

# ENVIRONMENTAL SCIENCE (ENVS)

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## **ENVS 101 Introduction to Environmental Science (3 semester hours)**

Introduction to the study of environmental science. Examination of issues and problems associated with the environment including examples from air, water, and soil pollution and some remediation strategies. University Core fulfilled: Explorations: Nature of Science, Technology, and Mathematics.

## **ENVS 102 Environmental Science and Sustainability (3 semester hours)**

Introduction to basic scientific principles for understanding a broad range of environmental and sustainability issues facing our society. The course will introduce environmental systems and the physical, chemical, and biological interconnectedness of Earth's ecosystems. Basic connections between the land, ocean, atmosphere, and biosphere, and the underlying science associated with anthropogenic impacts on these systems will be studied. Topics include: environmental systems, ecosystems, biodiversity, global climate change, and energy sources. Best practices for a sustainable environment will be emphasized throughout the course. ENVS majors and ENVS minors only. University Core fulfilled: Explorations: Nature of Science, Technology, and Mathematics.

## **ENVS 112 Environmental Field Sampling and Data Analysis (1 semester hour)**

This introductory field and lab course will test hypotheses related to environmental systems using experimental design. Students will collect environmental samples (water, air, soil, plant, etc.) to assess and monitor a range of environmental systems (e.g., coastal ocean, wetlands, air, etc.). The samples will be analyzed using varied laboratory analytical methods. The laboratory results will be evaluated using introductory statistical methods and compared to environmental regulations to assess environmental health. Corequisite: ENVS 102. ENVS majors only.

## **ENVS 190 Environmental Science Seminar (0 semester hours)**

This course focuses on introducing first-year and transfer environmental science majors to useful resources and opportunities including course registration best-practices, research and internship opportunities, and career planning. Academic and professional environmental science speakers will present on a variety of emerging environmental science research and professional opportunities. ENVS majors only.

## **ENVS 198 Special Studies (0-3 semester hours)**

## **ENVS 199 Independent Studies (0-3 semester hours)**

## **ENVS 210 Surveying and Mapping (4 semester hours)**

Study of basic surveying instruments and related computations for topographic surveys, horizontal and vertical curves, and the design of highways. The course will include computer aided design and geographic information systems (applications of AutoCAD to civil engineering design and fundamentals of GIS using ArcView). Prerequisite: MATH 123. University Core fulfilled: Flag: Information Literacy.

## **ENVS 240 Environmental Statistical Analysis and GIS (4 semester hours)**

Introduction to basic methods of extracting and presenting information from environmental data with a focus on statistical analysis, interpretation of results, and mapping of results. Classical tools of hypothesis testing (e.g. t tests and ANOVA) will be covered along with variability and error analysis. Mapping data will include basic survey tools and an introduction to geographic information systems. Students will apply these tools to real-world environmental data sets. Prerequisites: ENVS 102, EVS 112. ENVS majors only or consent of Program Director.

## **ENVS 250 Earth System Science (3 semester hours)**

An introductory exploration of how the Earth works. Focus is placed on connecting the Earth systems - the solid Earth, atmosphere, oceans, and biosphere - through the cycling of chemical elements and energy. The course will also discuss significant anthropogenic impacts to the natural Earth system. Prerequisites: CHEM 110 and 112.

## **ENVS 263 Surfing and the Ocean Realm (3 semester hours)**

Various basic principles of oceanography, meteorology, and marine biology are explored as applied to the art of surfing. Topics include the genesis, propagation, and dynamics of waves; marine weather systems and surf prediction; marine organisms; and marine pollution issues of concern to surfers. Prerequisite: MATH 101 or higher, or placement into MATH 106 or higher. University Core fulfilled: Explorations: Nature of Science, Technology, and Mathematics.

## **ENVS 275 The Automobile and the Environment (3 semester hours)**

The study of geologic processes in mineral formation, world-wide distribution, and commercial value to human societies. Prerequisite: MATH 101 or higher, or placement into MATH 106 or higher.

## **ENVS 276 Atmospheric Science (3 semester hours)**

The study of general phenomena of weather; including storms, atmospheric disturbances, and possible effects of pollution. This course involves weather forecasting using real-time meteorological data. Prerequisite: MATH 101 or higher, or placement into MATH 106 or higher.

## **ENVS 279 Principles of Environmental Sustainability (3 semester hours)**

This course explores the reality that the most difficult and enduring challenges are not merely technical but also social and institutional. An introduction to the basic science behind key environmental issues is provided along with tools for analyzing the social and institutional underpinnings of environmental conflict, and strategies to move towards sustainability. Prerequisite: MATH 101 or higher, or placement into MATH 106 or higher. University Core fulfilled: Explorations: Nature of Science, Technology, and Mathematics.

