

BIO-2150: ENVIRONMENTAL SCIENCE

Cuyahoga Community College

Viewing: BIO-2150 : Environmental Science

Board of Trustees:

June 2023

Academic Term:

Fall 2023

Subject Code

BIO - Biology

Course Number:

2150

Title:

Environmental Science

Catalog Description:

Fundamental ecological concepts and their application to environmental issues emphasizing the impact of human activity on the biosphere. Topics include populations, ecosystems, biodiversity, climate change, water quality, air quality, renewable and non-renewable energy, and environmental regulations.

Credit Hour(s):

3

Lecture Hour(s):

3

Lab Hour(s):

0

Other Hour(s):

0

Requisites

Prerequisite and Corequisite

BIO-1060 Environment, Ecology and Evolution; or BIO-1510 Principles of Biology II.

Outcomes

Course Outcome(s):

Explain major themes of environmental science.

Objective(s):

1. Discuss the interdisciplinary nature of environmental science.
2. Distinguish between an observation, hypothesis, experiment, conclusion, and theory.
3. Distinguish between observations and inferences.
4. Explain the concept of sustainability.
5. Describe the major components of population ecology, including population growth and carrying capacity.
6. Describe the major components of community ecology, including competition, herbivory, predation, and symbiotic relationships.
7. Explain how chemicals cycle through the various compartments of an ecosystem.
8. Explain how energy flows through the trophic levels in an ecosystem.
9. Compare and contrast the biotic and abiotic characteristics of the major terrestrial and aquatic ecosystems.
10. Explain the acquisition, transformation, utilization, and storage of energy in living things and in ecosystems.
11. Describe the laws of thermodynamics and explain why entropy is increasing.

12. Distinguish between renewable and non-renewable sources of energy.

Course Outcome(s):

Analyze and solve problems in environmental science.

Objective(s):

- a. Discuss the causes and consequences of climate change and describe what can be done to slow down global warming.
- b. Analyze a population growth curve, and explain the factors that affect population growth.
- c. Describe the various methods used to quantify biodiversity.
- d. Explain how the transfer of energy through trophic levels can affect both the length of food chains and the food supply for the human population.
- e. Describe the biomagnification of contaminants through a food chain.
- f. Explain how coal, oil, and natural gas are converted into usable forms of energy.

Course Outcome(s):

Apply concepts of environmental science to everyday life.

Essential Learning Outcome Mapping:

Civic Responsibility: Analyze the results of actions and inactions with the likely effects on the larger local and/or global communities.

Objective(s):

- a. Identify the complexity and interconnectedness of living things and their environment.
- b. Describe the major environmental laws and policies that protect the world's environmental resources.
- c. Describe the major threats to biodiversity, including habitat loss, overharvesting, non-native invasive species, pollution, and climate change.
- d. Describe how climate change is affecting local habitats and, regional ecosystems, and global biomes.
- e. Describe the factors that determine air quality and how they affect human health.
- f. Describe the major sources of fresh water, and the factors that affect the quality of fresh water.
- g. Explain how the human diet affects the world's food supply and the amount of energy that gets lost in ecosystems.
- h. Describe the wastes produced by various energy sources, including coal, oil, natural gas, and nuclear energy.
- i. Explain how to sustainably manage the major types of waste, including solid, hazardous, biomedical, electronic, and radioactive waste.

Methods of Evaluation:

- a. Examinations
- b. Issue analysis
- c. Writing/Discussion Board Assignments
- d. Quizzes
- e. Homework assignments

Course Content Outline:

- a. Introduction
 - i. Scientific method and problem solving
 - ii. Bioethics and analysis of environmental issues
- b. Population biology
 - i. Exponential growth
 - ii. Carrying capacity
 - iii. Factors affecting population growth
 - iv. Human population
 - v. Feeding the world's population
- c. Ecosystem biology
 - i. Ecosystem structure
 - ii. Energy flow in an ecosystem
 - iii. Nutrient cycling

- iv. Ecological succession
- v. Biomes
- vi. Sustainability
- d. Biodiversity conservation
 - i. Genetic biodiversity
 - ii. Landscape biodiversity
 - iii. Community biodiversity
 - iv. Value of biodiversity
 - v. Threats to biodiversity
 - 1. Habitat destruction and fragmentation
 - 2. Overharvesting
 - 3. Non-native invasive species
- e. Global warming and climate change
 - i. Long term climate patterns
 - ii. Greenhouse gasses
 - iii. Consequences of global warming
- f. Water quality
 - i. Water cycle
 - ii. Ground water
 - iii. Surface water
 - iv. Sources of water pollution
 - v. Eutrophication
 - vi. Bioaccumulation
 - vii. Sewage and water treatment
- g. Air quality
 - i. Structure of the atmosphere
 - ii. Major air pollutants and their effects
 - iii. Pollutant sources
 - iv. Controlling air pollution
 - v. Indoor air pollution
 - vi. Acid deposition
 - vii. Ozone depletion
- h. Waste management
 - i. Solid waste
 - 1. Disposal of municipal solid wastes
 - 2. Problems and solutions
 - ii. Hazardous, biomedical, electronic, and radioactive waste
 - iii. History of waste management
 - iv. Sustainable waste management
- i. Non-renewable energy
 - i. Coal
 - ii. Oil and natural gas
 - iii. Nuclear power
 - iv. Electrical power generation
- j. Renewable energy
 - i. Solar energy
 - ii. Biomass energy
 - iii. Wind energy
 - iv. Hydropower
 - v. Geothermal energy
- k. Regulations
 - i. History of environmental regulations
 - ii. Environmental Protection Agency (EPA)
 - iii. Clean Water Act
 - iv. Clean Air Act
 - v. Local environmental regulations

Resources

Allen, John L. *Annual Editions: Environment 1998/99*. Dushkin/McGraw-Hill, 1998.

Cunningham, William and Mary Ann Cunningham. *Environmental Science A Global Concern*. 13th ed. William C. Brown, 2014.

Enger, Eldon D., and Bradley F. Smith. *Environmental Science a Study of Interrelationships*. 14 ed. William C. Brown, 2015.

Theodore, Mary K., and Louis Theodore. *Major Environmental Issues Facing the 21st Century*. Prentice Hall, 1996.

Wright, Richard T. and Dorothy F. Boorse. *Environmental Science: Toward a Sustainable Future*. 12 ed. Prentice Hall, 2016.

Christensen, Leege, & Juliana. *The Environment and You*. 3rd ed. New York: Pearson Educ, Inc., 2019.

G. Tyler Miller & Scott Spoolman. *Environmental Science*. 16th edition. Cengage Learning;, 2018.

William Cunningham & Mary Cunningham. *Environmental Science*. 14th ed. McGraw Hil,

Eldon Enger & Bradley Smith. . *ENVIRONMENTAL SCIENCE*. 15th ed. McGraw-Hill Education, 2018.

Resources Other

- a. *How to be A Savvy consumer of Science News*, Heard on All Things Considered, ARI Shapiro, Host, National Public Radio (NPR). July 17, 2019.
- b. U.S. Global Change Research program. 2023. <https://www.globalchange.gov/>
- c. Great Lakes Climate Change. <https://elpc.org/wp-content/uploads/2020/04/2019-ELPCPublication-Great-Lakes-Climate-Change-Report.pdf>
- d. World Population Estimates and Projections (US Census Bureau International Database). <https://www.census.gov/programs-surveys/international-programs/about/idb.html>

Instructional Services

OAN Number:

Ohio Transfer 36 TMNS

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