engineering	ENVRES 226	Energy Law
ENERGY 282	Chemical Kinetics and Basin Modeling	ENVRES 230	Field Survey Data Collection & Analysis
ENERGY 289	Multiscale Methods for Transport in Porous Media	ENVRES 240	Environmental Decision-Making and Risk Perception
ENERGY 291	Optimization of Energy Systems	ENVRES 245	Psychological Insights for Science Communication
ENERGY 293B	Fundamentals of Energy Processes	ENVRES 246	Measuring Success in Environmental Messaging
ENERGY 293C	Energy from Wind and Water Currents	ENVRES 250	Environmental Governance
ENERGY 295	Electrochemical Energy Storage Systems: Modeling and Estimation	ENVRES 270	Graduate Practicum in Environment and Resources
ENERGY 300	Graduate Directed Reading	ENVRES 280	Introduction to Environment and Resources
ENERGY 301	The Energy Seminar	ENVRES 290	Capstone Project Seminar in Environment and Resources
ENERGY 351	ERE Master's Graduate Seminar	ENVRES 300	Introduction to Resource, Energy and Environmental Economics
ENERGY 352	ERE PhD Graduate Seminar	ENVRES 315	Environmental Research Design Seminar
ENERGY 355	Doctoral Report on Energy Industry Training	ENVRES 320	Designing Environmental Research
ENERGY 359	Teaching Experience in Energy Resources Engineering	ENVRES 330	Research Approaches for Environmental Problem Solving
ENERGY 360	Advanced Research Work in Energy Resources Engineering	ENVRES 340	E-IPER PhD Writing Seminar
ENERGY 361	Master's Degree Research in Energy Resources Engineering	ENVRES 380	Innovating Large Scale Sustainable Transformations
ENERGY 362	Engineer's Degree Research in Energy Resources Engineering	ENVRES 391	Curricular Practical Training
ENERGY 363	Doctoral Degree Research in Energy Resources Engineering	ENVRES 398	Directed Reading in Environment and Resources
ENERGY 365	Special Research Topics in Energy Resources Engineering	ENVRES 399	Directed Research in Environment and Resources
ENERGY 369	Practical Energy Studies	ENVRES 801	TGR Project
ENERGY 801	TGR Project	ENVRES 802	TGR Dissertation
ENERGY 802	TGR Dissertation	ENVRINST 198	Prehonors Seminar
ENGLISH 60N	Living on the Edge: Language and Landscape of the Western Fringes	ENVRINST 199	Interschool Honors Program in Environmental Science, Technology, and Policy
ENGLISH 91VO	Voices of the Land	ENVRINST 260	Water in the West: Challenges and Opportunities
ENGLISH 124	The American West	ESS 8	The Oceans: An Introduction to the Marine Environment
ENGR 25E	Energy: Chemical Transformations for Production, Storage, and Use	ESS 10SC	In the Age of the Anthropocene: Coupled-Human Natural Systems of Southeast Alaska
ENGR 50E	Introduction to Materials Science, Energy Emphasis	ESS 46N	Exploring the Critical Interface between the Land and Monterey Bay: Elkhorn Slough
ENGR 90	Environmental Science and Technology	ESS 60	Food, Water and War: Life on the Mekong
ENGR 113A	Solar Decathlon 2015	ESS 86N	The Most Rational People in the World
ENGR 113B	Solar Decathlon 2015	ESS 101	Environmental and Geological Field Studies in the Rocky Mountains
ENGR 113C	Solar Decathlon 2015	ESS 106	World Food Economy
ENGR 113D	SOLAR DECATHLON 2015	ESS 107	Control of Nature
ENGR 120	Fundamentals of Petroleum Engineering	ESS 108	Research Preparation for Undergraduates
ENGR 145	Technology Entrepreneurship	ESS 111	Biology and Global Change
ENGR 213	Solar Decathlon	ESS 112	Human Society and Environmental Change
ENVRES 199	Independent study	ESS 117	Earth Sciences of the Hawaiian Islands
ENVRES 201	Designing and Evaluating Community Engagement Programs for Social and Environmental Change	ESS 118X	Sustainable Urban Systems Fundamentals
ENVRES 212	Cities and Sustainability: Current Issues, Policy, and Law	ESS 132	Evolution of Earth Systems
ENVRES 220	The Social Ocean: Human Dimensions of Coastal and Marine Ecosystems	ESS 135	Community Leadership
ENVRES 221	New Frontiers and Opportunities in Sustainability	ESS 141	Remote Sensing of the Oceans
ENVRES 222	Climate Law and Policy	ESS 148	Introduction to Physical Oceanography
		ESS 151	Biological Oceanography

ESS 152	Marine Chemistry	ESS 301	Topics in Earth System Science
ESS 155	Science of Soils	ESS 305	Climate Change: An Earth Systems Perspective
ESS 158	Geomicrobiology	ESS 306	From Freshwater to Oceans to Land Systems: An Earth System Perspective to Global Challenges
ESS 162	Remote Sensing of Land	ESS 307	Research Proposal Development and Delivery
ESS 163	Demography and Life History Theory	ESS 322B	Seminar in Hydrology
ESS 164	Fundamentals of Geographic Information Science (GIS)	ESS 323	Stanford at Sea
ESS 165	Advanced Geographic Information Systems	ESS 330	Advanced Topics in Hydrogeology
ESS 170	Analyzing land use in a globalized world	ESS 360	Social Structure and Social Networks
ESS 179S	Seminar: Issues in Environmental Science, Technology and Sustainability	ESS 363	Demography and Life History Theory
ESS 185	Adaptation	ESS 363F	Oceanic Fluid Dynamics
ESS 205	Fundamentals of Geobiology	ESS 385	Practical Experience in the Geosciences
ESS 206	World Food Economy	ESS 400	Graduate Research
ESS 208	Topics in Geobiology	ESS 401	Curricular Practical Training
ESS 210	Techniques in Environmental Microbiology	ESS 801	TGR Project
ESS 211	Fundamentals of Modeling	ESS 802	TGR Dissertation
ESS 212	Measurements in Earth Systems	ETHICSOC 133	Ethics and Politics of Public Service
ESS 214	Introduction to geostatistics and modeling of spatial uncertainty	ETHICSOC 136R	Introduction to Global Justice
ESS 220	Physical Hydrogeology	ETHICSOC 178M	Introduction to Environmental Ethics
ESS 221	Contaminant Hydrogeology and Reactive Transport	ETHICSOC 185M	Contemporary Moral Problems
ESS 223	Ecophysiology and Land Surface Processes	ETHICSOC 278M	Introduction to Environmental Ethics
ESS 224	Remote Sensing of Hydrology	FEMGEN 44Q	Gendered Innovations in Science, Medicine, Engineering, and Environment
ESS 232	Evolution of Earth Systems	FEMGEN 129	Critical Issues in International Women's Health
ESS 240	Advanced Oceanography	FEMGEN 241	Sex and Gender in Human Physiology and Disease
ESS 241	Remote Sensing of the Oceans	FOODRES 103	
ESS 242	Antarctic Marine Geology and Geophysics	FOODRES 119	
ESS 244	Marine Ecosystem Modeling	FOODRES 125	
ESS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation	FOODRES 202	
ESS 246B	Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation	FOODRES 203	
ESS 247	Tropical Meteorology	FOODRES 219	
ESS 249	Marine Stable Isotopes	GEOLSCI 8	Oceanography: An Introduction to the Marine Environment
ESS 251	Biological Oceanography	GEOLSCI 59N	Earthquake 9.0: The Heritage of Fukushima Daiichi 6 Years Later
ESS 252	Marine Chemistry	GEOLSCI 122	Planetary Systems: Dynamics and Origins
ESS 253S	Hopkins Microbiology Course	GEOLSCI 135	Sedimentary Geochemistry and Analysis
ESS 255	Microbial Physiology	GEOLSCI 135A	Sedimentary Geochemistry Field Trip
ESS 256	Soil and Water Chemistry	GEOLSCI 251	Sedimentary Basins
ESS 258	Geomicrobiology	GEOLSCI 254	Carbonate Sedimentology
ESS 259	Environmental Microbial Genomics	GEOLSCI 260	Quantifying Uncertainty in Subsurface Systems
ESS 260	Advanced Statistical Methods for Earth System Analysis	GEOLSCI 266	Managing Nuclear Waste: Technical, Political and Organizational Challenges
ESS 262	Remote Sensing of Land	GEOLSCI 293A	Geology of Oman Field Trip
ESS 265	Advanced Geographic Information Systems	GEOLSCI 313	Modeling of Landforms
ESS 268	Empirical Methods in Sustainable Development	GEOPHYS 20N	Predicting Volcanic Eruptions
