

Course Outline

COURSE: ES 1 **DIVISION:** 10 **ALSO LISTED AS:**

TERM EFFECTIVE: Fall 2014 **CURRICULUM APPROVAL DATE:** 02/24/2014

SHORT TITLE: INTRO ENVIRONMENTAL SCIENCE

LONG TITLE: Introduction to Environmental Science

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

COURSE DESCRIPTION:

An introduction to the scientific principles and problem solving techniques used to evaluate the effects of human activities on different ecosystems. Topics will include the sustainability and stewardship of various ecosystems, environmental hazards such as air and water pollution, waste disposal, pesticides and herbicides, the impact of commercial and industrial activities, as well as population and urbanization. Basic chemistry, physics, and geology will be used throughout the course to explain and expand on these topics. The concepts will be reinforced with an integrated service learning laboratory program.

PREREQUISITES:

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity

STUDENT LEARNING OUTCOMES:

1. Use the scientific method to investigate and evaluate local, national and global

environmental issues.

Measure: assignments, quiz, exams, discussion

PLO: 1,2,3

ILO: 3,2,7

GE-LO: B-1,3,4,5,6,7,8,9

F-1,2

Year assessed or anticipated year of assessment: 2014

2. Explain how matter and energy changes as they cycle through ecosystems.

Measure: assignments, quiz, exams, discussion

PLO: 3,5,6

ILO: 3,7,1

GE-LO: B-1,7,8

Year assessed or anticipated year of assessment: 2014

3. Explain the role of evolution, biodiversity and population dynamics in ecosystems.

Measure: assignments, quiz, exams, discussion

PLO: 4,5,6

ILO: 3,7,1

GE-LO: B- 1,2,4,5,6,7,8,9

Year assessed or anticipated year of assessment: 2014

4. Critically evaluate renewable and nonrenewable energy resources.

Measure: assignments, quiz, exams, discussion

PLO: 1,2,3

ILO: 7,2,3

GE-LO: B-1,3,4,5,6,7,8,9

Year assessed or anticipated year of assessment: 2015

5. Use modern laboratory techniques and equipment to identify pollutants and use quantitative analysis to evaluate the effects on the environment.

Measure: assignments, quiz, exams, discussion, presentation, report

PLO: 1,7

ILO: 7,3,2

GE-LO: B-1,4,5,6,7,8,9

Year assessed or anticipated year of assessment: 2015

6. Apply objective problem-solving techniques to evaluate various environmental issues as they relate to politics, society, the legal system, economics at the local, national and global level.

Measure: assignments, quiz, exams, discussion

PLO: 1,2,3

ILO: 6,2,3,7

GE-LO: B-1,3,4,5,6,7,8,9

F-1,2

Year assessed or anticipated year of assessment: 2015

PROGRAM LEARNING OUTCOMES:

1) Use raw experimental data to conduct statistical analysis, and present conclusions in a graphical and

narrative form.

2) Find, select and evaluate various types of scientific information including primary research articles, mass media sources and world-wide web information.

3) Effectively communicate scientific concepts in both written and oral formats.

4) Identify the evolutionary processes that lead to adaptation and biological diversity.

5) Describe the relationship between life forms and their environment and ecosystems.

6) Explain the basic structures and fundamental processes of life at molecular, cellular and organismal levels.

7) Demonstrate the correct operating procedures in the use of common lab equipment such as compound microscopes, spectrophotometer, pH meter, electrophoresis gel apparatus, micropipettes, and centrifuges.

This course promotes understanding of:

Cultures and subcultures

Cultural inclusiveness

Familiarity with cultural developments and their complexities

Student Learning Outcome Number(s) 1,6

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 02/24/2014

3 lec 3 lab Hours

Content: 1. Introduction to Environmental Science

- A. Scientific methodologies: How science works
- B. Role of science in solving environmental problems
- C. Finding, interpreting, and evaluating scientific information
- D. History of environmentalism
- E. Environmental ethics and economics: our values and choices
- F. Environmental sustainability

Student Performance Objectives (SPO): Be able to describe what Environmental Science is and how the scientific method can help people understand the world. Be able to discuss why it is important to know how humans interact with the environment. Describe the role of ethics in environmental decision making. Describe the anthropocentric, biocentric, and ecocentric ethical worldviews. Discuss how environment and the economy are intricately linked.

Out-of-Class Assignments: Assignment from text. Address environmental concerns we face today such as - How to achieve sustainability, which would allow humans to survive within Earth limits. Describe the contributions to the principles of environmental science by immigrants and indigenous people. Highlight contributions made by Charles Darwin, Alfred Wallace, Thomas Malthus, Garrett Hardin, Rachel Carson, John Muir, Gifford Pinchot and Aldo Leopold and contemporary individuals.

