

**Coffeyville Community College**

**BIOL-103**

**COURSE SYLLABUS**

**FOR**

**ENVIRONMENTAL SCIENCE**

**Pam Oliver**

**Instructor**

**COURSE NUMBER:** BIOL-103      **COURSE TITLE:** Environmental Science

**CREDIT HOURS:** 5

**INSTRUCTOR:** Pam Oliver

**OFFICE LOCATION:** 2<sup>nd</sup> Floor Arts and Science

**OFFICE HOURS:** See schedule posted on door or call to schedule an appointment

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**PREREQUISITES:** None

**REQUIRED TEXTS:** *Principles of Environmental Science*. 6th Edition. Cunningham and Cunningham. McGraw Hill, Publisher.

**COURSE  
DESCRIPTION:**

A basic ecological approach to the diversity of life forms in various environments, and the impacts of human activities on these environments. Causes of and solutions to air and water pollution, soil erosion and pest problems, loss of bio-diversity, deforestation, energy depletion and possible climate changes are featured. Discussion of remedy techniques, risk assessment, and environmental legislation. Laboratory activities and many field trips demonstrate principles discussed in class.

**EXPECTED  
LEARNER  
OUTCOMES:**

1. The student will analyze human impacts on their environments, and assess demonstrated and potential solutions to environmental problems.
2. The student can name the types and components of terrestrial and aquatic ecosystems.
3. The student will understand energy flow and matter cycling and ecosystems' responses to stress.
4. The student will compare the economics of environmental degradation and protection, and can conduct risk-benefit analysis.
5. The student will analyze the causes and effects on humans of air pollution, and assess ways to prevent and control such pollution.

6. The student will analyze the causes and effects on humans of water pollution, and assess ways to prevent and control such pollution.
7. The student will recognize harmful effects of water resource depletion and soil erosion, and determine wise methods of water and soil management.
8. The student will categorize world agricultural systems and problems, and compile methods of sustainable food production and integrated pest management.
9. The student will assess forest and range land management practices, the need to protect wild species, and methods of managing wild species.
10. The student will understand the concepts of energy quality and efficiency.
11. The student will categorize humans' major sources of energy, and discuss the problems and potential value of each source.
12. The student will determine the management needed for mineral resources and solid wastes.

### **LEARNING TASKS & ACTIVITIES:**

Assignments and Activities in this on-line course will be the equivalent to a 5-hour on-site Environmental Science Course. In a normal semester this is three hours of lectures and 2.5 hours of lab per week. The topics are detailed in the course outline. Students will observe and experimentally demonstrate the environmental processes, problems and solutions during the laboratory assignments.

### **ASSESSMENT OF OUTCOMES:**

Each chapter will contain a chapter quiz to assess the student's comprehension of lecture topics; a laboratory assignment to assess laboratory performance, and a discussion or other assignment to engage the student. The lowest scored quiz, lab, and assignment will be dropped from the student's final grade.

#### **Late work is NOT accepted.**

The following points will be assigned to each evaluation:

13 quizzes @ 50 points each

13 lab assignments @ 25 points each

Grades will be assigned as follows:

90 to 100% = A

80 to 89% = B

70 to 79% = C

60 to 69% = D

59% or less = F

Incompletes given at the end of a course will only be possible if previously agreed upon by the student and the instructor. Please refer to the college catalog for the college's policies on incompletes.

**25% COMPLETION  
POLICY:**

**25% of the course material must be completed by Wednesday, September 21st at 11:55 p.m.**

**25% of the course material is defined as completion of Chapters 1, 2, 3 and 4 quizzes and labs. Failure to complete these assignments by 9/21/11 will result in the student being administratively dropped from the course.**

**ATTENDANCE  
POLICY:**

Although this is an online class, students are expected to "attend class" each day by working to complete the assignments in a timely manner.

**ACADEMIC  
INTEGRITY:**

It will be assumed that you entered college to better your life through lifelong learning opportunities. The work that you produce in this class must be original and authentic. Should dishonesty or misconduct be discovered, the student will receive a grade of "F" for the course, as well as action taken against the student at the administrative level.

