The University Of Toledo

New Graduate Course Proposal

* denotes required fields

1. College*: Coll Nat Sci and Mathematics
   Department*: Chemistry

2. Contact Person*: Mark Mason Phone: 530-1532 (xxx - xxxx) Email: mark.mason5@utoledo.edu

3. Alpha/Numeric Code (Subject area - number)*: CHEM 8210

4. Proposed title*: Environmental Chemistry
   Proposed effective term*: 201410 (e.g. 201140 for 2011 Fall)

5. Is the course cross-listed with another academic unit? ☐ Yes ☐ No
   Approval of other academic unit (signature and title)
   Is the course offered at more than one level? ☐ Yes ☐ No
   If yes, an undergraduate course proposal form must also be submitted. If the undergraduate course is new, complete the New Undergraduate Course Proposal; if the undergraduate course is existing, submit an Undergraduate Course Modification Proposal.

6. Credit hours*: Fixed: 3 or Variable:

7. Delivery Mode: Primary* Secondary Tertiary
   a. Activity Type * Lecture
   b. Minimum Credit Hours * 3
   Maximum Credit Hours * 3

Date Added: 11-26-13
Council Approved: 1-21-14
To Provost: 2-7-14
c. Weekly Contact Hours *:

8. Terms offered:  □ Fall  ✓ Spring  □ Summer

   Years offered:  □ Every Year  □ Alternate Years

9. Are students permitted to register for more than one section during a term?  □ No  ✓ Yes

   May the courses be repeated for credit?  □ No  ✓ Yes  Maximum Hours

10. Grading System*:
   □ Normal Grading (A-F, PS/NC, PR, I)
   □ Passing Grade/No Credit (A-C, NC)
   □ Credit/No Credit
   □ Grade Only (A-F, PR, I)
   □ Audit Only
   □ No Grade

11. Prerequisites (must be taken before): i.e. C or higher in (BIOE 4500 or BIOE 5500) and C or higher in MATH 4200

   CHEM 2420, Organic Chemistry II

   □ PIN (Permission From Instructor)
   □ PDP (Permission From Department)

   Co-requisites (must be taken together):

12. Catalog Description* (75 words Maximum)

   This course will focus on the chemistry of air, water, and soil with specific emphasis on the effects of human-made chemical products and by-products on the environment. Connections with green chemistry will be highlighted.

13. Attach a syllabus and an electronic copy of a complete outline of the major topics covered. Click here for template.
Course Approval:

Department Curriculum Authority:  Xiche Hu  Date  2013/04/08

Department Chairperson:  Ronald E. Viola  Date  2013/04/26

College Curriculum Authority or Chair:  Anthony Quinn  Date  2013/10/22

College Dean:  Brian P. Ashburner  Date  2013/10/24

Graduate Council:  [Signature]  Date  1-21-2014

Dean of Graduate Studies:  [Signature]  Date  1-21-2014

Office of the Provost:  

Administrative Use Only

Effective Date:  (YYYY/MM/DD)

CIP Code:  

Subsidy Taxonomy:  

Program Code:  

Instructional Level:  

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ENVIROMENTAL CHEMISTRY
CHEM 6210/8210

Instructor: Dr. Andrew Jorgensen
Bowman Oddy 2086F, 530-4579, fax -4033
andy.jorgensen@utoledo.edu

Offerings: Spring semester

Credit Hours: 3

Description: This course will focus on the chemistry of air, water, and soil with specific emphasis on the effects of human-made chemical products and by-products on the environment. Connections with Green Chemistry will be highlighted. The course will be beneficial to chemists, chemical and environmental engineers, and environmental scientists. Specific topics are listed below in approximate order of coverage:

Introduction to Environmental Problems, Sustainability, and Green Chemistry
Triple bottom line; tragedy of the commons; systems thinking; life-cycle assessment; cradle-to-cradle; carbon footprint; ecological footprint; water footprint; external costs; history of environmental regulations; risk/exposure/hazard

Stratospheric Chemistry: The Ozone Layer (Chapter 1)
The physics, chemistry, and biology of UV; formation and destruction of ozone; the Chapman mechanism; catalytic processes of ozone destruction

The Ozone Holes (Chapter 2)
Dobson units; the chemistry of ozone depletion; the chemicals that cause ozone destruction; CFC replacements; international agreements

The Chemistry of Ground-Level Air Pollution (Chapter 3)
The chemical fate of trace gases in air; the photochemical smog process; improving air quality; limiting VOC and NO emissions; catalytic converters; sulfur-based emissions; particulates in air pollution

Environmental & Health Consequences of Polluted Air—Outdoors & Indoors (Chapter 4)
Acid rain; Outdoor Pollutants; Indoor Air Pollution

The Greenhouse Effect (Chapter 5)
Mechanism of the greenhouse effect; greenhouse gases; the climate-modifying effects of aerosols; geo-engineering

Energy Use, Fossil Fuels, CO₂ Emissions, and Global Climate Change (Chapter 6)
Global energy use and energy sources; CO₂ sequestration; predicted effects of climate change on human health; international agreements

Biofuels and Other Alternative Fuels (Chapter 7)
Bio-ethanol; bio-butanol; hydrogen; synthesis gas; methanol; fuel cells
The Chemistry of Natural Waters (Chapter 10)
Gas solubility; oxidation-reduction chemistry; the pH scale; acidity/alkalinity; drinking water chemistry issues

The Pollution and Purification of Water (Chapter 11)
Water disinfection; groundwater: its supply, chemical contamination, and remediation; treatment of wastewater and sewage

Toxic Heavy Metals (Chapter 12)
Mercury, lead, cadmium, arsenic, chromium

Pesticides (Chapter 13)
Persistent organic pollutants; bioconcentration; principles of toxicology; chloro-organic, organophosphate, and carbamate insecticides; herbicides: atrazines and glyphosate

Dioxins, Furans, and PCBs (Chapter 14)
Production and sources, commercial uses, health and environmental impacts

Other Toxic Organic Compounds of Environmental Concern (Chapter 15)
Polynuclear aromatic hydrocarbons; endocrine disruptors; phthalates; BPA; fire retardants; perfluorinated compounds

Wastes, Solids, and Sediments (Chapter 16)
Solid waste disposal; recycling; basic soil chemistry; contaminated sediments; hazardous wastes

Emerging Contaminants (readings from the primary literature)

Textbooks: Course material will primarily be taken from the text by Baird and Cann. Additional examples will be taken from scientific articles and the text by Manahan. These have been placed on reserve in Carlson Library.


Grading: Grades will be based on two exams (100 points each), homework assignments and quizzes (150 points), a class presentation (50 points) and a comprehensive final exam (150 points). This totals 550 points. Grades will be assigned based the percentage of total points achieved.

Academic Dishonesty: The University Policy on Academic Dishonesty will be strictly enforced. See: http://www.dl.utoledo.edu/current_students/academic_dishonesty.htm.