COURSE: 477/478 ENVIRONMENTAL SCIENCE

GRADE: 11, 12

LEVEL: I AND II

CREDITS: 5

PREREQUISITE: Biology.

BASIC TEXT: Environmental Science, Holt (2008)

REQUIRED MATERIALS: field notebook, ruler, colored pencils.

COURSE DESCRIPTION:

Environmental Science is a field that utilizes aspects of many sciences, including biology, chemistry, ecology, geology, atmospheric science and other disciplines, to introduce students to local and global environmental issues and help them appreciate the relationship that exists between living things and their surroundings. It is a hands-on course allowing students to tap into their individual talents to learn and think critically about environmental issues such as resource conservation, pollution control, alternative energy and sustainability. Students are expected to design their own research project using the campus, its surrounding community and its resources.

MISSION RELATED GOALS:

This course promotes intellectual curiosity through student-guided scientific investigations and discussion of environmental science current events. Academic excellence is emphasized through critical assessment of higher order thinking skills, application of broad scientific principles in lab activities and responses to homework/discussion questions.

STUDENT EXPECTATIONS FOR LEARNING ADDRESSED:

Students will enhance their intellectual curiosity through exposure to inquiry style teaching. They will reinforce problem-solving and communication skills through a variety of laboratory investigations, written reports and oral presentations. Students will learn to work toward a common goal during cooperative group and laboratory activities. As individual members of lab groups, students will learn to respect the rights of others, as they are encouraged to accept other group members' right to express differing opinions/views. The course promotes personal growth and accepting responsibility, as individuals are held accountable for their contributions to the group. The combined accomplishment of these expectations will effectively result in the acquisition of life skills necessary for students to become successful contributing members of society.

GENERAL PERFORMANCE OBJECTIVES:

1. Apply the scientific method to laboratory and field investigations. Design an experiment.
2. Demonstrate proper care and procedural use of the microscope and collection and measurement apparatuses during laboratory and field investigations.

3. Analyze / interpret experimental data using graphs.
4. Recognize the interconnectedness between living things and their environments.
5. Investigate interactions between species, species adaptation and biodiversity.
6. Describe energy transfer in the ecosystem.
7. Investigate land use and ecosystem change.
8. Study various forms of pollution and hazardous waste.
9. Make environmental decisions using critical thinking.
10. Use science to solve environmental problems.

MASSACHUSETTS CURRICULUM FRAMEWORK STRANDS: Ecology
Broad Concept: Ecology is the interactin between living organisms and their environment

CURRICULUM FRAMEWORK LEARNING STANDARDS:
6.1 Explain how biotic and aboitic factors cycle in an ecosystem (water, carbon, oxygen, nitrogen)
6.2 Use a food web to identify and distinguish producers, consumers and decomposers, and to explain the transfer of energy through trophic levels.
6.3 Identify the factors in an ecosystem that influence fluctuation in population size.
6.4 Analyze changes in an ecosystem resulting from natural causes, changes in climate, human activity or the introduction of non-native species.
6.5 Explain how symbiotic behavior produces interactions within ecosystems.

UNITS AND THEMES:

Environmental Science: A Global Perspective Strands: 6.1, 6.4	4 weeks
Living Organisms in Ecosystems Strands: 6.3, 6.5	4 weeks
How Ecosystems Work Strands: 6.1, 6.2	3 weeks
Biodiversity Strand: 6.4	3 weeks
Pollution and Hazardous Waste Strands: 6.3, 6.4	4 weeks

COURSE OUTLINE:
I. Environmental Science: A Global Perspective
   a. Understanding our environment
   b. Using Science to solve environmental problems
   c. Making environmental decisions.
II. Living Organisms in Ecosystems
   a. Ecosystems: Everything is connected
   b. How species interact with each other
   c. Adapting to the environment
III. How Ecosystems Work
   a. Energy flow in ecosystems
   b. The cycling of materials
   c. How ecosystems change

V. Biodiversity
   a. Biodiversity at risk
   b. Public policy
   c. The future of biodiversity.

III. Pollution and Hazardous Waste
   a. Local agencies
   b. State agencies
   c. Federal agencies
   d. A look at our own "backyard"

SUGGESTED INSTRUCTIONAL STRATEGIES:

1. Assign Labs that reinforce measuring techniques
2. Assign labs that improve graphing skills
3. Assign labs that use the scientific method to solve a problem and design an experiment
4. Use the John Collins Method to write an essay which critically evaluates a "scientific"claim.
5. Use Think-Pair Share Strategies to do prelab exercises
6. Use cooperative groups of 2, 3 or 4 for Lab experiments and projects
7. Use a peer evaluation form/rubric to assess cooperative group's vs individual credit on projects
8. Maximize on task work by assigning students to work in pairs when doing microscope labs
9. Students are required to maintain notebooks. Note taking is assessed.
10. Give students cooperative roles when working in groups and require a written product. Example: butcher paper with bullets of major discussion points presented to class..
11. Students collect specimens from campus during ecology, taxonomy or microscopy units.
12. Students produce a Video or Powerpoint presentation that is presented to the class to teach concepts related to a course objective.

SUGGESTED INTEGRATED ACTIVITIES:

1. Studies of local habitat: the school campus.
2. Fall foliage phenology study
3. Owl pellet investigation.
4. Wildflower investigation.
5. Winter botany study.
6. Exploration of the environmental movement.
7. Water projects.

USE OF TECHNOLOGY:

Use of microscope, computer, basic calculator, overhead projector, clinometer, densitometer, compass, video programs, powerpoint presentations, microscope camera and video adapter, internet webquests

ASSESSMENTS:

All assessments follow the school wide rubric.
Unit Quizzes
Free-response tests

Laboratory Reports
Reports from cooperative teams
Integration Projects
Oral Presentations and visual displays from field investigations
Homework and Participation is 20% of grade
Standardized Departmental Final Exam is 20% of grade