ENVIRONMENTAL CHEMISTRY [CHEM/SOIL SCI 375]
Spring 2020

Departments of Chemistry and Soil Science
University of Wisconsin – Madison

Instructors: Associate Professor Timothy H. Bertram
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Instructor Office Hours: Prof. Timothy Bertram, Chem. 4355, T 10:45-11:45 and R 10-11
Prof. Joel Pedersen, Hiram Smith Annex 103, Tu 16:00-17:00

Course Website: TBD

Lecture: 08:50-09:40 MWF, Engineering Hall 2341

Credits: 3, based on the traditional Carnegie definition. CHEM/SOIL SCI 375 has three 50-minute lectures per week. Outside classroom work includes background reading and problem sets which is expected to amount to approximately 6 hours per week on average.

Course Designation: Breadth – Physical Science counts toward the Natural Science requirement. Level – Intermediate. L&S Credit – Counts as Liberal Arts and Science credit in L&S. Major Core Course – Environmental Science Major.

Instructional mode: face-to-face

COURSE INFORMATION

Course Description: CHEM/SOIL SCI 375 is an introductory environmental chemistry course that focuses on fundamental chemical processes impacting pollutants in the Earth's atmosphere, water, and soil. Specific topics include the ozone layer and ozone depletion, greenhouse gases and global climate change, the chemistry of ground-level air pollution, acid-base and redox chemistry of natural waters, trace metal cycling, and multimedia fate of toxic organic contaminants.

Course Requisites: CHEM 103 & 104 or CHEM 109.

Learning Outcomes: The primary learning objectives of CHEM/SOIL SCI 375 are to: (1) demonstrate knowledge of concepts and assumptions related to the processes impacting the fate of pollutants in the major environmental compartments at the Earth's surface (atmosphere, hydrosphere, geosphere) and (2) synthesize and evaluate scientific information about the life cycle of environmental pollutants.

Lecture: Three 50-minute lecture sessions each week covering the theory and applications of various topics in environment chemistry. During lectures we introduce principles and illustrate concepts with example questions. Lectures will provide an opportunity for discussion as well as tackling problems in a group. As a result, participation is central in class.

Problem Sets: Problem solving is a crucial aspect of this course and problems will be assigned on a regular basis (six over the course of the semester). Assignments will be made available at least 7 days before they are due.

Exams: There will be two in-class midterm exams of 50 minutes each. There will not be a written formal final exam. No makeup exams will be given. Please be alert to these exam dates. Please report any religious conflicts with exams or laboratory exercises to the instructor by the end of week two.

Exam	Date and Time	Topics Covered
Midterm 1	02/24	Atmospheric chemistry
Midterm 2	04/14	Aquatic and terrestrial chemistry

Final Project: The final project will be comprised of an oral presentation and a written paper investigating the life cycle of a pollutant (e.g., source, transport, chemical transformations, environmental/health impacts). Ungraded interim project reports will be required periodically during the semester on specific parts of the project. The interim project reports will serve as check-in points for the instructors to provide feedback as you develop your final project.

Grades: Your final grade will be computed with the following scheme:

	Percent	Notes
Midterm Exams (2x, 15% each)	30%	No make-up exams
Problem Sets	40%	Not all P.S. are equally weighted
Final Project Report	30%	See details above

Letter grades will be assigned using the following conversion between numerical scores and letter grades: 90-100 (A), 85-89 (AB), 80-84 (B), 75-79 (BC), 70-74 (C), 65-69 (D), below 65 (F).

Your scores are available to you on Canvas, with a 3-5 day time delay. There are no opportunities for extra credit, and late problem sets will be accepted for two days after the due date, with a 10% penalty per day late.

RESOURCES AND MATERIALS

- *Chemistry of the Environment*, 2nd edition, Ronald Bailey, Herbert M. Clark, James P. Ferris, Sonja Krause, and Robert L. Strong, 2002 (available online).
- *Environmental Chemistry*, 5th edition, Colin Baird and Michael Cann, 2012.
- Supplementary handouts

RULES, RIGHTS & RESPONSIBILITIES

See the Guide's to Rules, Rights and Responsibilities

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of

the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [us] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [we], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/

LECTURE OUTLINE
Course Outline and Calendar for Spring 2020

Week	Start Date	Topic	Reading[a]	Assignment[b]
1	01/22 (W)	Introduction to environmental chemistry and the atmosphere	Ch 1 & 2	
2	01/27	The ozone layer and depletion of stratospheric ozone	Ch 4	
3	02/03	Ground-level air pollution: gaseous pollutants	Ch 5, 6.8	HW 1
4	02/10	Ground-level air pollution: aerosols	Handouts	
5	02/17	Greenhouse gas emissions and global climate change	Ch 3	HW 2
6	02/24	Introduction to the hydrosphere and aquatic chemistry	Ch 11.1-11.3, 9.1	IPR 1
7	03/02	Acid-base chemistry	Ch 9.2, 9.3, 10.2, 11.4	HW 3
8	03/10	Metal ion complexation, introduction to the lithosphere	Ch 9.5, 12.1 & 12.3	IPR 2
Spring Recess				
9	03/24	Precipitation and dissolution	Ch 9.2, handouts	HW 4
10	03/30	Reduction-oxidation chemistry	Ch 9.4, handouts	IPR 3
11	04/07	Environmental surface chemistry and sorption	Ch 9.6-9.7, handouts	HW 5
12	04/14	Chemistry of organic contaminants	Ch 8, handouts	IPR 4
13	04/21	Chemistry of organic contaminants	Ch 8, handouts	HW 6
14	04/28	Student presentations		FPR

[a] Chapters are in Bailey et al. *Chemistry of the Environment*, 2nd ed., 2002.
[b] Assignments are due on the Friday of each week. Abbreviations: FPR, final project report; HW, homework assignment; IPR, interim project report (ungraded).