Environmental Organic Chemistry

Fall 2015
Time and location: Mondays and Wednesdays 2:30-3:45
Instructor: Dr. Peter Vikesland, 415 Durham Hall, pvikes@vt.edu, (540) 231-3568
Office Hours: By appointment
Web address: Class notes, class problems, reading assignments, and homework solutions will be posted on the Scholar website. Students should check the website prior to class to check for handouts/discussion materials.

This course focuses on the processes affecting the fate and transport of organic chemicals within natural and engineered systems. Students will gain a fundamental understanding of thermodynamic principles and will then utilize that information to predict intermolecular interactions. The course concludes with an introduction to environmental chemical transformation pathways.

Textbook: Environmental Organic Chemistry (2002) 2nd Edition by R.P. Schwarzenbach, P. M. Gschwend, and D. M. Imboden; Wiley-Interscience. (Required text) [Available online from the VT library: http://onlinelibrary.wiley.com/book/10.1002/0471649643]

Environmental Organic Chemistry (2016) 3rd Edition by R.P. Schwarzenbach, P. M. Gschwend, and D. M. Imboden; Wiley-Interscience. (Files will be made available if/when they are received)

Course Format: The class will be taught interactively. Both lectures and in-class activities will be used to create an active learning environment. A tentative course outline is attached. Homework will be assigned bi-weekly and may be completed by small groups (1-2 people). However, each individual is responsible for a complete understanding of the homework assignment. There will be three exams. The exams will be take-home and will be open note/open book.

Grading Policy: The course grade will be determined using the following distribution: 30% homework, 10% class lecture, 5% literature review, 10% class participation, and 45% for exams. The class will be graded on the following scale: (A) 94-100; (A-) 90-93; (B+) 87-89; (B) 84-86; (B-) 80-83; (C+) 77-79; (C) 74-76; (C-) 70-73; (D+) 67-69; (D) 64-66; (D-) 60-63; (F) <60.

Literature Review: Each student will select a paper from the current literature that examines chemical processes related to those currently being discussed in class. The student will then lead a 30 minute in-class discussion of the paper. The paper must be approved two weeks beforehand and photocopies (or directions for obtaining the paper from the internet) must be given to the other students in the class at least one week in advance.

Lecture Assignment: One time during the latter part of the semester each student will be expected to present a 35-minute lecture based on material either from the textbook or from material of the student's choice. Following this lecture, the student will develop one homework problem and one exam problem. Additional details are forthcoming.

Honor System: *All aspects of the coursework for this class are covered by the University Honor System. As noted, the **homework** may be completed by small groups (1-3 people), however, each individual must sign the submitted copy of the homework. By doing so they attest that they contributed in some manner to the final product. Students are encouraged to review the Honor Code and Honor System as described in either the Undergraduate Course Catalog and Academic Policies Handbook or in the Graduate Policies and Procedures Handbook.*

Principles of Community:

The VT Principles of Community are intended to increase access and inclusion and to create a community that nurtures learning and growth for all of its members. They are defined at: http://www.vt.edu/principles.php and here:

Virginia Tech is a public land-grant university, committed to teaching and learning, research, and outreach to the Commonwealth of Virginia, the nation, and the world community. Learning from the experiences that shape Virginia Tech as an institution, we acknowledge those aspects of our legacy that reflected bias and exclusion. Therefore, we adopt and practice the following principles as fundamental to our on-going efforts to increase access and inclusion and to create a community that nurtures learning and growth for all of its members:

- We affirm the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding.
- We affirm the right of each person to express thoughts and opinions freely. We encourage open expression within a climate of civility, sensitivity, and mutual respect.
- We affirm the value of human diversity because it enriches our lives and the University. We acknowledge and respect our differences while affirming our common humanity.
- We reject all forms of prejudice and discrimination, including those based on age, color, disability, gender, national origin, political affiliation, race, religion, sexual orientation, and veteran status. We take individual and collective responsibility for helping to eliminate bias and discrimination and for increasing our own understanding of these issues through education, training, and interaction with others.
- We pledge our collective commitment to these principles in the spirit of the Virginia Tech motto of Ut Prosim (That I May Serve).

Tentative Course Outline

Week #	Topics for the Week	Reading Assignment SGI = Schwarzenbach, Gschwend, and Imboden (2nd Edition)
1	Introduction to Environmental Organic Chemistry	SGI Chapter 1 and Chapter 2
	Introduction to Partitioning	SGI Chapter 3
2	Introduction to Partitioning	SGI Chapter 3
	Vapor Pressure	SGI Chapter 4
3	Vapor Pressure	SGI Chapter 4
	Activity Coefficient and Solubility	SGI Chapter 5
4	Activity Coefficient and Solubility	SGI Chapter 5
	Air-Organic Solvent and Air-Water Partitioning	SGI Chapter 6
5	Air-Organic Solvent and Air-Water Partitioning	SGI Chapter 6
Exam #1: Chemical Partitioning (tentatively scheduled for the Week of Sept. 28)		
6	Organic Liquid-Water Partitioning	SGI Chapter 7
7	Organic Acids and Bases	SGI Chapter 8
8	Sorption I – Sorption Involving Organic Matter	SGI Chapter 9
9	Sorption III – Sorption to Inorganic Surfaces	SGI Chapter 11
Exam #2: Chemical Partitioning (tentatively scheduled for the Week of October 19)		
10	Chemical Transformation Reactions	SGI Chapter 12
	Thermodynamics and Kinetics Hydrolysis	SGI Chapter 13
11	Chemical Transformation Reactions Redox Reactions	SGI Chapter 14
12	Photochemical Transformations Basic Principles Direct Photolysis	SGI Chapter 15
13	Photochemical Transformations Indirect Photolysis	SGI Chapter 16
14	Biological Transformations	SGI Chapter 17
15	Biological Transformations	SGI Chapter 17
Exam #3: Chemical Transformation Processes (currently scheduled for Final Exam Week)		