

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON



COURSE OUTLINE

Course Title: ENVIRONMENTAL SCIENCE

Code No.: ENV 1030

Semester: III

Program: CIVIL/CONSTRUCTION/ARCHITECTURE/GAS

Author: DAVID TROWBRIDGE

Date: JUNE 2002

Previous Outline Date: JUNE 2001

Approved: _____

Dean

Date

Total Credits: 3

Prerequisite(s): NONE

Length of Course: 16

Total Credit Hours: 48

Copyright © 2001 The Sault College of Applied Arts & Technology
Reproduction of this document by any means, in whole or in part, without the prior written permission of The Sault College of Applied Arts & Technology is prohibited.
For additional information, please contact Brian Punch, Dean, School of Natural Resources
(705) 759-2554, Ext. 688.

I. COURSE DESCRIPTION:

This is an introductory course covering the fundamentals of science related to the study of engineering technology. The course provides students with an understanding of the basic concepts of ecology, an introductory survey of biological concepts and the fundamentals of chemistry as applied to water and wastewater treatment. This will also provide the background to prepare students for an introduction to the process of environmental impact assessment. Practical aspects are presented in laboratory sessions throughout the course

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:
(Generic Skills Learning Outcomes placement on the course outline will be determined and communicated at a later date.)

Upon successful completion of this course the student will demonstrate the ability to:

- 1) Demonstrate an understanding of the role of environmental science and technology.

Potential Elements of the Performance:

- describe the steps in the scientific method;
- using the scientific method demonstrate how to solve a given problem;
- describe and give examples of the various levels of organization of matter;
- identify the environmental aspects of contemporary society including solid waste management, water supply and treatment and wastewater collection and treatment;

- 2) Explain basic ecological concepts, including energy flow, food chain and food web.

Potential Elements of the Performance:

- define basic terms including ecosystem, environment, community, habitat, niche;
- describe the energy flow in ecosystems;
- distinguish between a food chain and food web;
- trace the flow of nutrients in the primary nutrient cycles;
- describe the elements of limnology;
- define eutrophication and explain its cause;
- state the ecosystem approach to describing the interactions in the environment;
- describe the ecosystem concept and ecological sustainability;
- describe the causes and impacts of the major global environmental problems;
- state the meaning and importance of biological diversity;
- explain the pollution prevention approach ;

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

- 3) Describe the fundamental biological systems and their position within the ecosystem

Potential Elements of the Performance:

- list the characteristics of living organisms;
- identify the function of the main parts of plant and animal cells;
- describe the function of the various organelles within a cell;
- describe the physiological effects on the environment of animals, humans, plants and micro-organisms;
- describe the structure of bacteria, fungi, and viruses and their growth and reproduction;
- name and describe the main biological contaminants in drinking water;
- name and describe the main biological organisms found in wastewater treatment processes;

- 4) Apply proper microbiological, zoological and botanical classification

Potential Elements of the Performance:

- use correct convention in writing scientific names;
- explain the basis for classifying organisms;
- categorize selected examples of organisms into their respective taxonomic groups;
- identify the impact of bacteria, fungi and viruses on water supply;
- describe the role of indicator organisms in identifying environmental impacts;
- use a compound microscope to observe and draw cellular material

- 5) Describe basic strategies for obtaining nutrients and trace their intake and movement through the cell.

Potential Elements of the Performance:

- explain the role of micro-organisms in the treatment of wastewater
- differentiate between the process of diffusion and osmosis in cells
- summarize the processes of photosynthesis and respiration and their relationship to ecosystem function;
- describe the interactions between the atmosphere, earth, water, plant, animal and microbiological systems;

- 6) Apply the fundamentals of chemistry in theory and in practical situations.

Potential Elements of the Performance:

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

- differentiate between mass, weight, volume, density, states of matter, mixtures, solutions, and suspensions;
- relate characteristics of elements to their position in the Periodic Table;
- read and apply information from the Periodic Table including atomic symbols, atomic mass and atomic number;
- distinguish between metals, non-metals and inert gases;
- describe the chemical processes used to treat water and wastewater;

- 7) Interpret the language of chemistry including chemical symbols for the elements, compounds and chemical equations.

Potential Elements of the Performance

- describe and name ionic and covalent compound, organic and inorganic materials, acids and bases;
- explain and use the pH scale;
- describe the chemical and physical properties of water and their relationship to ecosystem functions;
- write and balance chemical equations including those common in water and wastewater treatment;

- 8) Perform chemical calculations related to environmental situations

Potential Elements of the Performance:

- calculate neutralization requirements for acidic or basic conditions based on a simple titration;
- calculate gram molecular weights and determine the numbers of moles of a given mass of substance;
- calculate the amount of material consumed or produced in chemical reaction;
- determine the concentration of solutions and carry out the procedure for diluting solutions;
- calculate the amount of a given solution needed to react with a given amount of material;
- define and calculate dissolved oxygen (DO) and biochemical oxygen demand (BOD)

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE
(Continued):**

- 9) Utilize correct laboratory techniques and safe working practices in a laboratory setting.

Potential Elements of the Performance:

- discuss and apply safe lab procedures including the handling of dangerous materials;
- demonstrate knowledge of the Workplace Hazardous Materials Information System;
- demonstrate use of balances, pH measuring devices, burettes, and common lab glassware;
- determine to within acceptable accuracy an unknown quantity by following a laboratory procedure;

- 10) Describe the principles of environmental assessment (EA) and the legal framework governing the EA process in Ontario.

Potential Elements of the Performance;

- describe the elements considered in the EA process including impacts on water, air and natural species
- discuss noise levels impacts and calculations
- list the steps required when undertaking a project governed by the Environmental Assessment Act;
- distinguish between Class Environmental Assessment and Individual EA;
- explain the requirement and process for public participation in EA;
- describe the components of an Environmental Study Report (ESR)

III. TOPICS:

- 1) Role of environmental science
- 2) Principles of ecology
- 3) Principles of biology
- 4) Principles of chemistry
- 5) Environmental Assessment

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Basic Environmental Technology, Jerry A. Nathanson, Second Edition, 2000, Prentice Hall

Laboratory coat and safety glasses

V. EVALUATION PROCESS/GRADING SYSTEM

There will be three tests during the semester and assignments or projects on various topics. A final grade will be determined based on the aggregate score of all work according to the following weighting;

Three tests at 20% each	= 60%
Laboratory work	= 30%
<u>Assignments and projects</u>	<u>= 10%</u>
Total	100%

Grades:

A+	90 - 100%
A	80 - 89%
B	70 - 79%
C	60 - 69%

Students, who have achieved less than 60% but more than 55% on all of the test and assignments, have the opportunity to write a supplemental test covering all of the course material. This is only granted where all of the assignments have been completed and attendance is satisfactory.

VI. SPECIAL NOTES:

- Special Needs
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities), you are encouraged to discuss required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Ext. 493, 717, 491 so that support services can be arranged for you.
- Retention of Course Outlines
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other post-secondary institutions.
- While every attempt will be made to meet the needs of all learners anyone with special needs should contact the Dean of the School to which they are applying.
- Substitute Course Information is available at the Registrar's Office.

VII. PRIOR LEARNING ASSESSMENT

-Students who wish to apply for advanced credit in the course should consult the instructor. Credit for prior learning will be given upon successful completion of the following: