1-2015

CHMY 541.01: Environmental Chemistry

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Chemistry 541-Syllabus
Environmental Chemistry
Spring Semester 2015

Instructor: Dr. Brooke Martin; Chem 207; **brooke.martin@umontana.edu**; ext 4546

Office hours: Mon. and Wed. 1-3 and by appointment**.**

Class Time: Tues and Thur: 1:10 -2:30pm

Texts: *No text is required for this course*. I will take material from:
Principles of Environmental Chemistry, James E. Girard, Jones and Bartlett, 2005;
Fundamentals of Environmental Chemistry, 3rd Ed., Stanley E. Manahan, CRC Press, 2009;
Environmental Chemistry, 8th Ed., Stanley E. Manahan, CRC press, 2005;
Environmental Chemistry, 5th Ed., Colin Baird and Michael Cann, 2012.

I will also use information from published papers, and will give you the citations when I do.

Learning Outcomes: Environmental Chemistry is a vast and broad topic that includes the chemistries of land, water and air, and the interaction of chemicals with plants and animals (including humans) in the environment. A one semester course cannot cover all of the topics in any real detail. Instead, this course will give an overview of important chemistries of the earth, water and air. The course will present natural chemical processes in the environment and use specific examples of anthropogenic impacts on the chemistry of the environment. The purpose of this course is to **1)** establish an understanding and appreciation of environmental chemical processes and their complexities, **2)** develop a working knowledge of the chemistry involved in specific environmental challenges, **3)** develop a familiarity with commonly used measurement techniques for the study of environmental chemistry, and **4)** provide a familiarity with current research in environmental chemistry. Having completed this course, the student should be able to read the literature describing studies of environmental chemistry and should be better prepared for more in-depth studies of specific environmental chemistries (e.g. atmospheric chemistry).

Background: It is assumed that students have an undergraduate level knowledge of physical chemistry (thermodynamics and kinetics) as well as a familiarity with chemical names, structures and notations, chemical reactions and stoichiometry, and chemical reactivity. Students should have a working knowledge of equilibrium chemistry, and acids and bases. Students are also expected to have a basic working knowledge and understanding of spectroscopy.

Course Organization: Approximately the first two thirds of the semester will be taught in the traditional lecture format. During this period, the fundamentals of various areas of environmental chemistry will be covered, along with examples of the chemistry of specific environmental issues. Following this period there will be a written exam. The final weeks of the semester will be used for invited lectures from local researchers

conducting research in environmental chemistry and for student presentations Those speakers will provide the students with a recent manuscript and will come to class for a lecture and discussion of the research in the manuscript. Students will be expected to read the manuscript and come to class prepared to discuss the research. Students will write a six to ten page paper on one or more of the research topics presented, expanding on the discussion to include work published by other researchers. There will be a comprehensive final exam that could include the fundamentals and specifics of the research presentations.

Grading: Grades will be on the +/- scale (A,A-,B+, etc) with the following breakdown:

GRADING BREAKDOWN	
Midterm Exam	20%
Homework Questions and Problems	15%
Preparation and Participation in Discussions	15%
Final Exam	20%
Research Paper	30%

Academic misconduct is subject to an academic penalty by the course instructor and/or disciplinary sanction by the University. Academic misconduct is defined as all forms of academic dishonesty. All of the academic policies found in the Student Conduct Code (**http://www.umt.edu/vpsa/policies/student_conduct.php**) apply to this course.

Of particular relevance to this course, it is considered academic misconduct to represent another person's words, ideas, data, or materials as one's own. It is also considered academic misconduct to copy from another student's paper, consult unauthorized material, give information to another student or collaborate with one or more students without authorization during an examination or academic exercise without the instructor's permission.

Students with Disabilities

If you are a student with a disability and wish to discuss reasonable modifications for this course, contact me privately to discuss the specific modifications you wish to request. Please be advised I may request that you provide a letter from Disability Services for Students verifying your right to reasonable modifications. If you have not yet contacted Disability Services, located in Lommasson Center 154, please do so in order to verify your disability and to coordinate your reasonable modifications. For more information, visit the Disability Services website at **http://www.umt.edu/disability**.

Important Dates Important dates and deadlines regarding registration for the fall semester can be found at **http://www.umt.edu/provost/academiccalendar**

Lecture Schedule:

Jan. 27, 29: Introduction and overview, Relevant chemical concepts, Cycles

Part I: The Lithosphere

Feb. 03, 05: Chemical composition of earth and soils
Feb. 10, 12: Agriculture, mineral resource development,
Energy Consumption/Output

Part II: The Atmosphere

Feb.17, 19 Layers of the atmosphere and their chemical composition
Feb. 24, 26 Photochemical smog and particulate matter
Mar. 03, 05 Greenhouse gasses and climate change
Mar. 10, 12 Ozone depletion and the ozone holes
Week 8 Mar 17 Exam I
Mar. 19 Special Topic: Bob Yokelson: Biomass Burning Emissions Chemistry.

Part III: The Hydrosphere

Mar. 24, 26 Chemistry of Natural Waters: pH and Redox Chemistry
Spring Break: March 30- April 3rd. Final Paper Presentation *Topics* Due.
Apr. 07, 09 Water pollution: Acid rain, Acid mine Drainage.
Apr. 14, 16 Water Treatment and management of water resources

Part IV: Special Topics and Student Presentations.

These depend upon the availability of speakers and are being scheduled. Students are expected to read a journal article and then the speaker will give a professional presentation on that work. Students are expected to be engaged in discussion after the lecture.
Confirmed Speakers:

Apr 21: Dr. Tony Ward**: "Sources of airborne particulate matter and exposures"**

Apr 23, 27
Prof. Mike DeGrandpre**: Carbon Cycle in Aquatic Systems/Ocean Acidification**
Prof Ed Rosenberg: **Environmental remediation/Selective extraction of metals.**

The final three lessons are for students to provide an article and give a presentation on the topic "The Chemistry of Catastrophe or Recovery". Topics need to be approved beforehand and must focus on the Chemical or Biochemical Nature of the Catastrophe or Recovery. Guidelines and guidance will be given during the first lecture and throughout the semester.

Apr. 30 Student presentations/Special Topics
May 05, 07 Student presentations/Special Topics

Finals Week: May 11-15