**COMPETENCIES:**

<p><b>Environmental Impacts:</b> The student will analyze human impacts on their environments, and assess demonstrated and potential solutions to environmental problems.</p>
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1. Define nonrenewable and renewable resources and list two examples of each. (Knowledge)
2. Define sustainable yield of a resource. (Knowledge)
3. Differentiate between degradable and persistent pollutants. (Analysis)
4. Name three ways that pollution can be prevented. (Knowledge)
5. Differentiate between overpopulation and over-consumption. (Analysis)
6. Evaluate the environmental impacts of hunting and gathering, shifting cultivation, subsistence farming, and industrial agriculture and manufacturing. (Evaluation)
7. Evaluate the effects of worldviews of environmental impacts. (Evaluation)
8. Appraise the environmental impacts of paint production, and the cleanup needed for the former production of paint containing lead compounds. (Evaluation)

9. Role-play conflicting positions in a simulated environmental management situation , to gain understanding for various points of view.

**Ecosystems:** The student can name the types and components of terrestrial and aquatic ecosystems.

1. Name and define the five major kingdoms or organisms. (Knowledge)
2. Define autotrophs and heterotrophs and name an example of each. (Knowledge)
3. Define primary, secondary and tertiary consumers, herbivores, carnivores, omnivores, and detritivores, and name an example of each. (Knowledge)
4. Define predators, scavengers and parasites, and name an example of each. (Knowledge)
5. Define organism, population, community, and ecosystems. (Knowledge)
6. Differentiate between the principal types of terrestrial and aquatic ecosystems. (Analysis)
7. Observe and identify several components of prairie, forest, stream and lake ecosystems. (Analysis)
8. Examine an aquatic plankton community under the microscope, a terrestrial soil arthropod community, and a forest plant community. (Analysis)
9. Microscopically observe bacteria from several ecosystems. (Analysis)
10. Demonstrate adaptive variations of leaf shapes in an art project, bird beaks in a game, and bird songs in music. (Application)

**Ecosystem Dynamics:** The student will understand energy and matter cycling and the nature of ecosystems' responses to stress.

1. Define homeostasis.(Knowledge)
2. Explain how speciation and extinction take place. (Comprehension)
3. Observe primary succession on rock outcrops, and outline the stages of secondary succession in an abandoned farm field. (Syntheses)
4. Describe the tolerance range of species to abiotic factors. (Comprehension)
5. Demonstrate in a game how the principle of limiting factors affects growth of a population in an ecosystem. (Application)
6. Determine how changes in survival have affected human populations , and compare population demographics of various countries and regions. (Evaluations)
7. Draw simplified drawings of the carbon, nitrogen, phosphorous and water cycles. (Application)
8. Define native, immigrant, keystone, and indicator species. (Knowledge)

**Environmental Economics:** The student will compare the economics of environment degradation and protection, and can conduct risk-benefit analysis.

1. Define the gross national product (GNP), the real GNP, and the GNP per capita.
2. Explain why the real GNP per capita is not a good estimator of quality of life. (Comprehension)
3. Differentiate between internal and external costs. (Analysis)
4. Explain why poverty is the primary cause of environmental degradation in less developed countries. (Comprehension)

5. Describe and assess three approaches of U.S. environmental protection laws. (Evaluation)
6. Differentiate between toxic substances, hazardous substances, carcinogens, mutagens, and teratogens based on their effects on humans, and name an example of each. (Analysis)
7. Experimentally determine the toxicity of several substances to brine shrimp, and name two other methods of toxicity testing. (Application)
8. Define the desirability quotient of a particular technology as determined by potential benefits and risks to society. Conduct a risk-benefit analysis of an environmental situation. (Application)
9. Describe four aspects of technology that cause people to overestimate its risk. Explain why many people ignore the far more serious risks of smoking, alcohol use and automobile use. (Comprehension)
10. Demonstrate the cumulative effects of various risk factors in a game. (Application)
11. Tour a hazardous waste management facility. Compare the three methods used to dispose of most hazardous waste in the U.S., and a problem associated with each method. (Evaluation)

**Air Pollution:** The student will understand the causes and effects on humans of air and water pollution, and know ways to prevent and control such pollution.

1. Name three classes of compounds that cause the most air pollution. (Knowledge)
2. Name the most common indoor air pollutant. (Knowledge)
3. Differentiate between photochemical smog and industrial smog in terms of type of pollutant causing the smog, and season of the year and weather conditions which aggravate it. (Analysis)
4. Demonstrate how a thermal inversion can trap air pollutants and aggravate their detrimental effects on people. (Application)
5. Name two primary pollutants which can be transported long distances by wind and converted to secondary pollutants which cause acid rain or snow. State the pH range of natural precipitation and the pH range of acid rain. (Knowledge)
6. Describe three damaging effects of acid rain on the environment. (Comprehension)
7. Test the pH of several water samples and other materials. (Applications)
8. Observe and assess several water samples and other materials. (Application)
9. Describe three methods of preventing emissions of sulfur dioxide and nitrogen oxides. (Comprehension)
10. Explain how the "greenhouse effect" could lead to global warming. (Comprehension)
11. Determine the possible effects of global warming on coastal areas, crop production and human health. (Evaluation)
12. Assess three methods of slowing down possible global warming. (Evaluation)
13. Describe three effects on humans of ozone depletion and a method of slowing ozone depletion. (Comprehension)

**Water Pollution:** The student will analyze the causes and effects on humans of water pollution, and assess ways to prevent and control such pollution.

