ENVS-102: ENVIRONMENTAL SCIENCE LABORATORY

Also listed as: ENVS-102H

Effective Term
Fall 2024

BOT Approval Date
11/09/2023

Discipline
ENVS - Environmental Studies
Course Number
102

Course Title
Environmental Science Laboratory

Short Title
Environmental Sci Lab

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lab Units
1.00

Total Units
1.00

Hours

Lab Contact Hours
48-54
Out of Class Hours Lab
0.00

Total Contact Hours
48 - 54

Total Out of Class Hours
0 - 0

Total Student Learning Hours
48 - 54

Is this an existing Extensive Lab?
Yes

Distance Education
Yes

Distance Education

Distance Education Type
Both Fully Online and Hybrid Online

Does the DE also apply to the Honors section?

Yes

Honors component will meet synchronously (face-to-face or moderated through online technology such as Zoom)

Fully Online Delivery Requirements:
a. Students must be notified via the college schedule of classes and the syllabus for the class if proctored tests are required for this course
b. Any planned face-to-face meetings, such as an orientation or study session, must be optional
c. The MSJC curriculum committee requires the use of accessible, asynchronous discussion as a component of every fully online course

Are you using publisher content?

No

Regular Substantive Interaction

Instructor-to-student, student-to-student, and student-to-content contact shall be distributed in a manner that will ensure regular substantive interaction (RSI) is maintained not only weekly but also for the duration of the course. Instructor interactions should be equivalent in time, quality and consistency to the engagement students would receive in a face-to-face course—for example, through announcements, discussion participation, personalized feedback, video messages, or other instructional communications. Instructors are expected to be responsive to student inquiries within a 24-72 hour time frame excluding holidays. RSI will be maintained through a variety of methods: • Orientation - Students must be oriented to the online and face-to-face portions at the start of the course. • Announcements - Announcements using the course management system must be posted at least weekly to keep students current on course events, due dates, materials, etc. • Discussion Forums - Content-related discussion forums within the designated CMS will include appropriate instructor participation and will be initiated and maintained, with timely feedback provided. Instructors are required to monitor the discussions and related activities to provide guidance and direction. Open-ended discussion boards may be used to further learning and interaction. • MSJC Communication – Instructor will use MSJC-administered communication tools (such as email or the designated CMS communication tools) to regularly communicate with and provide ease of access to students. • Timely Feedback - Timely feedback on student work will be provided by the instructor, which may include comments and/or rubrics, within the Grades area of the designated CMS. • Scheduled Meetings – Hybrid and synchronous courses will meet at regularly scheduled times. ADA Compliance - All course interactions and content must be designed with accessibility in mind and meet ADA requirements.

Honors / Non-honors

ENVS-102H

C-ID (Admin Only)

CB 00

CCC000035074

Course Title

Honors Environmental Science Laboratory

Approved Cal-GETC Area

AREA-5C

Approved Second Cal-GETC Area

Approved Third Cal-GETC Area

Catalog Description

This course explores the laboratory methods and field monitoring techniques pertinent to research investigations in environmental science. It entails inquiry-based projects that highlight critical thinking and the application of the scientific method to problems related to the impact of humans on their biotic and abiotic surroundings.

Requisites

Pre or corequisite(s)

Prerequisite or corequisite(s) (must be taken simultaneously if not taken before)
ENVS-101 (with a grade of C or better).

Codes

TOP Code (CB 03)
0301.00 - Environmental Science

CIP Code
03.0104 - Environmental Science.

Repeatability Code
No

Grading Option
Letter grade OR P/NP

GE Information

Check GE Types Requested
AA/AS A - Natural and Physical Sciences

Cal-GETC Areas

Approved Cal-GETC Area
AREA-5C

Learning Objectives

Learning Objectives

Learning Objective
1. Relate the scientific method to the objectives of various approaches to laboratory and field investigation.
2. Design appropriate laboratory and/or field techniques to address a problem or question in environmental science.
3. Evaluate how laboratory and field analysis contributes knowledge to the study of environmental science.
4. Assess the relationship between fundamental scientific concepts and environmental concerns.
5. Determine and justify the role of thermodynamics and the cycling of matter through ecological systems as it relates to sustainability.
6. Assess the influence of human interactions on the biotic and abiotic components of their surroundings at various scales.
7. Generate data as a means of addressing a hypothesis.
8. Synthesize information from and discern the relative reliability of a variety of sources in addressing an issue related to environmental science.
9. Discern the manner in which fundamental research exposes the environmental justice issues affecting different cultures, genders, or regions of the world.

Honors Objectives

1. Propose field methods in the application of the scientific method to a question or problem identified in the local environment.
2. Critically assess and analyze current environmental issues and demonstrate that environmental solutions are often social and political rather than scientific.
3. Apply course content as the basis for approaching an original research project on a topic relevant to current issues in the realm of the environment and human society.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will apply the scientific method to environmental field investigations.
2. Students will assess the influence of human interactions with the biotic and abiotic elements of the environment through field studies.
3. Students will compare and contrast the main techniques of environmental science and ecology laboratory and field techniques.

Program Learning Outcomes

Learning Outcome
1. Explain how scientific knowledge is obtained and verified.
2. Evaluate the cycling of matter and the flow of energy in environmental systems.
3. Achieve basic environmental literacy.
4. Think critically about environmental issues by drawing on an understanding of scientific principles.
5. Explore the ethical and social considerations inherent in environmental science.
6. Apply the most current environmental discoveries and regulations to contemporary situations.

Institutional Learning Outcomes

Aesthetic Awareness: The student will identify and evaluate how aesthetic expression leads to an appreciation of social and cultural context as well as the values of art and nature.
Critical Thinking: The student will analyze problems, gather and synthesize relevant information, evaluate ideas, information, and evaluate alternative points of view to create, innovate and implement effective solutions.
Scientific Awareness: The student will apply the scientific method of inquiry to assess potential solutions for real-life challenges by employing science-based knowledge and methodologies in daily life.

Content

Course Lab Content

1. Nature of Scientific Inquiry
   a. Environmental Problems and their disproportionate impact on human populations
   b. Critical Thinking and the Scientific Method
   c. Systems Analysis
2. Ecological Field Techniques
   a. Principles of Field Investigation
   b. Organization of Data
   c. Laboratory and Field Data Recording
   d. Ecological Measurements
3. Biodiversity
   a. Measurements of Species Composition
   b. Community Interactions – Predator/Prey Relationships
   c. Species Interactions – Home Range Measurements
   d. Endangered Species
   e. Green spaces and access to nature
   f. Food deserts and environmental justice
4. Population dynamics
   a. Growth Equations and Measurement Carrying Capacity
   b. Limiting Factors
   c. Human Populations – Census Data Interpretation
   d. Ecological footprint and disparities of impact by race, ethnicity, gender, and other demographic distinctions
5. Health and Toxicology
   a. Risk and Hazards
   b. LD and LC 50 Calculations

   c. Chemical, Physical and Biological Hazards
   d. Exposure to pollution and environmental racism (NIMBY)
6. Agricultural Ecology
   a. Pesticide Application
7. Waste Disposal
   a. Monitoring pollution in coastal waterways
8. Geological Resources
   a. Erosion
   b. Soil Types
   c. Geographical Resources
9. Survey of Southern California Biomes
   a. Weather Analysis
10. Air Pollution
   a. Light pollution

Honors Content

The honors component of the course will cover the same content as ENVS 102 course. In addition, Honors students will explore topics at a greater depth.

Honors assignments will require students to investigate a relevant topic at a level that goes beyond the standard library research paper. Students will work with their instructor to determine the most suitable topic and are welcome to continue working on a project undertaken in ENVS 101H.

Examples of relevant topics include:

1. an exploration of the relationship between ecological footprint and affluence.
2. the distribution of light pollution and the environmental justice implications of its impact on different demographic groups.
3. lead pollution in playground soils and environmental racism.
4. greenwashing and responsible consumerism.
5. the impact of regulations banning single-use plastic bags on plastic pollution.

Methods of Instruction

Method

Discussion

Integration

Group exercises and discussions will emphasize the comparing and contrasting of a variety of laboratory and field techniques used in the study of environmental science.

DE Adaptations for MOI

Student discussion will be achieved via asynchronous communication using the online discussion forum feature of the CMS. Alternative means of communication, including video conferencing, may be offered.

Method

Experiments

Integration

Students will independently generate and analyze data from experiments and environmental monitoring projects.

DE Adaptations for MOI

Students will use online simulations, gather data from recorded demonstrations, or access open-source data sets to complete experimental assignments. All materials, including links to data sources, will be provided in the CMS.

Method

Group Projects

Integration

Students will collaborate in group research projects to develop a question, generate an appropriate method for addressing that question, propose a hypothesis, gather data, and draw conclusions. Group members will collaborate on the development of norms of inclusivity in order to facilitate an open and productive environment in which students can share and learn from one another's lived experiences.

