

# Environmental Science

Environmental science is the application of scientific information in order to solve conflicts resulting from humans' use of our planet's resources. This requires an understanding of the sustainability of natural systems and resources, the interrelationships between these systems, as well as the human impact on the environment.

Environmental science is thus an inherently interdisciplinary field, using and combining information from such varied disciplines as:

- biology
- chemistry
- geology
- economics
- political science
- law
- ethics

California Lutheran University's B.S. degree in environmental science is designed to provide the student with the tools to critically examine environmental issues from a variety of perspectives.

Beyond the required foundational science courses, the program provides a broad range of science and humanities courses to select from, allowing students to tailor the program to their interests. The curriculum emphasizes experiential learning, providing the student with opportunities to actively engage in research.

Many students who obtain the B.S. degree in environmental science are planning careers in environmental protection and management, risk assessment, environmental law or education. The program also prepares students to pursue graduate studies in various environmental fields.

## Bachelor of Science in Environmental Science

45 credits minimum, 18 credits upper division.

BIOL 120	Introduction to Ecology and Populations	3
BIOL 123L	Intro Biol Experimentation I	2
EES 152	Introduction to Environmental Science	4
Select one of the following:		4-5
CHEM 111/111L	Chemistry and the Environment and Chemistry and the Environment Lab	
CHEM 151/151L	General Chemistry and General Chemistry Lab	
Select one of the following		4
EES 111/111L	Physical Geology and Physical Geology Lab	
EES 151/151L	Physical Geography and Physical Geography Lab	
Lower Division Support Courses - one of the following: <small>EES 111/111L and EES 151/151L only count here if not counted above</small>		4
BIOL 121	Introduction to Cells and Organisms	
CHEM 152/152L	General Chemistry II and General Chemistry II Lab	
EES 111/111L	Physical Geology and Physical Geology Lab	
EES 112/112L	Historical Geology and Historical Geology Lab	
EES 118/118L	The Oceans and The Oceans Lab	
EES 151/151L	Physical Geography and Physical Geography Lab	
Complete 14 cr. from the following, at least two courses from EES:		14
BIOL 311	Evolution	
BIOL 313	Climate Change	
BIOL 325/325L	Environmental Ecology and Environmental Ecology Lab	
BIOL 333/333L	Ecology and Ecology Lab	
BIOL 343/343L	Invertebrate Zoology and Invertebrate Zoology Lab	
BIOL 345/345L	Marine Biology and Marine Biology Lab	
BIOL 352/352L	Oceanography and Oceanography Lab	
BIOL 440/440L	Primate Ecology and Primate Ecology Lab	
BIOL 450/450L	Animal Behavior and Animal Behavior Lab	

CHEM 301	Environmental Chemistry	
CHEM 305/305L	Quantitative Analysis and Quantitative Analysis Lab	
EES 305	Climate Change	
EES 331/331L	Paleontology and Paleontology Lab	
EES 332/332L	Stratigraphy Sedimentation and Stratigraphy Sediment Lab	
EES 390/390L	Introduction to Soils and Intro to Soils Lab	
EES 395/395L	Water Resources and Lab Field Studies Water Resources	
EES 3XX		
MATH 331	Data Analysis With R	
Select two of the following:		8
BUS 330	Fundamentals of Sustainable Business	
ECON 414	Economics of the Environment	
ENGL 216	Environmental Literature	
POLS 414	Environmental Law and Policy	
RLTH 381	Religion, Food and the Environment	
RLTH 384	Religion and Ecological Ethics	
ENVS 485	Environmental Science Capstone	2
<b>Total Hours</b>		<b>45-46</b>

## Courses

### Lower Division

#### **EES 111. Physical Geology. (3).**

A systematic analysis of the Earth, inside and out, its rocks, minerals, soils and water. This involves the study of the processes by which these materials are formed and are constantly changed, including how mountains are created and then eroded by streams, wind and glaciers. Volcanoes, earthquakes and plate tectonics are also covered. Field trips. Lecture, 3 hours/week.

#### **EES 111L. Physical Geology Lab. (1).**

Hands-on study of rocks and minerals, topographic and air photo interpretation and a variety of geologic exercises that help understand the geologic processes and landforms studied in Geol 111. Laboratory, 2 hours/week. Prerequisite or corequisite: EES-111.

#### **EES 112. Historical Geology. (3).**

The study of the ancient distribution of land and sea and change in life through geologic time. Lecture, 3 hours/week. Prerequisite: EES-111.

#### **EES 112L. Historical Geology Lab. (1).**

Includes fossil identification, geologic map interpretation and paleogeographic problems. Prerequisite or corequisite: EES-112.

#### **EES 118. The Oceans. (4).**

A general survey of geological and biological processes in the oceans with a strong environmental emphasis. Laboratory exercises and field trips complement lecture material. (Cross-listed with Biol 118).

#### **EES 118L. The Oceans Lab. (0).**

Co-requisite: EES-118 (Cross-listed with BIOL-118L).

#### **EES 150. Introduction to Environmental Studies. (4).**

This course introduces students to the field of environmental studies - a field comprising the biophysical sciences, social sciences, and humanities - exploring the interactions between cultures and environments over time.

#### **EES 151. Physical Geography. (3).**

A systematic study of the nature of basic physical elements of human habitat, especially climate, landforms and Earth resources.

#### **EES 151L. Physical Geography Lab. (1).**

#### **EES 152. Introduction to Environmental Science. (4).**

An examination of the relationship between people and the physical environment. Topics include geologic hazards such as volcanoes and earthquakes; pollution of land, air and water; park conservation; energy alternatives; and global challenges such as ozone depletion and human-induced climate change. Lecture, 3 hours/week; Laboratory required, 2 hours/week.