Lab: Introduction of Lab Format and Scientific Methods. Introduce and review scientific literature and research methods. Introduce Service Learning and select primary research project.

3 lec 3 lab Hours

Content: 2. Ecological Principles - Physical environment - From chemistry and energy to life

Environmental systems: connections, cycles and feedback loops

- A. Energy flow through ecosystems
 - 1) Energy forms and the laws of thermodynamics
 - 2) Food chains, food webs, and ecological pyramids
 - 3) Bioaccumulation and biomagnifications of contaminants

Student Performance Objectives (SPO): Describe the fundamental building blocks of matter. Discuss the characteristics, sources, and uses of various forms of energy for living organisms. Describe the various types of ecosystems/biomes. Describe the principles of ecological pyramids.

Out-of-Class Assignments: Critique the Bioremediation process of the Gulf of Mexico and Exxon Valdez Oil spill. Work on Service Learning project.

Lab: Chemistry of life, Molecule to cell, Cell to Organism

Community Structure

3 lec 3 lab Hours

Content: 2. Ecological Principles Continue

B. Cycling of matter within ecosystems

- 1) Conservation of mass
- 2) Biogeochemical cycles
- 3) Ecosystems/Biomes

Student Performance Objectives (SPO): Define a system. Describe major characteristics of various biomes and ecosystems. Describe the major biogeochemical cycles and the human impacts on these cycles.

Out-of-Class Assignments: Text Assignment Case study: The Gulf of Mexico's Dead Zone and a System out of Sorts. Case study: Critique the No-Till Agriculture practice in Brazil and how it has affected soil erosion and crop productivity.

Lab: Biogeochemical cycles

Ecosystems/Biomes, ID local biomes

3 lec 3 lab Hours

Content: 2. Ecological Principles continue

C. Populations: species, evolution, population ecology, human demographics

D. Biological communities: species interactions, ecological niche, succession

Student Performance Objectives (SPO): Discuss the relationship between evolution of species and biodiversity. Describe the theory of evolution by natural selection. Describe the major characteristics of population. Discuss the important interactions between species that occur within communities.

Out-of-Class Assignments: Text Assignment- Evaluate the Costa Rican Cloud Forest and climate impact on biodiversity. Also, how do social and economic factors affect species and communities? Work on Service Learning project.

Lab: Diversity I- Protista, Fungi and Plant

Ecological succession habitat survey

Organism to population (species)

Population to Community

3 lec 3 lab Hours

Content: 3. Biodiversity, preservation and conservation

- A. Definition and importance of biodiversity
- B. Endangered and threatened species
- C. Invasive species and other threats to biodiversity
- D. Legislation: Endangered Species Act
- E. Social, economic, and/or cultural impacts/considerations

Student Performance Objectives (SPO): Discuss the various types of biodiversity. Explain species extinction and causes of biodiversity loss.

Out-of-Class Assignments: Text Assignment- Define and give an example of a local keystone species- Why are they important? Service Learning project- Insects of Gavilan used to show biodiversity and coevolution.

Lab: Diversity II- Animal and Coevolution

Habitat and Niche

Ecological Competition

Lifestyle Choices and effects on biodiversity

3 lec 3 lab Hours

Content: 4. Population and Growth

Student Performance Objectives (SPO): Describe how population growth affects the environment. Discuss why wealthy countries, with lower growth rates can have a huge environmental impact. Land use, forest management and creating livable cities. Discuss the concept of urbanization and why public lands are needed. Discuss the issues and alternatives involved in modern forest management. Discuss the tools for planning sustainable cities and urban areas.

Out-of-Class Assignments: Case study- Evaluate China's One-Child Policy. Research the current state of Denmark, Sweden, Africa, India, China and the America(s). Work on Service learning project.

Lab: Estimating Population Size- quadrat sampling methods- plants and animals

Human Population Dynamics

Assessment of a Land-Use Planning report

3 lec 3 lab Hours

Content: 5. Agriculture, biotechnology and future of food

Student Performance Objectives (SPO): Discuss the current status of agriculture production. Describe role of pest management in agriculture. Discuss pros and cons of transgenic crop. Discuss various methods of preserving genetic diversity of agricultural products. Describe the environmental impacts of modern animal production methods. Discuss the characteristics and environmental benefits of sustainable agriculture.

Out-of-Class Assignments: Identify and describe methods that countries use to provide sustainable agriculture. Describe the history of agriculture. What does it mean to be Organic?