## **ENVS 298 Special Studies (1-3 semester hours)**

## **ENVS 310 Oceanography (3 semester hours)**

The basic concepts of physical and biological oceanography will be presented. Prerequisites: BIOL 101, 102, 111, 112; CHEM 110, 111, 112, 113.

## **ENVS 318 Principles of Ecology (4 semester hours)**

(See BIOL 318.)

## **ENVS 320 Intro to Environmental Engr (3 semester hours)**

Introduction to elements of water treatment, water pollution control, solid and hazardous waste disposal, and air pollution control. The interrelationships of the movement of pollutants between the land, air, and water media are discussed.

**ENVS 350 Earth System Science (3 semester hours)**

An in-depth exploration of how the Earth works. Focus is placed on the complex interactions between the Earth systems “ the solid Earth, atmosphere, oceans, and biosphere “ through the cycling of chemical elements and energy. The course will also discuss significant anthropogenic impacts to the natural Earth system. Prerequisites: CHEM 110 and CHEM 112.

**ENVS 356 Sustainable Practices (3 semester hours)**

(See CHEM 356.)

**ENVS 357 Environmental Chemistry: Atmosphere and Climate (3 semester hours)**

A study of chemical processes in the environment. Topics include stratospheric ozone depletion, the greenhouse effect, climate change, air pollution, and non-renewable sources of energy. Prerequisites: CHEM 112 or CIVL 320.

**ENVS 358 Environmental Chemistry: Water, Soil, and Sediment (3 semester hours)**

A study of chemical processes in the environment. Topics include renewable sources of energy, water chemistry, water purification, sewage treatment, pesticides, solid waste, soils and sediments. Prerequisites: CHEM 110 and CHEM 112.

**ENVS 359 Environmental Chemistry Laboratory (1 semester hour)**

Analysis to determine pollutants found in air, water, soil systems; emphasis on the use of instrumental methods and techniques. Prerequisites: CHEM 110, CHEM 111, CHEM 112, and CHEM 113. Pre- or Corequisites: CHEM 357 or CHEM 358 or ENVS 357 or ENVS 358.

**ENVS 361 General Microbiology (3 semester hours)**

(See BIOL 361.)

**ENVS 362 General Microbiology Laboratory (1 semester hour)**

(See BIOL 362.)

**ENVS 398 Special Studies (1-3 semester hours)****ENVS 399 Independent Studies (1-4 semester hours)****ENVS 460 Environmental Microbiology (3 semester hours)**

Introduction to the diversity of microorganisms and their role in ecological and environmental processes in soil, water, and air; environmental services provided by microorganisms; and how microbial functions are utilized in managed and artificial systems. Prerequisites: BIOL 101, BIOL 201, BIOL 202, and CHEM 220. Permission of instructor required.

**ENVS 470 Environmental Monitoring: Practice and Impacts (1 semester hour)**

Students will learn about how federal and state governments protect the environment through environmental monitoring. They will be exposed to the inner workings of local regulatory agencies. Students will learn how to choose optimal environmental monitoring methods, collect and analyze data, and assess the outcome with respect to an established standard. They will understand the importance of effective monitoring for informing future legislative and regulatory efforts as well as identifying populations impacted by environmental injustice and systematic inequities so that bad actors can be held accountable. ENVS majors only or permission of Program Director

**ENVS 491 Environmental Science Capstone I (1 semester hour)**

Work on a research project within the field of environmental science. Focus will be on conducting a literature review, developing an experimental procedure, and collection of data for the project. Majors only or permission of Director required.

**ENVS 492 Environmental Science Capstone II (1 semester hour)**

Work on a research project within the field of environmental science. Focus will be on determining results and discussion of results, preparation for presentation, and write up of paper for submission for the project. Prerequisite: ENVS 491. Majors only or permission of Director required. University Core fulfilled: Oral Skills.

**ENVS 493 Environmental Science Internship (1-4 semester hours)**

Work experience in the field of environmental science in a research, industry, or municipal setting. ENVS majors only or consent of Program Director. University Core fulfilled: Flag: Engaged Learning.

**ENVS 495 Environmental Science Teaching (0-1 semester hours)**

Guided teaching of the undergraduate laboratories. May be repeated for credit up to 8 semester hours. Credit/No Credit only. Permission of Program Director required.

