

JEFFERSON COLLEGE

COURSE SYLLABUS

BIO109

ECOLOGY AND ENVIRONMENTAL CONSERVATION

3 Credit Hours

**Prepared by:
Ms. Dora Mitchell**

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by
Dr. Patricia McDaniel/Ms. Dora Mitchell**

**Arts and Science Education
Dr. Mindy Selsor, Dean**

BIO109 ECOLOGY AND ENVIRONMENTAL CONSERVATION

I. CATALOGUE DESCRIPTION

Prerequisite: none

3 semester hours credit

Ecology and Environmental Conservation deals with fundamental principles of ecology and how these principles can be applied to the understanding of environmental problems. Areas of application include population, land use, air, wildlife, resources and pollution control. Ecology and Environmental Conservation will partially fulfill the natural science requirement for the Associate of Arts degree. (F, S)

II. GENERAL COURSE OBJECTIVES

Upon completion of this course the student will be able to:

- A. Understand the basic methods of science, understand the value of experimental and control groups in a scientific study, and know the strengths and limitations of various types of scientific studies.
- B. Have a basic understanding of ecologic laws and theories.
 - 1. Food chains
 - 2. Energy flow in food chains
 - 3. Matter cycles in food chains
- C. Have a basic understanding of physical laws such as:
 - 1. Thermodynamic laws
 - 2. Conservation of matter laws
 - 3. Chemical bonding laws and theories
 - 4. Nuclear energy concepts
- D. Know a few basic biomes and the physical conditions that support them.
- E. Understand ecological succession.
- F. Understand the basic principles of population ecology.
- G. Understand inter and intra specific interactions.
- H. Understand some basic human population demographics and how to calculate rate of growth, doubling time, and fertility rate.
- I. Understand population growth factors in undeveloped and developed countries.
- J. Understand the relationship of population growth to most of environmental problems.

- K. Understand age structure pyramids in projecting future human population growth.
- L. Understand human energy consumption and the extent, use, efficiency, environmental effect, historical perspective of various types of energy production including:
 - 1. Fossil fuels
 - 2. Nuclear energy
 - 3. Derived energy
 - 4. Renewable forms of energy
- M. Understand net energy and efficiency on future of various energy sources.
- N. Understand food production history, efficiencies, and limitations.
- O. Understand undernutrition and malnutrition.
- P. Understand toxic waste studies and epidemiology.
- Q. Historical perspectives on toxic wastes including:
 - 1. Heavy metals
 - 2. Pesticides
 - 3. Dioxin
- R. Understand the physical properties of water.
- S. Understand eutrophication and lake succession.
- T. Understand the watershed concept.
- U. Understand the aquifer concept.
- V. Know various individual forms of water pollution.
- W. Know basic water treatment concepts.
- X. Know the names of two layers of atmosphere above the earth and the reason for the existence of those layers and the difference in atmospheric dynamic within each layer.
- Y. Know the cause of an inversion.
- Z. Know various air pollutants, their source, sinks, and means of dispersal and biological effects.

III. COURSE OUTLINE (COURSE CONTENT WILL BE DRAWN FROM THIS)

- A. Science Overview
 - 1. Complexity and holistic nature of environmental science
 - 2. Scientific methods

3. Physical principles of atoms, energy, and matter
- B. Ecosystems
- C. Populations of Organisms
- D. The Biosphere
- E. Changes in Ecosystems
- F. Human Populations
- G. Soil and Agriculture
- H. Food Production and World Hunger
- I. Sources of Energy
- J. Human Health and the Environment
- K. Pest and Weed Control
- L. Water Resources
- M. The Air
- N. Extinction

IV. UNIT OBJECTIVES

- A. Science Overview
 1. Environmental Law and Solutions
 - a. Understand why environmental problems are complex and interrelated.
 - b. Know that environmental problems are tied to social, political, and economic issues.
 - c. Know the basic legal jargon of environmental law.
 - d. Understand how cost-benefit studies related to environmental decision making.
 2. Scientific Methods and Procedure
 3. Basic Elements of Chemistry and the Physics of Energy
- B. Ecosystems
 1. Identify the abiotic and biotic factors in the ecosystem.