Lab: Genetically Modified Organisms- Biotech lab- Guest Speaker Biotech/Agriculture industry

3 lec 3 lab Hours

Content: 6. Water

A. Water as a resource

- 1) Properties and importance
- 2) Hydrologic cycle and human impacts
- 3) Resource issues: flooding, drought, groundwater depletion, salinization, wetland loss
- 4) Water conservation and management strategies
- 5) California water resources and use
- 6) Personal water use

Student Performance Objectives (SPO): Describe the Hydrological cycle and human impact on water resources. Describe the importance of water its properties and characteristics. Compare and contrast the structure and function of marine and freshwater ecosystems. Examine strategies for solving freshwater depletion problems.

Out-of-Class Assignments: text assignment. Identify California's major freshwater sources, and policies that govern distribution. Identify Gavilan's water source, distribution, and conservation efforts. Identify Santa Clara's county water source, distribution, and conservation efforts. Identify the bay area's water source, distribution and conservation efforts.

Lab: Stream Ecology

Stream Quality Assessment using survey of animal/plant life and physical assessment

- a. Total Dissolved Solids
- b. pH
- c. Biochemical Oxygen Demand
- d. Fecal Coliform
- a. Total phosphate
- b. Total Nitrate
- c. Ammonium Nitrogen

3 lec 3 lab Hours

Content: 6. Water continue

B. Water Pollution

- 1) Types, sources, and effects of water pollution
 - 2) Improving water quality
 - 3) Wastewater and drinking water treatment
- C. Legislation: e.g. Safe Drinking Water Act, Clean Water Act
- D. Social, economic, and/or cultural impacts/considerations

Student Performance Objectives (SPO): Describe the types and the effects of water pollution. Investigate water quality local, state, national and other countries. Describe the Clean Water Act and how it protects our waters.

Out-of-Class Assignments: Service Learning Perchlorate and South county water pollution history and update.

Lab: Field trip Water Treatment Plant

3 lec 3 lab Hours

Content: 7. Air

- A. Air as a resource: properties and importance
- B. Air pollution: types, sources, effects, solutions
- C. Regional and global atmospheric changes: causes, effects, solutions
 - 1) Global climate change
 - 2) Ozone depletion
 - 3) Acid deposition
- D. Legislation: e.g. Clean Air Act, Kyoto Protocol, Montreal Protocol
- E. Social, economic, and/or cultural impacts/considerations

Student Performance Objectives (SPO): Be able to list the various types of pollutants in the air and their effects on the environment. Compare and contrast the different types of greenhouse gases, how they operate and their effects on the environment. Discuss current conclusions made by atmospheric scientist about global climate change. Describe some causes of the debate surrounding climate change. Describe the Clean Air Act and the Kyoto protocol.

Out-of-Class Assignments: Evaluate evidence that supports and negates the cause and impact that climate change will have on earth living organisms. Work on Service Learning project.

Lab: Air Pollution - Natural sources, human sources, reduction efforts and legislation- Guest speaker EPA and Air Quality Assessment.

3 lec 3 lab Hours

Content: 8. Energy

- A. Units for energy and power
- B. Fossil fuels: types, origin, availability, pros and cons, new technologies
- C. Nuclear energy: types, pros and cons, safety, radioactive waste

Student Performance Objectives (SPO): Define energy. Describe energy usage for developed and developing countries. Describe the development of non-renewable energy and renewable energy. Describe renewable energy sources. Describe how nuclear reactors work. Describe the environmental impact using fossil fuels, natural gas and nuclear energy.

Out-of-Class Assignments: Summarize the advantages and disadvantages of accessing natural gas, and nuclear energy technology.

Lab: Economics of Energy Consumption

Renewable Energy

Personal Energy Consumption

Environmental Awareness and Lifestyle

3 lec 3 lab Hours

Content: 8. Energy continue

- D. Renewable energy: types, pros and cons, new technologies
- E. Conservation and efficiency
- F. Energy strategies: national, local, personal
- G. Social, economic, and/or cultural impacts/considerations

Renewable and Nonrenewable energy sources

Student Performance Objectives (SPO): Compare and contrast the sources of renewable and nonrenewable energy used by developing and developed countries. Discuss the advantages and disadvantages of wind, geothermal, hydrogen fuel and nuclear energy usage.

Discuss the environmental impacts of using fossil fuels and other alternatives.

Out-of-Class Assignments: Assess energy consumption of your home.