**ENVS 498 Special Studies (1-4 semester hours)****ENVS 499 Independent Studies (1-4 semester hours)****ENVS 502 Applied Environmental Microbiology (3 semester hours)**

Emphasis on the practical physical and biochemical aspects of bacterial metabolism and behavior in the environment as applied to environmental engineering and environmental science; kinetics and energetics of microbial growth as applied to wastewater treatment, biosolids stabilization, and biogas generation. Prerequisite: CIVL 320 or ENVS 358.

**ENVS 505 Aquatic Chemistry (3 semester hours)**

Review of stoichiometry, oxidation-reduction reactions, thermodynamics, and chemical kinetics. Equilibrium chemistry concepts including acid-base, gas, and solid-liquid equilibria applied to aquatic systems with an emphasis on problem-solving methods to determine chemical speciation and pH effects in natural and treated aquatic systems. Prerequisite: CHEM 110 or CHEM 114.

**ENVS 506 Applied Environmental Microbiology (3 semester hours)**

Emphasis on the practical physical and biochemical aspects of bacterial metabolism and behavior in the environment as applied to environmental engineering and environmental science; kinetics and energetics of microbial growth as applied to wastewater treatment, biosolids stabilization, and biogas generation. Prerequisite: CIVL 320 or ENVS 358.

**ENVS 507 Environmental Engineering and Science Lab (3 semester hours)**

Students will learn the theory, application, and techniques of several key environmental laboratory tests and methods of instrumental analysis associated with environmental monitoring and wastewater treatment operations. Tests will be performed on samples collected from various field sites (e.g., Ballona Creek, Dockweiler Beach), local wastewater treatment facilities, or during a field trip to Ballona Wetlands. Students will develop strong technical and scientific writing skills throughout the course. Prerequisite: CIVL 320 or ENVS 358.

**ENVS 508 Contaminant Fate, Transport, and Remediation (3 semester hours)**

Introduction to physical, chemical, and biological processes governing the movement and fate of contaminants in the surface and coastal water environment. Practical quantitative problems solved based on contaminant mass transport, equilibrium partitioning, and chemical transformations in the environment. Regulatory implications and remediation approaches. Prerequisite: CIVL 320 or ENVS 358.

**ENVS 551 Remote Sensing with Civil Engineering and Environmental Science Applications (3 semester hours)**

The course introduces the fundamental concepts of remote sensing from space, remote sensing data, and image data processing. Topics include characteristics of electromagnetic spectrum and remote sensing devices, digital processing methods for interpreting, manipulating and analyzing remotely-sensed image data, and applications of satellite remote sensing to civil engineering and environmental fields. Prerequisite: MATH 112 or MATH 122 or MATH 131.

**ENVS 552 Spatial Data Analysis and Geographical Information Systems (3 semester hours)**

Concepts, principles, and use of geographic information systems (GIS) to investigate spatial patterns associated with physical and social processes. Specific topics include dataset management, site suitability analysis, modeling, remote sensing, cartography and visualization, with a focus on civil and environmental engineering and environmental science applications. Juniors and seniors only.

**ENVS 578 Research Civil Engr & Env Sci (3 semester hours)****ENVS 580 Engineering Geology (3 semester hours)**

Evaluation of the significance of geologic origin, composition, and structure on the characteristics of soils and rocks. Influence geology and plate boundary impacts have on design and construction of engineering projects.

**ENVS 581 Ecosystem Services in Urban Landscapes (3 semester hours)**

This course focuses on the concept of ecosystem services and how they are integrated into urban watersheds to make cities more sustainable and resilient to a changing climate. Key topics include the structure and dynamics of watersheds, the impacts of poor resource management and pollution to environmental quality within urban watersheds, and reestablishing ecosystem services through green infrastructure and similar strategies, and habitat restoration activities. Material is learned through class discussions, presentations by guest researchers and resource managers, several mandatory weekend field trips, and class projects.

**ENVS 582 Urban Coasts: Habitats, Stressors, and Resilience (3 semester hours)**

Urban coastal regions provide a wealth of ecosystem services associated with their shallow marine, shoreline, estuarine, and wetland habitats, but are under constant stresses from human activities and a changing climate. Through this course, students will learn about: 1) the nature of coastal habitats; 2) the natural and anthropogenic interactions between oceanic, coastal, and watershed processes impacting these habitats; and 3) policies and strategies, both behavioral and structural, to mitigate stressors resulting in more resilient coastal cities.

