

NEW COURSE PROPOSAL

PROGRAM: BIOLOGICAL AND PHYSICAL SCIENCES

1. **Catalog Description of the Course.** *[Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]*

CHEM 301. ENVIRONMENTAL CHEMISTRY (3)

Three hours of lecture per week.

Prerequisite: CHEM 122 with a grade of "C" or better

An introductory course to the chemistry of the environment. The goal of this course is to teach the fundamental natural chemical processes of the atmosphere, oceans and soil of the Earth, as well as the anthropogenic effects on this system. Current topics of environmental interest will be discussed. The sciences behind these processes will be the focus of this course.

2. **Mode of Instruction.**

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	24
Seminar			
Laboratory			
Activity			

3. **Justification and Learning Objectives for the Course.** (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

People are becoming increasingly interested in environmental issues, especially human impact on the environment. Issues such as climate change and gasoline additives in drinking water are areas of reasonably large interest to many people. Understanding the basic science behind such issues is needed for people to make informed judgments as citizens and decision makers. This course is designed for the student to have basic knowledge of the chemistry involved in historical and current environmental issues. This course also provides a vehicle for otherwise intimidated students to be introduced to science via a well-received topic. Furthermore, this course can fulfill an upper division science elective for Environmental Science and Resource Management majors whose emphasis is environmental science. It will also be chemistry elective for biology majors who want to learn more on the subject, as well as for chemistry minors. These students will already be taken the prerequisite CHEM 122.

Students who successfully complete this course will be able to:

- Understand the scientific method and how it is used to approach scientific problems
- Identify the scientific principles that form the basis for environmental chemistry; including water, air and soil chemistry in the natural and polluted state
- Recognize important aqueous phase oxidation and reduction chemical reactions
- Distinguish current and past anthropogenic forcing on the Earth system
- Explain elementary gas phase kinetics and how it effects atmospheric chemistry
- Describe soil chemistry, including the important cycles and exchanges taking place in the geosphere
- Identify different types of hazardous waste and be able to explain the meanings of each type
- Consider the options in dealing with hazardous waste and anthropogenic emissions
- Explain the scientific principles behind environmental analysis techniques

4. Is this a General Education Course YES **NO**
- If Yes, indicate GE category:

A (English Language, Communication, Critical Thinking)	
B (Mathematics & Sciences)	
C (Fine Arts, Literature, Languages & Cultures)	
D (Social Perspectives)	
E (Human Psychological and Physiological Perspectives)	

5. **Course Content in Outline Form.** *[Be as brief as possible, but use as much space as necessary]*

Planet Earth and the Environment
 The hydrosphere, atmosphere, lithosphere and biosphere
 The scientific method
 Environmental science and chemistry
 Fundamentals of Aqueous Phase Chemistry
 Chemical Reactions
 Chemical Equilibrium
 Solutions
 Ions and Molecules
 Types of Reactions
 Oxidation-Reduction
 Oxidation States
 Nearnst Equation
 Redox Cycles
 Corrosion
 Phase Interactions
 Formation of Sediments
 Solubility
 Henry's Law
 Colloidal Particles
 Ion Exchange
 Aquatic Microbial Biochemistry
 Algae, Fungi and Bacteria
 Biodegradation
 Nitrogen Fixation
 Phosphorus and Sulfur Cycles
 Water Pollution
 Elemental Pollutants/Heavy Metals
 Organic Metals
 Inorganic Species
 Organic Pollutants
 Radionucleides
 Water Treatment
 Municipal Drinking Water
 Waste Water
 Osmosis
 Disinfections
 Atmospheric Chemistry
 Solar Radiation
 Gas Phase Kinetics
 Tropospheric Gas Phase Processes
 Stratospheric Processes
 Particles in the Atmosphere
 Physical Processes
 Chemical Processes
 Gaseous Inorganic Pollutants
 Sulfur Cycle
 Nitrogen Cycle

- Acid Rain
- Halogens
- Organic Air Pollutants
 - Naturally emitted organics
 - Hydrocarbons
 - Aromatic Organics
 - Oxygenated Organics
 - Organo-Sulfur
- Photochemical Smog
 - Smog formation from emissions
 - Mechanism for smog formation
 - Health Effects of Smog
- Anthropogenic Change
 - Climate Change
 - Acid Precipitation
 - Stratospheric Ozone Destruction
 - Smog
- Geochemistry
 - Solids in the geosphere
 - Soil
 - Chemical Weathering
 - Groundwater
- Soil Chemistry
 - Ion-Exchange in Soil
 - Nitrogen, Phosphorus and Potassium
 - Fertilization
 - Pollutants
- Hazardous Waste
 - Classification of Hazardous Waste
 - Flammable Substances
 - Reactive Substances
 - Corrosive Substances
 - Toxic Substances
- Environmental Chemistry
 - Fate of Hazardous Waste
 - Treatment and Disposal of Waste
 - Toxicological Chemistry
- Chemical Analysis
 - Water Analysis
 - Air Analysis
 - Soil and Waste Analysis

6. References. [Provide 3 - 5 references on which this course is based and/or support it.]

Schwarzenbach, R.P.; Gschwend, P.M.; Imboden, D.M. *Environmental Organic Chemistry*, 2nd Ed., Wiley, 2002
 Baird, C. *Environmental Chemistry*, 2nd Ed., Freeman, 1998
 Manahan, S. *Environmental Chemistry*, 7th Ed., Lewis Publishers, 1999.
 Williams, I. *Environmental Chemistry*, Wiley, 2001.

7. List Faculty Qualified to Teach This Course.

Dr. Simone Aloisio, Dr. Philip Hampton

8. Frequency.

a. Projected semesters to be offered: Fall X Spring Summer

9. New Resources Required.

None.

10. Consultation.

Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

____ Philip Hampton _____ 1/8/03 _____
Proposer of Course Date