ESS 270	Analyzing land use in a globalized world	GEOPHYS 50N	Planetary Habitability, World View, and Sustainability
ESS 275	Nitrogen in the Marine Environment	GEOPHYS 60N	Man versus Nature: Coping with Disasters Using Space Technology
ESS 280	Principles and Practices of Sustainable Agriculture	GEOPHYS 70	The Water Course
ESS 282	Designing Educational Gardens	GEOPHYS 90	Earthquakes and Volcanoes
ESS 292	Directed Individual Study in Earth System Science		
ESS 300	Climate studies of terrestrial environments		

GEOPHYS 110	Introduction to the Foundations of Contemporary Geophysics	GEOPHYS 289	Global Positioning System in Earth Sciences
GEOPHYS 112	Exploring Geosciences with MATLAB	GEOPHYS 290	Tectonophysics
GEOPHYS 120	Ice, Water, Fire	GEOPHYS 385A	Reflection Seismology
GEOPHYS 130	Introductory Seismology	GEOPHYS 385B	Environmental Geophysics
GEOPHYS 141	Remote Sensing of the Oceans	GEOPHYS 385D	Theoretical Geophysics
GEOPHYS 150	Geodynamics: Our Dynamic Earth	GEOPHYS 385E	Tectonics
GEOPHYS 160	D <sup>3</sup> : Disasters, Decisions, Development	GEOPHYS 385K	Crustal Mechanics
GEOPHYS 162	Laboratory Characterization of Properties of Rocks and Geomaterials	GEOPHYS 385L	Earthquake Seismology, Deformation, and Stress
GEOPHYS 181	Fluids and Flow in the Earth: Computational Methods	GEOPHYS 385N	Experimental Rock Physics
GEOPHYS 182	Reflection Seismology	GEOPHYS 385S	Wave Physics
GEOPHYS 183	Reflection Seismology Interpretation	GEOPHYS 385V	Poroelasticity
GEOPHYS 184	Journey to the Center of the Earth	GEOPHYS 385W	GEOPHYSICAL MULTI-PHASE FLOWS
GEOPHYS 185	Rock Physics for Reservoir Characterization	GEOPHYS 385Z	Radio Remote Sensing
GEOPHYS 186	Tectonophysics	GES 50Q	
GEOPHYS 190	Near-Surface Geophysics	GES 260	
GEOPHYS 191	Observing Freshwater	GES 267	
GEOPHYS 196	Undergraduate Research in Geophysics	GES 277	
GEOPHYS 201	Frontiers of Geophysical Research at Stanford	GES 340	
GEOPHYS 202	Reservoir Geomechanics	GS 55Q	
GEOPHYS 203	Fluids and Flow in the Earth: Computational Methods	GS 182	
GEOPHYS 205	Effective Scientific Presentation and Public Speaking	GS 214	
GEOPHYS 208	Unconventional Reservoir Geomechanics	GS 226	
GEOPHYS 210	Basic Earth Imaging	GS 241	
GEOPHYS 211	Environmental Soundings Image Estimation	GS 249	
GEOPHYS 212	Topics in Climate Change	GS 381	
GEOPHYS 214	Water Management in Agricultural Areas	GSBGEN 332	Sustainable Energy: Business Opportunities and Public Policy
GEOPHYS 220	Ice, Water, Fire	GSBGEN 335	Clean Energy Project Development and Finance
GEOPHYS 222	Reflection Seismology	GSBGEN 336	Energy Markets and Policy
GEOPHYS 223	Reflection Seismology Interpretation	GSBGEN 532	Clean Energy Opportunities
GEOPHYS 224	Seismic Reflection Processing	GSBGEN 533	Technology Licensing
GEOPHYS 229	Earthquake Rupture Dynamics	GSBGEN 569	The Open Road: Innovation in Cars, Driving, and Mobility
GEOPHYS 235	Waves and Fields in Geophysics	HISTORY 1B	Global History: The Early Modern World, 1300 to 1800
GEOPHYS 240	Borehole Seismic Modeling and Imaging	HISTORY 40	World History of Science
GEOPHYS 241A	Seismic Reservoir Characterization	HISTORY 40A	The Scientific Revolution
GEOPHYS 255	Report on Energy Industry Training	HISTORY 42S	The Circle of Life: Visions of Nature in Modern Science, Religion, Politics and Culture
GEOPHYS 257	Introduction to Computational Earth Sciences	HISTORY 44	Women and Gender in Science, Medicine and Engineering
GEOPHYS 259	Laboratory Characterization of Properties of Rocks and Geomaterials	HISTORY 44Q	Gendered Innovations in Science, Medicine, Engineering, and Environment
GEOPHYS 260	Rock Physics for Reservoir Characterization	HISTORY 47	History of South Africa
GEOPHYS 262	Rock Physics	HISTORY 74	Mexico Since 1876: History of a "Failed State"?
GEOPHYS 265	Imaging Radar and Applications	HISTORY 79C	The Ethical Challenges of Climate Change
GEOPHYS 270	Electromagnetic Properties of Geological Materials	HISTORY 102	History of the International System
GEOPHYS 280	3-D Seismic Imaging	HISTORY 103D	Human Society and Environmental Change
GEOPHYS 281	Geophysical Inverse Problems	HISTORY 106A	Global Human Geography: Asia and Africa
GEOPHYS 284	Hydrogeophysics	HISTORY 106B	Global Human Geography: Europe and Americas
GEOPHYS 287	Earthquake Seismology	HISTORY 107	Introduction to Urban Studies
GEOPHYS 288A	Crustal Deformation	HISTORY 140	World History of Science
GEOPHYS 288B	Crustal Deformation		

HISTORY 144	Women and Gender in Science, Medicine and Engineering	HUMBIO 113S	Healthy/Sustainable Food Systems: Maximum Sustainability across Health, Economics, and Environment
HISTORY 147	History of South Africa	HUMBIO 114	Environmental Change and Emerging Infectious Diseases
HISTORY 151	The American West	HUMBIO 118	Theory of Ecological and Environmental Anthropology
HISTORY 174	Mexico Since 1876: History of a "Failed State"?	HUMBIO 121E	Ethnicity and Medicine
HISTORY 200B	Doing Environmental History: Climate Change... the podcast	HUMBIO 122M	Challenges of Human Migration: Health and Health Care of Migrants and Autochthonous Populations
HISTORY 207B	Environment, Technology and Revolution in World History	HUMBIO 125	Current Topics and Controversies in Women's Health
HISTORY 223E	Cities of Empire: An Urban Journey through Eastern Europe and the Mediterranean	HUMBIO 126	Promoting Health Over the Life Course: the Science of Healthy Living
HISTORY 226E	Famine in the Modern World	HUMBIO 130	Human Nutrition
HISTORY 243C	People, Plants, and Medicine: Colonial Science and Medicine	HUMBIO 135	Exercise Physiology
HISTORY 254	Popular Culture and American Nature	HUMBIO 151R	Biology, Health and Big Data
HISTORY 326E	Famine in the Modern World	HUMBIO 153	Parasites and Pestilence: Infectious Public Health Challenges
HISTORY 343C	People, Plants, and Medicine: Colonial Science and Medicine	HUMBIO 154A	Engineering Better Health Systems: modeling for public health
HISTORY 374	Mexico Since 1876: History of a "Failed State"?	HUMBIO 154B	Principles of Epidemiology
HISTORY 378	The Historical Ecology of Latin America	HUMBIO 155H	Humans and Viruses I
HISTORY 391C	Early Imperial China	HUMBIO 159	Genes and Environment in Disease Causation: Implications for Medicine and Public Health
HISTORY 471A	Environmental History of Latin America	HUMBIO 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context
HISTORY 471B	Environmental History of Latin America	HUMBIO 173	Science, Innovation and the Law
HRP 206	Meta-research: Appraising Research Findings, Bias, and Meta-analysis	HUMBIO 182	Peopling of the Globe: Changing Patterns of Land Use and Consumption Over the Last 50,000 Years
HRP 214	Scientific Writing	ILAC 256A	Landscapes in Latin American Cinema
HRP 216	Analytical and Practical Issues in the Conduct of Clinical and Epidemiologic Research	ILAC 263	Visions of the Andes
HRP 223	Introduction to Data Management and Analysis in SAS	INTNLREL 102	History of the International System
HRP 224	Social Entrepreneurship and Innovation Lab (SE Lab) - Global & Planetary Health	INTNLREL 135A	International Environmental Law and Policy
HRP 225	Design and Conduct of Clinical and Epidemiologic Studies	INTNLREL 136R	Introduction to Global Justice
HRP 226	Intermediate Epidemiologic and Clinical Research Methods	JAPANGEN 160	
HRP 231	Epidemiology of Infectious Diseases	JEWISHST 39S	The Other Side: Ethnography and Travel Writing through Jewish, Christian and Muslim Eyes