Lab:

Field Trip Power plant Calpine Gilroy Cogeneration/Moss Landing Power plant

5 lec 6 lab Hours

Content: 9. Solid and Hazardous Waste

- A. Solid waste: types, sources, disposal methods, environmental impacts
- B. Hazardous waste: types, sources, disposal methods, environmental impacts
- C. Waste prevention: reduction, reuse, recycling
- D. Legislation: e.g. Resource Conservation and Recovery Act, Superfund Act
- E. Social, economic, and/or cultural impacts/considerations

Student Performance Objectives (SPO): Discuss the various categories of waste. Describe new methods, such as composting and recycling.

Out-of-Class Assignments: Service Learning project. Assess Gavilan's waste production. Propose a viable cost effective plan to reduce waste production. Draft letter for public meeting to implement a recycling program.

Lab: Our Finite Resources

Service Learning activity- Recycling and Waste management

5 lec 6 lab Hours

Content: 10. Our Future World: Creating Sustainable Communities

- A. Feeding our communities: Sustainable agriculture
- B. Where do we live and work: Urbanization trends and creating sustainable cities
 - 1) Land-use planning, sustainable development
 - 2) Urban Forestry
 - 3) Green-building

Student Performance Objectives (SPO): Describe the concept of sustainable development. Describe the difference between growth and progress and methods to achieve sustainable progress.

Out-of-Class Assignments: text assignment- What must be done to initiate sustainable lifestyles. Work on Service Learning project

Lab: Service Learning activity - Restoration/Conservation efforts

Process of Land use planning Assessment of an Environmental Impact Report and mitigation

Guest speaker- Environmental planner

3 lec 3 lab Hours

Content: 11. Environmental policy: Decision making and problem solving

Student Performance Objectives (SPO): Discuss goals of environmental policy. Describe the legislative, executive and judicial branches of the U.S. Government and how they influence environmental policies. Identify the major steps of environmental policy making process. Describe the various state, federal and international organizations that are involved in environmental affairs.

Out-of-Class Assignments: Describe the three phases of U.S. Environmental policy and some major environmental laws that were passed during each phase. What impact did the publication of 'Silent Spring' have in 1962?

Lab: Campus Environmental Audit - biodiversity survey, energy usage, water usage

3 lec 3 lab Hours

Content: 12. Environmental Education- What then shall we do? What are the benefits, cost and limits of Green business and technology?

Student Performance Objectives (SPO): Summarize environmental education. Describe environmental literacy and how it helps us understanding our environment. Evaluate practical changes that individuals can do to better conditions. Define 'environmental leader'.

Out-of-Class Assignments: What is meant by 'Campus Greening?' Evaluate campus philosophy regarding green consumerism.

Lab: Service Learning Project Activity and Report.

2 Hours

Final

METHODS OF INSTRUCTION:

Lecture and visual aids
Discussion of assigned reading
Discussion and problem solving performed in class
Quiz and examination review performed in class
Homework and extended projects
Field observation and field trips
Guest speakers
Collaborative projects

METHODS OF EVALUATION:

No Change 0 Change 1

Category 1 - The types of writing assignments required:

Percent range of total grade: 10 % to 20 %

Written Homework

Lab Reports

Essay Exams

Term or Other Papers

Percent range of total grade: 10 % to 20 %

Homework Problems

Field Work

Lab Reports

Quizzes

Exams

Other: service learning

Category 3 -The types of skill demonstrations required:

Percent range of total grade: 30 % to 40 %

Class Performance/s

Field Work

Category 4 - The types of objective examinations used in the course:

Percent range of total grade: 30 % to 40 %

Multiple Choice

True/False

Matching Items

Completion

Other: Essay

REPRESENTATIVE TEXTBOOKS:

Required:

Cunningham/Cunningham. Environmental Science: A Global Concern 12th ed. McGraw Hill. 2012, or other appropriate college level text.

ISBN: 978-0-07-338325-5

Reading level of text, Grade: 14 Verified by: DYoung

Other textbooks or materials to be purchased by the student:

Environmental Science: Active Learning Laboratories and Applied Problem Sets, 2nd Edition
by Travis P. Wagner, Robert Sanford
January 2009, ©2010
Composition notebook (quad rule)

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B2, effective 201470

GAV B3, effective 201470

GAV F, effective 201470

CSU GE:

IGETC:

CSU TRANSFER:

Transferable CSU, effective 201470

UC TRANSFER:

Transferable UC, effective 201470

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: A

Noncredit Category: Y

Cooperative Education:

Program Status: 2 Stand-alone

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department: ES

CSU Crosswalk Course Number: 1

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E

Maximum Hours: 3

Minimum Hours: 3

Course Control Number: CCC000530562

Sports/Physical Education Course: N

Taxonomy of Program: 030100