**ENVS 583 Environmental Toxicology and Health Risk (3 semester hours)**

An introduction to the principles of risk assessment, perception of risk and risk communication as it relates to chemicals, pathogens, and radiation in the environment and their effect on humans and animals considering dermal, ingestion, and inhalation pathways; chronic daily intake, potency factors, dose response, bioconcentration, and bioaccumulation are discussed along with regulatory fundamentals.

**ENVS 584 Climate Change and Impacts (3 semester hours)**

Overview of Earth's climate system and exploration of the science, impacts, and politics of global climate change. Specific topics include the greenhouse effect; climate drivers; atmospheric and oceanic circulations; observations and projections; climate modeling; politics; vulnerability; resiliency, adaption, and mitigation; impacts on water resources, extreme climate events, and agriculture.

**ENVS 586 Climate Change Mitigation (3 semester hours)**

Opportunities and challenges of climate change mitigation in different sectors such as energy, agriculture, health, transport, housing, urban planning, etc. Co-benefits to the environment and health of climate change mitigation policies at the local, urban, national, and global levels. Linkages with the Paris Climate Change Treaty and the National Determined Contributions.

**ENVS 587 Climate Change Adaptation and Resilience (3 semester hours)**

Current and future climate impacts on planetary and human health, ecosystems, food systems, socioeconomic determinants, human security, etc. Vulnerability issues. Opportunities of climate adaptation and resilience. Disaster Risk Reduction and Risk Management. Climate adaptation strategies, policies, and planning at the community, city, national, and global levels. The Paris Climate Change Treaty and adaptation in the National Determined Contributions.

**ENVS 588 Environmental Health (3 semester hours)**

Introduction to the field of environmental health sciences. Examination of series of topics relevant to science of environmental health (e.g., population, agriculture/food, microbiology, energy, climate change, water, waste, air) by introducing scientific basis from ecological perspective and describing how topics relate to health. Risk assessment, risk management, and risk communication. Application of scientific information to real world problems and ability to communicate effectively with different stakeholders. Emerging issues and solutions.

**ENVS 589 Sustainability, Health, and Equity (3 semester hours)**

Sustainability Development goals and practices to protect the planet, human health, welfare, equality, biodiversity, oceans, peace, etc. as part of the new sustainable development 2030 agenda with a focus on health and equity targets. Sustainable production and consumption, sustainable cities, climate action, education, etc. Inter-sectoral, innovative, socio-economic, and environmentally sustainable and equitable solutions. Design an implementation strategy for a specific community on a specific item that is part of one of the 17 Sustainable Development Goals. Emerging circular economy.

**ENVS 593 Environmental Science Internship Workshop (1-4 semester hours)**

Advanced work experience in the field of environmental science in a research, industry, or municipal setting.

**ENVS 598 Special Studies (1-4 semester hours)****ENVS 599 Independent Studies (1-4 semester hours)****ENVS 601 Sustainable Water Quality and Resources (3 semester hours)**

Review of stoichiometry, oxidation-reduction reactions, thermodynamics, and chemical kinetics. Equilibrium chemistry concepts including acid-base, gas, and solid-liquid equilibria applied to aquatic systems with an emphasis on problem-solving methods to determine chemical speciation and pH effects in natural and treated aquatic systems.

**ENVS 605 Aquatic Chemistry (3 semester hours)**

Review of stoichiometry, oxidation-reduction reactions, thermodynamics, and chemical kinetics. Equilibrium chemistry concepts including acid-base, gas, and solid-liquid equilibria applied to aquatic systems with an emphasis on problem-solving methods to determine chemical speciation and pH effects in natural and treated aquatic systems.

**ENVS 606 Applied Environmental Microbiology (3 semester hours)**

Emphasis on the practical physical and biochemical aspects of bacterial metabolism and behavior in the environment as applied to environmental engineering and environmental science; kinetics and energetics of microbial growth as applied to wastewater treatment, biosolids stabilization, and biogas generation. Prerequisite: CIVL 601 or ENVS 605.

**ENVS 607 Environmental Engineering and Science Lab (3 semester hours)**

Students will learn the theory, application, and techniques of several key environmental laboratory tests and methods of instrumental analysis associated with environmental monitoring and wastewater treatment operations. Tests will be performed on samples collected from various field sites (e.g., Ballona Creek, Dockweiler Beach), local wastewater treatment facilities, or during a field trip to Ballona Wetlands. Students will develop strong technical and scientific writing skills through the course. Prerequisite: CIVL 601 or ENVS 605.

