ESS 0001L - INTRODUCTION TO ENVIRONMENTAL SCIENCE LABORATORY

Catalog Description

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in ESS 1
Hours: 54 laboratory
Description: Hands-on, inquiry-based learning in topics associated with environmental science. Laboratory and field studies including applications of physical science principles, ecological studies, and exposure to sustainability issues related to human society. Promotes critical thinking, problem solving, scientific and environmental literacy. May include field trip(s) during or in lieu of lab time. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Utilize the scientific method, critical thinking and a variety of techniques, instrumentation and equipment to collect, document, analyze, interpret, display and evaluate environmental data. (PSLO A)
- CSLO #2: Assess environmental conditions and analyze impacts and causes of environmental issues including pollution, resource consumption, and population growth. (PSLO B, C)
- CSLO #3: Identify solutions to complex environmental problems, taking into account diverse stakeholder perspectives. (PSLO D, E)

Effective Term

Fall 2020

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

0

Total Student Learning Hours

54

Course Objectives

1. Describe the scientific method and the process of science. (Lab Outline I)
2. Utilize a variety of techniques, instrumentation and equipment to collect and document environmental data. (Lab Outline I)
3. Design a controlled experiment and assess the relationship between the dependent variable and the independent variable. (Lab Outline I)
4. Document and display data in appropriate form, such as through line graphs, pie charts, tables and maps.
5. Produce reports summarizing information acquisition, analysis, and interpretation of results.
6. Apply critical thinking to analyze topics and reason logically to interpret data and other scientific information.
7. Describe major ecological principles and the biotic and abiotic factors that regulate natural ecosystems. (Lab Outline II)
8. Analyze impacts on ecosystems as well as the risk for humans exposed to select environmental pollutants. (Course Outline III)
9. Assess environmental conditions and analyze causes of and solutions for local environmental issues. (Course Outline IV and V)
10. Demonstrate ability to work collaboratively to generate solutions to complex environmental problems, taking into account diverse stakeholder perspectives. (Course Outline V)

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Life Sciences
  - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B3 Lab Activity
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 5C Laboratory Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Classroom Discussions
  - Example: Utilizing the perspective of the assigned stakeholder, discuss the merits and impacts of a proposed development project on local social, economic and environmental systems. As a group, work towards a resolution that (most) stakeholders can support. (Students will be evaluated on their ability to identify stakeholder priorities, critically think about the big picture, distinguish diverse stakeholder perspectives, collaborate, and generate a feasible plan.)
- Essay Examinations
  - Example: Explain how a specific human land use can affect a local ecosystem. (Students will be evaluated on whether their answers are accurate, if they support their statements with data and examples and properly cite valid sources.)
- Objective Examinations
  - Example: What are the steps, in the correct order, of the scientific method?
- Problem Solving Examinations
  - Example: Calculate the volume of water in Secret Ravine in cubic feet per second if given the stage and velocity of the creek.
- Projects
  - Example: Conduct a field study of a nature reserve or local, state or national park.
- Reports
  - Example: Complete the lab write-up report for the Microhabitat Analysis field activity. (Students will be evaluated on completeness and accuracy).
- Skill Demonstrations
  - Example: Use the flow meter to accurately measure the velocity of water in Secret Ravine.

Repeatable

No

Methods of Instruction

- Laboratory
- Distance Learning

Lab:

1. Instructor will guide students to a field study location and orient them to their surroundings. Working in small teams, students will conduct a Microhabitat Analysis, observing or researching the following: temporal information, weather, topography, land use, lithosphere, climate, biotic community type, biotic community members. Instructor will regularly check-in with students to assess progress, answer questions, guide study, and encourage critical thinking as appropriate. Students will utilize class handouts and field guides as well and information available in the Internet.(Objectives 4,7,8,9)
2. Instructor will introduce key tools for conservation and guidelines for reserve design. Students will work in teams to design a nature reserve for a particular species. Instructor will provide some basic background information to read about he species, some possible reserve areas, and a set amount of money to spend. Students must brainstorm the stakeholders in the project and anticipate any potential conflict, and present a viable reserve design.

Typical Out of Class Assignments

Reading Assignments

1. Read sections of the Microhabitat Analysis lab in your lab manual: introduction, general procedures, temporal information, spatial information, lithosphere, atmosphere, community type, and habitat diversity. Take notes and be prepared to conduct the field activity. 2. Read the following peer-reviewed scientific journal article, take notes, and be prepared to discuss in class: Forntin et al. 2005. "Wolves Influence Elk Movements: Behavior Shapes a Trophic Cascade in Yellowstone National Park." Ecology, v86, n5, pp1320-1330.

Writing, Problem Solving or Performance

1. In lab "Section III: Land Use" you listed five human land uses in and around your Microhabitat Analysis study area. Explain how each land use can affect the ecosystem that you analyzed, using specific examples and supporting your statements. What can we do to reduce these impacts? You will need to do research to complete this task; please cite your sources. Responses should typed and attached to this lab write-up. Be sure to address all five of the land uses separately. 2. How does energy flow through this ecosystem? (a) Using the organisms that you and your classmates observed or saw evidence of at your study site, draw a potential food web with at least four (4) food chains. Include both terrestrial and aquatic organisms. Make sure that you include arrows pointing in the direction of energy flow. (b) What is the highest trophic level in your food web? (c) List three species that occur at more than one trophic level. 3. Calculate how many liters (and gallons) of water are lost in 1 month by a toilet or faucet that leaks 2 drops of water per second. (One liter of water equals about 3,500 drops and 1 liter equals 0.265 gallon.) How many bathtubs (each containing about 151 liters or 40 gallons) could be filled with this lost water?

Other (Term projects, research papers, portfolios, etc.)

Required Materials

- Withgott & Laposata
  - Author: Environment: The Science Behind the Stories
  - Publisher: Pearson
  - Publication Date: 2017
  - Text Edition: 6th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Lab Manual for Environmental Science
  - Author: Edward Wells
  - Publisher: Cengage Learning
  - Publication Date: 2008
  - Text Edition: 1st
  - Classic Textbook?:
  - OER Link:
  - OER:
- Field and Laboratory Activities for Environmental Science
  - Author: Enger & Smith
  - Publisher: McGraw-Hill Education
  - Publication Date: 2012
  - Text Edition: 8th
  - Classic Textbook?:
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.

Prepared laboratory handouts coordinated with the course text.