HRP 236	Epidemiology Research Seminar	JEWISHST 129A	Milk and Honey, Wine and Blood: Food, Justice, and Ethnic Identity in Jewish Culture
HRP 238	Genes and Environment in Disease Causation: Implications for Medicine and Public Health	LATINAM 207	Spanish in Science/Science in Spanish
HRP 256	Economics of Health and Medical Care	LATINAM 248	Racial and Gender Inequalities in Latin America
HRP 259	Introduction to Probability and Statistics for Epidemiology	LAW 908	Advanced Environmental Law Clinic
HRP 299	Directed Reading in Health Research and Policy	LAW 908A	Environmental Law Clinic: Clinical Practice
HUMBIO 2A	Genetics, Evolution, and Ecology	LAW 908B	Environmental Law Clinic: Clinical Methods
HUMBIO 2B	Culture, Evolution, and Society	LAW 908C	Environmental Law Clinic: Clinical Coursework
HUMBIO 3B	Behavior, Health, and Development	LAW 1047	Business, Social Responsibility, and Human Rights
HUMBIO 4B	Environmental and Health Policy Analysis	LAW 2503	Energy Law
HUMBIO 5E	Science Education in Human Biology	LAW 2504	Environmental Law and Policy
HUMBIO 19SC	Parks and Peoples: Dilemmas of Protected Area Conservation in East Africa	LAW 2505	Land Use Law
HUMBIO 112	Conservation Biology: A Latin American Perspective	LAW 2506	Natural Resources Law and Policy
HUMBIO 113	The Human-Plant Connection		

LAW 2508	The Business of Water	ME 370B	Energy Systems II: Modeling and Advanced Concepts
LAW 2509	Clean Energy Project Development and Finance	ME 370C	Energy Systems III: Projects
LAW 2510	California Coast: Science, Policy and Law	ME 371	Combustion Fundamentals
LAW 2512	Cities and Sustainability: Current Issues, Policy, and Law	MED 23	ASB The Cuisine of Change: Promoting Child Health and Combating Food Insecurity
LAW 2513	Climate: Politics, Finance, and Infrastructure	MED 108Q	Human Rights and Health
LAW 2515	Environmental Justice	MED 158A	From Foodies to Freegans: Food Popular Topics in the Silicon Valley
LAW 2516	Natural Resources Law and Policy - South Africa: Field Study	MED 158B	From Foodies to Freegans Practicum
LAW 2517	Modern Crosscurrents in Energy and Environmental Law	MED 214	PHS/Public Health Seminar Series
LAW 2518	U.S. Environmental Law in Transition	MED 228	Physicians and Social Responsibility
LAW 2519	Water Law	MED 237	Health Law: Improving Public Health
LAW 4014	Law, Technology, and Liberty	MED 285	Global Leaders and Innovators in Human and Planetary Health
LAW 4043	The Social & Economic Impact of Artificial Intelligence	MI 70Q	Photographing Nature
LAW 5015	International Dealmaking: Vienna Field Negotiation	MLA 282	Indigenous Peoples and Environmental Problems
LAW 7024	Food Law and Policy	MLA 297	Islands as Model Systems: Geology, Evolution, Ecology, and Human Societies
LAW 7030	Federal Indian Law	MLA 314	Social and Environmental Sustainability: The Costa Rican Case
LAW 7051	Local Government Law	MLA 322	Coffee, Sugar, and Chocolate: Commodities and Consumption in World History. 120–1800
LAW 7824	Advanced Negotiation: Public Policy	MS&E 52	Introduction to Decision Making
LAW 8002	Environmental Law and Policy Colloquium	MS&E 92Q	International Environmental Policy
LAWGEN 20SC	Fighting over Our Common Heritage: Public Lands in the West	MS&E 93Q	Nuclear Weapons, Energy, Proliferation, and Terrorism
MATSCI 144	Thermodynamic Evaluation of Green Energy Technologies	MS&E 152	Introduction to Decision Analysis
MATSCI 156	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	MS&E 185	Global Work
MATSCI 161	Energy Materials Laboratory	MS&E 190	Methods and Models for Policy and Strategy Analysis
MATSCI 256	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution	MS&E 201	Dynamic Systems
MATSCI 301	Engineering Energy Policy Change	MS&E 243	Energy and Environmental Policy Analysis
MATSCI 302	Solar Cells	MS&E 250A	Engineering Risk Analysis
MATSCI 303	Principles, Materials and Devices of Batteries	MS&E 250B	Project Course in Engineering Risk Analysis
ME 30	Engineering Thermodynamics	MS&E 252	Decision Analysis I: Foundations of Decision Analysis
ME 70	Introductory Fluids Engineering	MS&E 292	Health Policy Modeling
ME 112	Mechanical Systems Design	MS&E 352	Decision Analysis II: Professional Decision Analysis
ME 141	Alternative Energy Systems	MS&E 391	Doctoral Research Seminar in Energy-Environmental Systems Modeling and Analysis
ME 170A	Mechanical Engineering Design- Integrating Context with Engineering	MS&E 494	The Energy Seminar
ME 170B	Mechanical Engineering Design: Integrating Context with Engineering	NATIVEAM 109A	Federal Indian Law
ME 182	Electric Transportation	NATIVEAM 109B	Native Nation Building
ME 206A	Design for Extreme Affordability	NENS 230	Analysis Techniques for the Biosciences Using MATLAB
ME 206B	Design for Extreme Affordability	OB 601	Organizational Ecology
ME 250	Internal Combustion Engines	OB 672	Organization and Environment
ME 257	Gas-Turbine Design Analysis	OBGYN 256	Current Topics and Controversies in Women's Health
ME 260	Fuel Cell Science and Technology	OIT 333	Design for Extreme Affordability
ME 262	Physics of Wind Energy	OIT 334	Design for Extreme Affordability
ME 267	Ethics and Equity in Transportation Systems	OSPAUSTL 10	Coral Reef Ecosystems
ME 352B	Fundamentals of Heat Conduction	OSPAUSTL 25	Freshwater Systems
ME 357	Gas-Turbine Design Analysis	OSPAUSTL 30	Coastal Forest Ecosystems
ME 370A	Energy Systems I: Thermodynamics		

OSPAUSTL 40	Australian Studies: History, Society and Culture Down Under	POLECON 231	Strategy Beyond Markets: Challenges and Opportunities in Developing Economies
OSPCPTWN 50	[Independent Study] Conservation & Resources in Sub-Saharan Africa	POLECON 515	Strategy Beyond the Market: Innovation in the Energy Industry
OSPGEN 53	Corals of Palau: Ecology, the Physical Environment, and Reefs at Risk	POLISCI 73	Energy Policy in California and the West
OSPGEN 63	Bio-Cultural Diversity and Community-Based Conservation in Oaxaca	POLISCI 124A	The American West
OSPMADR 8A	Cities and Creativity: Cultural and Architectural Interpretations of Madrid	POLISCI 133	Ethics and Politics of Public Service
OSPMADR 79	Earth and Water Resources' Sustainability in Spain	POLISCI 134L	Introduction to Environmental Ethics
OSPOXFRD 23	Topics in Climate Economics and Policy	POLISCI 136R	Introduction to Global Justice
OSPOXFRD 49	Environmental Economics and Policy	POLISCI 241S	Spatial Approaches to Social Science
OSPPARIS 91	The Future of Globalization: Economics, Politics and the Environment	PSYC 136A	Valuescience: Shedding Illusion to Live and Die Well
OSPSANTG 29	Sustainable Cities: Comparative Transportation Systems in Latin America	PSYC 136B	Valuescience: Shedding Illusion to Live and Die Well
OSPSANTG 58	Living Chile: A Land of Extremes	PSYCH 298	Advanced Studies in Health Psychology
OSPSANTG 63	Entrepreneurship and Innovation in Latin America	PSYCH 459	Frontiers in Interdisciplinary Biosciences
OSPSANTG 71	Santiago: Urban Planning, Public Policy, and the Built Environment	PUBLPOL 85	Environmentalism in California
OSPSANTG 77	Independent Study in Environmental Engineering	PUBLPOL 101	Politics and Public Policy
OUTDOOR 15	Rock Climbing: Intermediate Anchors	PUBLPOL 103D	Ethics and Politics of Public Service
OUTDOOR 60	Introduction to Flyfishing	PUBLPOL 104	Economic Policy Analysis
OUTDOOR 70	SCUBA Diving Open Water: Beginner	PUBLPOL 174	The Urban Economy
OUTDOOR 71	SCUBA Diving Open Water: Advanced	PUBLPOL 209	What is Public about Public Lands - Who and How to Manage.