**ENVS 608 Contaminant Fate, Transport, and Remediation (3 semester hours)**

Introduction to physical, chemical, and biological processes governing the movement and fate of contaminants in the surface and coastal water environment. Practical quantitative problems solved based on contaminant mass transport, equilibrium partitioning, and chemical transformations in the environment. Regulatory implications and remediation approaches. Prerequisite: CIVL 601 or ENVS 605.

**ENVS 651 Remote Sensing with Civil Engineering and Environmental Science Applications (3 semester hours)**

The course introduces the fundamental concepts of remote sensing from space, remote sensing data, and image data processing. Topics include characteristics of electromagnetic spectrum and remote sensing devices, digital processing methods for interpreting, manipulating and analyzing remotely-sensed image data, and applications of satellite remote sensing to civil engineering and environmental fields.

**ENVS 652 Spatial Data Analysis and Geographical Information Systems (3 semester hours)**

Concepts, principles, and use of geographic information systems (GIS) to investigate spatial patterns associated with physical and social processes. Specific topics include dataset management, site suitability analysis, modeling, remote sensing, cartography and visualization, with a focus on civil and environmental engineering and environmental science applications.

**ENVS 678 Research Civil Engr & Env Sci (3 semester hours)**

This course is designed to provide undergraduates and graduate students with research opportunities and better prepare undergraduates for advanced degrees. Students perform research in accordance with the scientific methodology in areas civil engineering, environmental engineering, and/or environmental science under the supervision of a research advisor who may or may not be the primary course instructor. The precise research topic is selected together by each student and/or advisor. Topics include the research process; hypothesis formulation and testing; modern scientific research; relevant research topics; analysis of scientific articles; data interpretation; critical assessment of public opinion versus scientific evidence; and article, report, and presentation preparation. Permission of instructor required.

**ENVS 680 Engineering Geology (3 semester hours)**

Evaluation of the significance of geologic origin, composition, and structure on the characteristics of soils and rocks. Influence geology and plate boundary impacts have on design and construction of engineering projects.

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**ENVS 686 Climate Change Mitigation (3 semester hours)**

Opportunities and challenges of climate change mitigation in different sectors such as energy, agriculture, health, transport, housing, urban planning, etc. Co-benefits to the environment and health of climate change mitigation policies at the local, urban, national, and global levels. Linkages with the Paris Climate Change Treaty and the National Determined Contributions.

**ENVS 687 Climate Change Adaptation and Resilience (3 semester hours)**

Current and future climate impacts on planetary and human health, ecosystems, food systems, socioeconomic determinants, human security, etc. Vulnerability issues. Opportunities of climate adaptation and resilience. Disaster Risk Reduction and Risk Management. Climate adaptation strategies, policies, and planning at the community, city, national, and global levels. The Paris Climate Change Treaty and adaptation in the National Determined Contributions.

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**ENVS 689 Sustainability, Health, and Equity (3 semester hours)**

Sustainability Development goals and practices to protect the planet, human health, welfare, equality, biodiversity, oceans, peace, etc. as part of the new sustainable development 2030 agenda with a focus on health and equity targets. Sustainable production and consumption, sustainable cities, climate action, education, etc. Inter-sectoral, innovative, socio-economic, and environmentally sustainable and equitable solutions. Design an implementation strategy for a specific community on a specific item that is part of one of the 17 Sustainable Development Goals. Emerging circular economy.

**ENVS 690 Comprehensive Oral Exam (0 semester hours)**

The oral examination provides an opportunity to assess the student's understanding of some of the fundamental principles of environmental engineering, water resources engineering, and/or environmental science. It provides an opportunity for the student to demonstrate her/his problem-solving abilities using knowledge learned through coursework and an indication of student accomplishment broader than what is obtained from conventional classroom assessment. The exam is generally offered on the Friday of final examinations week. Students can register for the class only if all of course requirements will be complete at the end of the semester in which they plan to take the exam. Credit/No Credit only.

**ENVS 695 Master Thesis (3 semester hours)****ENVS 696 Thesis Defense (0 semester hours)**

Students who opt for a thesis must defend their research to a thesis committee in the form of a written thesis and an oral presentation. It is the intent of the thesis committee to determine if the student 1) has mastered the subject matter of the thesis, 2) understands the work done by others, and 3) can critically assess that work and his/her own work. No later than two weeks prior to the thesis defense presentation, the student must provide their written thesis to their thesis committee for review. The presentation should take no longer than one hour including questions and answers from the committee and audience. Immediately after the presentation, the committee will deem the thesis complete, complete with exceptions, or incomplete. Credit/No Credit only.

**ENVS 698 Special Studies (1-4 semester hours)****ENVS 699 Independent Studies (1-4 semester hours)**