DE Adaptations for MOI

Groups will be formed within the CMS and collaborations will be achieved via asynchronous communication using the online discussion forum feature. Alternative approaches may include video conferencing and other means of communication.

Method

Lab Activities

Integration

Laboratory activities and demonstrations will focus on ecological principles and processes that can be used to assess the influence of human interactions with the biotic and abiotic elements of the communities in which they live.

DE Adaptations for MOI

Students will engage in virtual lab activities through a variety of simulations and recorded demonstrations. These interactive assignments will be accessed in the CMS.

Method

Lecture

Integration

Lectures will be supplemented with audio-visual presentations and demonstrations of environmental laboratory and field observation techniques.

DE Adaptations for MOI

Lectures will be presented in the CMS and may consist of narrative content, recorded videos, or other means of communication.

Additional Methods of Instruction for Honors

Students will meet with their instructor regularly throughout the semester (minimum of 3 times, possibly more) to evaluate progress on the honors project and to discuss relevant issues further.

Students may be provided additional readings and resources relevant to their research topic and will be expected to consider their significance and integrate the content into their overall understanding of the issue they are investigating.

Students will use a journal to demonstrate thorough note-taking skills and document their progress in working on the honors project. Through consultation with the instructor, students will receive guidance on the research process.

Methods of Evaluation

Method

Exams/Tests

Integration

Examinations will be used to assess students' understanding and grasp of the course content. Examinations may be multiple choice, written, or oral. Instructors will provide thorough and timely feedback.

DE Adaptations for MOE

Examinations will be given through the online CMS, and may consist of multiple choice, true/false, matching, or written essay questions. Clear rubrics will be provided along with thorough instructions for accessing and completing the exams. Timely feedback will be provided by the instructor.

Method
Class Work

Integration
Students will engage in lab activities involving the demonstration of appropriate techniques, generation of data, analysis of results, and development of conclusions. Grading will assess the proper application of techniques and interpretation of data.

DE Adaptations for MOE
Lab activities will be virtual and students will demonstrate their understanding by answering questions, submitting data, and preparing written assessments. Students will be assessed based on the proper application of techniques and interpretation of data. Rubrics will be available and timely feedback will be provided.

Method
Research Projects

Integration
Students will engage in a research project focusing on the impact of environmental degradation on human societies. The research will be based on published scientific literature. Students will be graded on their ability to assess the scientific validity of their sources, their demonstrated understanding of the disproportionate impacts of environmental degradation on different races, cultures, genders, and socioeconomic groups, as well as the professional presentation of their work.

DE Adaptations for MOE
Completed research projects will be submitted for evaluation through the assignments feature of the CMS, where instructors will provide timely feedback. Sources for the research project will be accessed online through the MSJC library. A clear rubric for proper development of the research project will be provided.

Evaluation of Honors assignments
To receive honors credit, students must successfully complete the regular course and honors supplemental assignments.

The Research Project will be assessed according to the organization and presentation, the number and kind of references consulted, the depth of the analysis of the theoretical framework for the work investigated, and the thoughtful exposure of different points of view on the topic investigated.

The journal will serve as a thorough documentation of the honors project development. The work will be assessed based on the consistent documentation of the progression through the research process.

Assignments

Assignment Type
Writing

In-class and/or outside of class
In-class

Formative or Summative
Formative

Assignment
Contamination Study:
1. Work together in groups to decide on a chemical contaminant that humans commonly interact with.
2. Dilute four concentrations of this substance in water.
3. Set up an experiment consisting of potting soil in standard 3 inch pots, each planted with 10 wheat seeds.
3. There will be one control and four treatments, one for each dilution. Set up two replicates of the experiment for a total of 15 pots.
4. Water the control with tap water and the treatments with the appropriate dilution.

5. Over a two-week period, collect data by measuring the growth (height in mm) of each plant. Use the data to construct a growth-response curve.
6. Develop and submit a lab analysis in the form of a portfolio that includes hypothesis, methods, observation notes, graphs (the dose-response curve) and a discussion.

How assignment will be adapted in online format

Two approaches can be taken for the online implementation of this assignment.

The first option is a simulation, in which the experimental steps are set up in a scaffolded manner and students are able to collect data from images taken of the actual project being implemented in the lab. For example, images of each pot are taken at each observational stage and uploaded to a page in the CMS where students may access them virtually and collect data.

The second option involves a lab kit that is sent to the student's home (or the materials may be purchased by the student). In this case, the lab activity is completed by the student following the same procedure that is implemented in the lab.

Assignment Type

Reading

In-class and/or outside of class

In-class
Outside of class

Formative or Summative

Summative

Assignment

Monitor rainfall data in tandem with water pollution metrics throughout the semester.