OUTDOOR 72	SCUBA Diving Open Water: Rescue	PWR 1CS	Writing & Rhetoric 1: Debating the Environment
OUTDOOR 101	Introduction to Outdoor Education	PWR 1KMB	Writing & Rhetoric 1: Cradle to Cradle: the Rhetoric of Sustainability
OUTDOOR 105	Outdoor Living Skills	PWR 1KMC	Writing & Rhetoric 1: Staying Cool on a Hot Planet: Environmental Rhetoric for a Changing World
OUTDOOR 106	Outdoor Leadership Practicum	PWR 1LO	Writing & Rhetoric 1: What Are We Trying to Sustain? Rhetoric of Nature's Values and Services
OUTDOOR 119	Outdoor Educator Apprenticeship	PWR 1MFA	Writing & Rhetoric 1: Shades of Green: The Rhetoric of Contemporary Environmentalism
PEDS 150	Social and Environmental Determinants of Health	PWR 1MGD	Writing & Rhetoric 1: Who Speaks for Nature? Rhetorics of Environmentalism and Justice
PEDS 250	Social and Environmental Determinants of Health	PWR 1MS	Writing & Rhetoric 1: Seeing Nature: The Power of Environmental Visual Rhetoric
PEDS 258	Developing and Defining Strong Community-Academic Partnerships	PWR 1SI	Writing & Rhetoric 1: Super-Storms, Polar Bears, and Droughts: The Rhetoric of Climate Change
PHIL 72	Contemporary Moral Problems	PWR 1VS	Writing & Rhetoric 1: Eating-Animals: The Rhetoric of Animals, Food, and the Environment
PHIL 76	Introduction to Global Justice	PWR 2CR	Writing & Rhetoric 2: Communicating Science to the Public
PHIL 164	Central Topics in the Philosophy of Science: Theory and Evidence	PWR 2JS	Writing & Rhetoric 2: In Science We Trust
PHIL 167B	Philosophy, Biology, and Behavior	PWR 2KM	Writing & Rhetoric 2: A Planet on the Edge: The Rhetoric of Sustainable Energy
PHIL 175A	Ethics and Politics of Public Service	PWR 2MFB	Writing & Rhetoric 2: Sustainability: Making an Impact with Research and Rhetoric
PHIL 177C	Ethics of Climate Change	PWR 2RL	Writing & Rhetoric 2: The Rhetoric of the Natural and Beyond
PHIL 178M	Introduction to Environmental Ethics	PWR 2SB	Writing & Rhetoric 2: Writing 'Science': Fact, Fiction, and Everything Between
PHIL 264	Central Topics in the Philosophy of Science: Theory and Evidence	PWR 91CL	Intermediate Writing: Self & Science
PHIL 267B	Philosophy, Biology, and Behavior		
PHIL 275A	Ethics and Politics of Public Service		
PHIL 277C	Ethics of Climate Change		
PHIL 278M	Introduction to Environmental Ethics		
PHIL 378W	Owning the Earth		
PHYSICS 199	The Physics of Energy and Climate Change		
PHYSICS 240	Introduction to the Physics of Energy		
PHYSICS 241	Introduction to Nuclear Energy		
POLECON 230	Strategy Beyond Markets		

PWR 91EC	Intermediate Writing: Farmers, Scientists, & Activists: Public Discourse of Food Economies	SOMGEN 260	Preparing for Community, Health and Learning through Service in Sri Lanka
PWR 91EP	Intermediate Writing: Communicating Climate Change: Navigating the Stories from the Frontlines	STATS 60	Introduction to Statistical Methods: Precalculus
PWR 91JS	Intermediate Writing: Stanford Science Podcast	STATS 110	Statistical Methods in Engineering and the Physical Sciences
PWR 91KS	Intermediate Writing: Design Thinking and Science Communication	STATS 141	Biostatistics
PWR 91NSC	Intermediate Writing: Introduction to Science Communication	STATS 160	Introduction to Statistical Methods: Precalculus
PWR 91RS	Intermediate Writing: Communicating Bioinformation	STATS 245	Data, Models and Applications to Healthcare Analytics