#### **EES 212. Dinosaurs. (4).**

A survey of the non-avian dinosaurs includes: anatomical comparisons of the major dinosaur groups, plus flying and swimming vertebrates of the Mesozoic Era: new discoveries such as dinosaur eggs and nesting sites, the emergence of birds, soft tissue preservation, and the search for genetic material; a review of the process of fossilization; the paleogeography of the Mesozoic world; and the geological background relevant to dinosaur studies. Lab activities are integrated into the meeting times of the lecture course.

**EES 224. Planetary Geology. (4).**

This course will focus on the Earth and its local planetary neighbors utilizing the vast amount of information that has been and continues to be acquired by space probes as well as manned lunar missions. Exposure to comparisons with other nearby planets and planetary objects will allow a better understanding of the Earth, especially our impact on climate and resources. New discoveries and observations in planetary geology demonstrate how the field of geology has changed dramatically since the inception of the "space age". This class will provide students with new insights into planetary evolution, the impact of the space program on our societal needs, and challenge them to critically evaluate data. Lecture, 3 hours/week; Laboratory, 2 hours/week.

**EES 224L. Planetary Geology Lab. (0).****EES 282C. ST: Selected Topic (Core). (1-4).**

Select Topic approved for core requirement.

**EES 3ST. Selected Topics. (1-4).****EES 4ST. Selected Topic. (1-4).****Upper Division****EES 305. Climate Change. (4).**

This course investigates how contemporary/anthropogenic climate change compares to climate variations over Earth's long history, including our scientific understanding of its causes and its local and global impacts. An overview of the physical components of Earth's climate system is discussed. The course includes both lecture and laboratory experiences. Prerequisite: EES 111 or EES 152. Offered Fall semesters.

**EES 311. Crystallography & Mineralogy. (5).**

Covers morphological crystallography, crystal chemistry, relation of mineral properties to their internal structure, recognition of selected minerals in hand specimen and optical techniques used for mineral identification (use of the polarizing microscope). Lecture, 3 hours/week; Laboratory, 6 hours/week. Prerequisites or corequisites: EES-112; Chem-151.

**EES 312. Petrology. (5).**

The study of the origin, occurrence, classification and identification of igneous and metamorphic rocks in hand specimen. Lecture, 4 hours/week; Laboratory, 3 hours/week. Prerequisite: EES-311.

**EES 331. Paleontology. (4).**

A survey of the study of ancient life as revealed in the fossil record. Lecture stresses evolutionary theory and the history of life; lab surveys major invertebrate fossil taxa with emphasis on taxonomy and functional morphology. Lecture, 3 hours/week; Laboratory, 3 hours/week. Prerequisites: EES-111/EES-111L.

**EES 331L. Paleontology Lab. (0).****EES 332. Stratigraphy & Sedimentation. (4).**

The study of sedimentary rocks, sites of deposition, postdepositional changes and sedimentary tectonics. Lecture, 3 hours/week; Laboratory, 3 hours/week.

**EES 332L. Stratigraphy & Sediment Lab. (0).****EES 335. Structural Geology. (5).**

The discussion of primary and secondary rock structures, with particular reference to crustal deformation. Lecture, 3 hours/week; Laboratory, 6 hours/week.

**EES 335L. Structural Geology Lab. (0).****EES 390. Introduction to Soils. (4).**

Soil Science encompasses a broad spectrum of integrated sciences that include biology, chemistry, earth/geological sciences, physics, horticulture and ecology. Lectures will introduce you to many of the subdivisions of soil science that include: agriculture and nutrient management, soil formation and pedology, soil classifications, soil biology, soil physics and soil chemistry. Lab exercises are designed to provide you with some hands on experience pertinent to the subdivisions of Soil Science.

**EES 390L. Intro to Soils Lab. (0).****EES 395. Water Resources. (3).**

An introduction to the principles of surface and groundwater hydrology and to problems related to water utilization. Includes water distribution and availability, alternatives for increasing future water supply, water pollution and mitigation, and water rights law.

**EES 395L. Lab & Field Studies Water Resources. (1).**

Water sampling and testing; simulation of groundwater movement and contaminant migration; stream-table modeling of fluvial landforms. Field trips to study geologic and hydrologic characteristics of areas important to water supply in California and the Southwest.

**EES 405. Geophysics. (4).**

An interdisciplinary study of how to use geophysical observations of the Earth's gravitational and magnetic fields, seismic wave velocities and subsurface electrical resistivity to solve geological and environmental problems. Specific field methods using geophysical instruments will be taught along with the interpretation of the collected data. Lecture, 3 hours/week; Laboratory 3 hours/week. Prerequisites: PHYS 201 & PHYS 202 or Phys 211 & PHYS 212. EES-111 or EES-152 recommended. (cross-listed with Phys 405).

**EES 405L. Geophysics Lab. (0).**

**EES 421. Field Geology. (4).**

Studies the field methods used in geology, including surveying, plane tabling, geologic mapping and section measuring. Prerequisite: EES-335.

**EES 482C. ST: Selected Topic (Core). (1-4).**

Select Topic approved for core requirement.

**EES 485. Environmental Science Capstone. (2).**

This course introduces students to the professional skills and practices required in the environmental field. Includes introduction to GIS (Geographic Information Systems), literature searches, written and oral presentation of work. Prerequisite: senior standing.

**EES 490. Independent Study. (1-4).**

**EES 492. Internship. (1-4).**

**EES 496. Directed Research. (4.00).**