The objective of this assignment is to foster enhanced numeracy and to learn to read data sets and graphs over time.
1. Create an ePortfolio or paper field notebook.
2. Under the guidance of your instructor, choose two locations along the southern California coastline that have different characteristics. The parameters are up to you and will form the basis of your hypothesis. The differences could be geological features, demographic disparities of the local population, proximity to rivers, or any feature determined to be important.
3. Access online sources of two separate data sets: water quality in the ocean and precipitation.
4. Each day that the class meets, you will update your ePortfolio or field notebook with the latest data. Each entry should be accompanied by written observations of changes, trends, or anomalies.
5. Conclude with a short 500 - 800 word essay addressing how the data collected relates to environmental justice. Is access to clean water enjoyed by all demographic groups equally? Based on the geospatial representation of data on a map, do any trends emerge? How do the two locations you focused on fit into this larger picture?

How assignment will be adapted in online format

Students will create their ePortfolio online using the appropriate feature of the CMS or using a word processing application. All data sources and maps will be accessible online. ePortfolios will be submitted through the Assignment feature of the CMS.

Honors Assignments

Assignment

Students in ENVS 102H will complete all of the regular course requirements for ENVS 102. In order to receive honors credit, students must also complete one of Option A or B, in addition to Option C.

Required or Optional

Required

Assignment

Option A: Students will apply field methods that they have learned in the course to engage in a short research project that involves data collection and analysis. The scope should be limited given that ENVS 102 is a one-unit course, and the project can augment the research assignment undertaken in ENVS 101H.

Possible research projects include:
1. Compare the germination rates of a local native plant species across a gradient of temperatures or levels of nutrient pollution.
2. Use a citizen science app (such as Marine Debris Tracker) to study patterns of littering and pollution across the campus environment.
3. Use Google Earth or another mapping application to study accessibility to nature (open green spaces) via public transit across demographic groups in a local city.

The results of the research will be presented in a lab write-up of 2-3 pages in length. The write-up will consist of an introduction exploring the issue, a short overview of the methods, a summary of the results, and a brief conclusion. Students will be required to consult the scientific literature for background and to include a minimum of two peer-reviewed citations in the written report.

Required or Optional

Optional

Honors Core Values

Academic Rigor and Research
Engagement
Positive Transgressive Behavior (as evidenced by creativity, innovation, risk taking, challenging norms and standard narratives)

Justify how the assignment reflects the Academic Rigor and Research Core Value

Students will develop a research project based on their understanding of the research methods presented in the class. They will use data to address a question or problem.

Justify how the assignment reflects the Engagement Core Value

Students will move beyond reporting on what they have learned about a topic and engage directly with the scientific endeavor. Engagement in the act of conducting science will empower students to see themselves as scientists and to address questions problems and concerns in a proactive way.

Justify how the assignment reflects the Positive Transgressive Behavior Core Value

Developing a research project involves creativity and innovation. Students will challenge the common narrative that science is the realm of trained professionals in sterile environments. They will be encouraged to challenge this stereotype and see themselves as empowered innovators and problem-solvers.

Assignment

Option B: The student will engage in a service learning project. The student, with the approval of the instructor, will identify a project or organization where the student can volunteer to assist in some manner. The commitment should be limited to only 4 hours (given that this is a one-unit lab course).

Examples might include volunteering at beach clean-up events (such as with the Surfrider Foundation) or contributing to citizen science endeavors (as through a BioBlitz or online data project).

The student will prepare a 2-3 page reflection on the experience. This reflection may include a description of their engagement in the project, and/or how the project reflects the content of the course. Students will be required to conduct background research relating to the project or organization and to include at least one relevant citation in the written report.

Required or Optional

Optional

Honors Core Values

Engagement
Positive Transgressive Behavior (as evidenced by creativity, innovation, risk taking, challenging norms and standard narratives)

Justify how the assignment reflects the Engagement Core Value

The volunteer component engages students directly in their community and immerses them in their field if interest. Persistence and commitment to the project are requisite to meet the required number of hours.

Justify how the assignment reflects the Positive Transgressive Behavior Core Value

Students will move beyond the campus environment to engage in a volunteer experience. This requires initiative and commitment. It additionally challenges the norms of learning activities and will empower students to see themselves as a part of a professional community in which they can play an active role and make a positive contribution.