PWR 91S	Intermediate Writing: Communicating Science	STRAMGT 574	Strategic Thinking in Action - In Business and Beyond
SINY 122	The Agile City	STS 123	Making of a Nuclear World: History, Politics, and Culture
SINY 148	Grappling with the Global: Gentrification, Immigration, and Sustainability in New York City	STS 181	Techno-metabolism: Technology, Society, and the Anthropocene
SINY 150	Biology, Technology, and Society: The City as a Human Life Support System	STS 190	Issues in Technology and the Environment
SIS 103Q		STS 200A	Food and Society: Politics, Culture and Technology
SIS 125Q		SURG 231	Healthcare in Haiti and other Resource Poor Countries
SIS 137Q		SUST 210	Pursuing Sustainability: Managing Complex Social Environmental Systems
SIS 149Q		SUST 220	Case Studies in Leading Change for Sustainability
SIS 204N		SUST 240	Sustainability Science and Practice Practicum
SIS 235N		SUST 261	Art and Science of Decision Making
SIS 236N		THINK 8	Sustainability and Collapse
SIS 327Q		THINK 40	Sustainability Challenges and Transitions
SIS 342Q		UAR 43	LSP: Exploring Research, Writing, and Problem Solving at Stanford
SIS 377Q		URBANST 20	Exploring Urbanism in San Francisco: Three Urban Adventures to Better Understand Cities
SIW 115	Health and Environmental Regulatory Policy	URBANST 102	Social and Urban Development in Beijing: Field Observation & Service Learning
SIW 122	Energy, Environment and Security in South Asia	URBANST 104	Civic Dreams, Human Spaces: Designing Cities for People
SIW 128	Transitions in Energy Policy Speakers Series	URBANST 107	Introduction to Urban and Regional Planning
SIW 132	Bridging the gap between environmental science and policy	URBANST 110	Introduction to Urban Studies
SIW 137	Energy and Environment: Technology, Economics and Policy	URBANST 113	Introduction to Urban Design: Contemporary Urban Design in Theory and Practice
SIW 140	Health and Environmental Policy Speaker Series	URBANST 114	Urban Culture in Global Perspective
SIW 144	Energy, Environment, Climate and Conservation Policy: A Washington, D.C. Perspective	URBANST 122	Ethics and Politics of Public Service
SIW 153	Energy and Climate Cooperation in the Western Hemisphere	URBANST 124	Spatial Approaches to Social Science
SOC 22N	The Roots of Social Protest	URBANST 132	Concepts and Analytic Skills for the Social Sector
SOC 118	Social Movements and Collective Action	URBANST 138	Smart Cities & Communities
SOC 152	The Social Determinants of Health	URBANST 146	Retaking the Commons: Public Space and Heritage for Sustainable Cities
SOC 159	Social and Cultural Dimensions of GlobalIndigeneity	URBANST 160	Environmental Policy and the City in U.S. History
SOC 160	Formal Organizations	URBANST 163	Land Use Control
SOC 218	Social Movements and Collective Action	URBANST 164	Sustainable Cities
SOC 260	Formal Organizations	URBANST 165	Sustainable Urban and Regional Transportation Planning
SOC 349	Race, Space, and Stratification	URBANST 166	East Palo Alto: Reading Urban Change
SOC 362	Organization and Environment		

URBANST 167	Green Mobilities for the Suburbs of the Future
URBANST 174	Defining Smart Cities: Visions of Urbanism for the 21st Century
URBANST 183	Team Urban Design Studio
URBANST 188	Exploring Urbanism in San Francisco: Three Urban Adventures to Better Understand Cities
URBANST 189	Urban Sustainability Collaborative
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Total Units	0