2. Know the various ecological terms such as: producer, herbivore, carnivore, omnivore, scavenger, parasite, and decomposer.
 3. Relate the concept of food web and food chain to population size and niche.
 4. Understand energy flow in an ecosystem.
 5. Be able to explain the cycling of nutrients through ecosystems.
- C. Populations of Organisms
1. Know the basic concepts of population ecology.
 2. Understand that birth rate and death rate together determine population growth rate.
 3. Be able to identify survivorship curves and population growth curves.
 4. Understand how environmental factors affect population growth.
 5. Know the different types of species interactions.
- D. The Biosphere
1. Know the major terrestrial biomes and characteristics of each.
- E. Changes in Ecosystems
1. Understand the role of Darwin and Wallace in the development of The Theory of Evolution.
 2. Understand Natural Selection.
 3. Know the various pathways which may be followed during the process of speciation.
 4. Know the evidence of evolution.
 5. Understand the processes occurring in primary and secondary succession.
- F. Human Populations
1. Know the different methods of demography, how to calculate, rate of growth, doubling time, and fertility rate.
 2. Understand the past and current population trends in developed and less-developed countries.
 3. Understand the relationship between human population growth and the problems in other environmental areas.
- G. Soil and Agriculture
1. Know the properties of soil.
 2. Understand past and current farming methods and their effect on the environment.
 3. Understand the process of desertification.
- H. Food Production and World Hunger
1. Know the basic nutrient requirements for humans.
 2. Understand the consequences of nutrient deficiency.
 3. Understand social and political barriers to proper nutrition.
 4. Know the possible food sources of the future.
- I. Sources of Energy
1. Know the laws of thermodynamics.

2. Know the currently used sources of energy and their expected supply for the future.
 3. Understand the different methods of energy conservation.
 4. Know the possible energy sources of the future.
 5. Understand age structure pyramids in projecting future human population growth.
 6. Understand human energy consumption and the extent, use, efficiency, environmental effect, historical perspective of various types of energy production including:
 - a. Fossil fuels
 - b. Nuclear energy
 - c. Derived energy
 - d. Renewable forms of energy
- J. Human Health and the Environment
1. Be able to identify the more common toxic substances.
 2. Know the diseases and abnormalities associated with these substances.
 3. Know how exposure levels to these substances are determined.
 4. Understand the focus of the field of science called epidemiology.
- K. Pest and Weed Control
1. Know the effects that pesticides and herbicides may have in an ecosystem.
 2. Understand the possible human health effects of pesticides and herbicides.
 3. Know the alternative methods of pest and weed control.
- L. Water Resources
1. Know the properties of water.
 2. Know the effects humans have on the water supply.
 3. Understand the properties of lakes.
 4. Know what the future outlook for the water supply is.
 5. Understand the different methods of water treatment.
 6. Understand the importance of wetlands.
 7. Understand aquifers.
 8. Know various water pollutants.
 9. Know basic water treatment concepts.
- M. The Air
1. Understand the properties of the atmosphere.
 2. Know the major sources of air pollution.
 3. Know the effects of air pollution on human health.
 4. Know the names of two layers of atmosphere above the earth and the reason for the existence of those layers and the difference in atmospheric dynamic within each layer.
 5. Know the cause of an inversion.
 6. Know various air pollutants, their source, sinks, and means of dispersal and biological effects.

- N. Extinction
 - 1. Understand the consequences of habitat destruction.
 - 2. Know the difference between threatened and endangered species.
 - 3. Know the causes of extinction.
 - 4. Know the endangered species of Missouri.

V. METHOD OF INSTRUCTION

- A. Lectures
- B. Class Discussion
- C. Reading Textbook
- D. Videotapes

VI. REQUIRED TEXTBOOK(S) WITH PUBLICATION INFORMATION

Cunningham, W.P., et al. 2005 Environmental Science: A Global Concern, 8th ed. McGraw-Hill Companies, Inc. NY

VII. REQUIRED MATERIALS (Student)

- A. Writing paper and pens
- B. No. 2 pencil for examinations

VIII. SUPPLEMENTAL REFERENCES

- A. List of websites covering various aspects of environmental science and conservation
- B. List of major journals covering topics in conservation, environmental science and ecology

IX. METHOD OF EVALUATION (Student)

- A. Lecture Examinations
- B. Short written paper and oral presentation covering an environmental/conservation issue