Assignment

Option C: Students will keep a journal documenting their progress through Option A or B. Students will document the refinement of the topic, issue, or question they wish to pursue. They will keep track of relevant citations and data sources, including annotations for quick reference. This will serve as a record of the background research process. Students will be expected to properly format citations (using APA) and to include a short summary or annotation highlighting the relevance of the source to the project. Any service hours or data collection activities will be included along with notes from meetings with the instructor. The journal can be kept digitally or on paper and should be kept up to date and available for consultation with the instructor so that streamlined and personal guidance can be provided for the development of the research or service learning project.

Required or Optional

Required

Honors Core Values

Academic Rigor and Research
Engagement

Justify how the assignment reflects the Academic Rigor and Research Core Value

Rigorous note-taking and documentation are important to conducting research. This project will support students in the development of a successful Honors project and will underscore the importance of attention to detail in academic endeavors.

Justify how the assignment reflects the Engagement Core Value

Students will be engaged throughout the course of the semester in the ongoing development of the research/service learning project. The journal will provide a record of progress and instill a sense of accountability, ultimately leading to a refined product.

Course Materials

Textbooks

Withgott, J., M. Laposata (2020). Essential Environment: The Science Behind the Stories Pearson. ISBN: 978-0134714882

Other Resources

Floyd, K.W. and E. Walsh (2022) Introduction to Environmental Science Laboratory Manual. Kendall Hunt. ISBN: 979-8765708156

Class Size Information

Class Size

32

Class Size Category

G - Large lab 32

Diversity and Inclusion

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

This laboratory course empowers students with the critical thinking and analytical skills to use data-driven inquiry in confronting environmental issues. As a companion course to ENVS 101, which has a strong focus on environmental justice issues that affect marginalized communities both domestically and abroad, students further grapple with these issues by interacting directly with data and metrics for analysis. For example, students investigate how different regions and cultural groups differ in terms of their

exposure to various types of pollution. As an extension of the lab analysis activities, students are invited to reflect on the ways in which environmental degradation impacts cultures, ethnicities, and genders in diverse and unequal ways.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The course adds an analytical dimension to the content of ENVS 101, which centers on global environmental issues. Through the topics explored in both the lab and lecture components, students are exposed to diverse cultures, voices, and lived experiences. Instruction is focused on eliminating structural barriers to success by incorporating open educational resources and presenting a diverse array of media to connect with a spectrum of learning styles. In addition, students are expected to interact with one another while working on projects focused on data acquisition and analysis and to engage in discussions exploring broad societal impacts while adhering to norms of inclusivity. Students are encouraged to challenge normative expectations of what it means to engage with science and are provided with the tools to be active in the scientific endeavor regardless of their chosen major or career path.

Interactions

Explain how the course will incorporate student-to-student interaction.

Students will have frequent opportunities to interact with one another while engaging in lab activities, data analysis projects, and online or in-person discussions focusing on environmental issues. These interactions will augment the other forms of content delivery employed in this course by exposing students to diverse perspectives held by members of their own communities. Students will be encouraged to develop and abide by norms of tolerance and inclusivity.

Explain how the course will incorporate instructor-to-student interaction.

Instructors will participate in and guide group discussions. For challenging assignments and projects, instructors will model metacognitive approaches, engaging with students to guide them through complex critical thinking processes. This may include demonstrations of map reading techniques, data interpretation approaches, or interactions with complex texts (such as lab procedures or results in written form).
In the distance education modality, these interactions may be either asynchronous, taking place in the discussion forum or via email communication, or synchronous, via video conferencing. Feedback will be provided either verbally, in writing, or in the course management system. Instructors will be available to answer questions and interact with students directly.

Explain how the course will incorporate student-to-content interaction.

Students will be provided with a variety of accessible forms of media for content delivery. These may include written narratives, journal articles, textbook materials, videos, or verbal lectures. A diverse array of approaches will be employed to accommodate a spectrum of learning styles. For the online modality, these materials will be posted in an accessible format in the course management system, with the lecture component being recorded and captioned. Students will work towards concept mastery through formative assessments, engage in deeper more reflective work through critical writing assignments, and will assess their assimilation of the content through summative assignments. Students will engage with content in active ways, bringing their schema to bear with reading assignments, mining data for meaning, and providing feedback to enhance relevance and relatability.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Students will engage in critical thinking activities that require them to explore the conclusions drawn from laboratory studies and relate them to environmental issues that directly affect their lives. They will be encouraged to critically assess their ethical stance on contemporary environmental concerns and reflect on any discordance between their subjective worldview and their understanding of objective science. Students will consider their own relationship to the environment and through a variety of analysis projects explore differences in the ways people around the world interact with their local resources. Through reflection, students will be immersed in the global context of the topics presented in the course.

Key: 1528