

# Minnesota State University Moorhead

## **CHEM 102: Environmental Chemistry**

### **A. COURSE DESCRIPTION**

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: \*.\*

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: Goal 03 - Natural Science

A study of the fundamental applications of chemistry to environmental problems in the context of the social, political, economic, and ethical issues surrounding those problems. Students will formulate and test hypotheses by performing experiments and simulations in class and at home. They will communicate their findings and interpretations both orally and in writing. Suitable for those who have had no high school chemistry. Credit not applicable to a chemistry major or minor. MnTC Goal 3.

### **B. COURSE EFFECTIVE DATES: 08/17/2011 - Present**

### **C. OUTLINE OF MAJOR CONTENT AREAS**

1. Chemistry of acid rain: sources, reactions, impacts, history, nitrogen cycle.
2. Chemistry of common air pollutants including their origin and reactions.
3. Chemistry of ozone depletion by CFCs.
4. Common solutes and solution properties.
5. Common themes in all of the above:  
Risk/benefit analyses  
Modern society's need for energy  
Sustainability  
Central role of chemistry in understanding environmental and social issues.
6. Drinking water regulations, treatment and global challenges.
7. Fossil fuels: origin, structure, chemical reactions, energy transformation, petroleum refining, future reserves, and alternative fuels.
8. Identity, structure, and physical properties of greenhouse gases.
9. Introduction of quantitative concepts such as moles and mass calculations.
10. Introduction to acid/base chemistry and pH.
11. Introduction to atoms, molecules, classifications of matter, and chemical reactions.
12. Lewis structural models for molecules.
13. Nuclear power plants, nuclear weapons, radioactive waste, and future of nuclear power.
14. Other selected topics such as: Batteries, fuel cells, etc., Drug structure, function, and design.  
Nutrition: Classes and properties of food chemicals.
15. Radiation and matter.
16. Radioactivity and sources of radiation.
17. Scientific basis for energy from nuclear reactions.
18. The carbon cycle.
19. The scientific method including a brief introduction to the philosophy of science and the influence of society on science.
20. Unique physical and chemical properties of water.

### **D. LEARNING OUTCOMES (General)**

1. Understand the influence of society on the practice of science.
2. Make informed decisions and choices about societal issues based on scientific understanding of the underlying phenomena.
3. Explain the basic concepts of chemical structure and reactivity as it relates to energy and the environment.
4. Gain experience at applying the scientific method through designing and implementing several experiments and analyzing and drawing conclusions from the results.

### **E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

#### Goal 03 - Natural Science

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

**F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

**G. SPECIAL INFORMATION**

None noted