1. Differentiate between surface water, groundwater, watershed and aquifer. (Analysis)

2. Name three kinds of wastes that constitute the primary pollutants of drinking water supplies. (Knowledge)
3. Analyze water samples for coliform bacteria, dissolved oxygen, pH, and nitrate and phosphate contents. (Analysis)
4. Define eutrophication of shallow lakes and reservoirs, and list three ways of minimizing it. (Knowledge)
5. Identify several common species of algae and other organisms living in water. (Application)
6. Describe three methods of preventing groundwater contamination. (Comprehension)
7. Observe and diagram the steps of primary and secondary sewage treatment. (Application)
8. Observe municipal water treatment procedures. (Application)
9. Observe and diagram the steps of animal waste management. (Application)
10. Describe four methods of protecting coastal waters from pollution. (Comprehension)

**Water and Soil Management:** The student will recognize the harmful effects of water resource depletion and soil erosion, and determine wise methods of water and soil management.

1. Name two human activities that contribute to flood damage and two that contribute to drought damage. (Knowledge)
2. Name three problems that can result from overuse of groundwater. (Knowledge)
3. Describe two ways each of reducing water waste in crop irrigation, industry, and homes. (Comprehension)
4. Compare two advantages and three disadvantages of building large dams and reservoirs. (Evaluation)
5. Describe two problems with desalination of seawater or brackish groundwater. (Comprehension)
6. Experimentally demonstrate rock weathering and the value of soil organic matter. (Application)
7. Name three human activities that accelerate desertification and three that cause soil erosion. (Knowledge)
8. Observe and assess three soil erosion control practices on a commercial farm. (Evaluation)
9. Experimentally demonstrate the diversity of soil life, the effects of plant competition, and beneficial nitrogen-fixing bacteria. (Application)
10. Analyze soil samples for pH, nitrogen, phosphorous and potassium levels. (Analysis)
11. Determine how construction of a housing development can cause soil erosion, and assess an alternative method of development that conserves soil, natural vegetation and water resources. (Evaluation)
12. Describe three measures local governments can take to protect cropland, forests and other non-urban lands from degradation and ecologically unsound development. (Comprehension)

**Agricultural Management:** The student will categorize world agricultural systems and problems, and compile methods of sustainable food production and integrated pest management.

1. Compare three harmful effects each of industrialized agriculture and traditional subsistence-intensive agriculture. (Evaluation)
2. Determine two problems resulting from clearing tropical rainforests for grain and livestock production. Describe and assess a cropping system that allows profitable harvests from rainforests without degrading the ecosystem. (Evaluation)
3. Observe and assess a successful food-producing, perennial agro-forestry system producing high protein yields and very little soil erosion. (Evaluation)
4. Evaluate the effects of U.S. government farm commodity programs and wetlands regulations on crop and livestock production and prices. (Evaluation)
5. Assess the effects of international food and agricultural development aid on food production in less developed countries. (Evaluation)
6. Identify several crop diseases, weeds and insect pests. (Application)
7. Assess three beneficial and two detrimental effects of pesticides. (Evaluation)
8. Assess the economic and social effects of U.S. pesticide regulations. (Evaluation)
9. Describe three methods of managing crop diseases, weeds and insect pests other than pesticides. (Comprehension)
10. Screen seedling plants for disease resistance. (Analysis)

<p><b>Forest, Range Land and Wildlife Management:</b> The student will assess forest and range land management practices, the need to protect wild species, and methods of managing wild species.</p>
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1. Differentiate between virgin, old growth and secondary forests. (Analysis)
2. Assess the influence of forest on local, regional and global climates, and on soil erosion, air pollution, and species conservation. (Evaluation)
3. Describe three causes of tropical deforestation, and three methods of reducing it. (Comprehension)
4. Defend the need to preserve wild plant species with no known use to humans at present. (Evaluation)
5. Explain why the U.S. government expends up to \$5 million per individual saved on some endangered animal species, and under \$8 per individual on others. (Comprehension)
6. Compare methods and effects of the species approach, the ecosystem approach and the wildlife management approach to protecting, wild species from extinction. (Evaluation)
7. Differentiate between even-aged and uneven-aged forest management in terms of practices and environmental effects. (Analysis)
8. Differentiate between the following tree-harvesting methods in terms of procedures and environmental effects: selective cutting, shelter wood cutting, seed-tree cutting, and clear-cutting. (Analysis)
9. Describe three methods of protecting forests from diseases and insects. (Comprehension)
10. Differentiate between the environmental effects of surface fires, crown fires and ground fires in forests. (Analysis)
11. Assess the environmental effects of fire prevention, allowed natural fires, and prescribed surface burning in national parks and wilderness areas (Evaluation)
12. Describe the effects of overgrazing on grasslands, and describe three ways of controlling livestock distribution on a range land to prevent overgrazing. (Comprehension)
13. Observe and describe wildlife management procedures of a nuclear power plant. (Comprehension)

14. Develop a plan to improve wildlife habitat in a campus or backyard. (Application)

**Energy Use:** The student will understand the concepts of energy quality and efficiency.

1. Differentiate between high-quality and low-quality energy. (Analysis)
2. State the laws of conservation of matter and energy, and the law of energy conversion. (Knowledge)
3. Define energy efficiency. (Knowledge)
4. Name two ways of increasing energy efficiency. (Knowledge)
5. Describe how the law of energy conversion reduces the effectiveness of recycling waste materials. (Comprehension)
6. Compare the economic and environmental effects to society of improving energy efficiency vs. drilling for oil under Alaska's North Slope. (Evaluation)
7. Determine the energy and cost savings to a family of a more energy-efficient furnace, refrigerator and automobile. (Evaluation)
8. Conduct a campus energy audit and devise a plan for improving energy efficiency. (Synthesis)
9. Experimentally compare the effectiveness of various types of insulation. (Evaluation)
10. Select superior species and placement of shade trees to reduce air conditioning needs, and plant trees. (Application)

**Energy Sources:** The student will categorize humans' major sources of energy, and discuss the problems and potential value of each source.

1. Differentiate between passive and solar heating systems. (Analysis)
2. Evaluate the advantages and disadvantages of photovoltaic cells. (Evaluation)
3. Measure the effectiveness of a simple solar energy collector. (Analysis)
4. Evaluate the advantages and disadvantages of producing electricity from wind. (Evaluation)
5. Evaluate the advantages and disadvantages of producing ethanol to power automobiles. (Evaluation)
6. Evaluate the advantages and disadvantages of extracting geothermal energy. (Evaluation)
7. Differentiate between primary, secondary, and tertiary oil recovery, comparing the processes used and economics of removing each type. (Analysis)
8. Observe and diagram the process of refining oil for use as fuel. (Application)
9. Categorize the component gases of natural gas to electricity. (Comprehension)
10. Observe and describe the conversion of natural gas to electricity. (Comprehension)
11. Diagram the process of coal formation. (Application)
12. Compare the environmental impacts of area strip mining, contour strip mining, and subsurface mining of coal. (Evaluation)
13. Diagram the nuclear fuel cycle, showing the open fuel cycle used today and the potential closed fuel cycle. (Application)
14. Describe three proposals for developing a sustainable U.S. energy policy. (Evaluation)
15. Evaluate three proposals for developing a sustainable U.S. energy policy. (Evaluation)

**Mineral and Solid Waste Management:** The Student will determine the management needed for mineral resources and solid wastes.

1. Differentiate between igneous, sedimentary and metamorphic rocks in terms of formation, components and examples. (Analysis)
2. Assess the environmental impacts of mining, processing and using minerals. (Evaluation)
3. Compare the throwaway solid waste approach with the preventative wasted solids approach in terms of practices and environmental impacts. (Evaluation)
4. Assess the environmental effects of trash-to-energy incineration of solid waste. (Evaluation)
5. Categorize the types of solid wastes your household produces over a three day period, and the amounts that could be reduced, reused or recycled. (Analysis)
6. Differentiate between primary, closed-loop recycling and secondary, open-loop recycling. (Analysis)
7. Compare the environmental effects of reusing beverage containers vs. recycling them. (Evaluation)
8. Observe commercial waste sorting for recycling, and compare the environmental effects of reusing beverage containers vs. recycling them. (Evaluation)
9. Make paper from waste office paper. (Application)
10. Practice garden composting, and view municipal composting. (Application)

**This syllabus is subject to revision with prior notification to the student by the instructor.**