



CHEM F631

Fate and Transport

Spring 2018

CRN: 34890 or 35528, 3 credits

Instructor: Jennifer Guerard, Ph.D.

Office: REIC 180

Office Hours: M 1030-1230 and by appt.

Lecture: REIC 204, 915am MWF

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Course Description. Examination of the physical properties that govern the behavior, fate and transport of contaminants released into the environment. Topics include air-water partitioning and exchange, organic solvent-water partitioning, diffusion, sorption, chemical and biological transformation reactions, and modeling concepts.

Course Materials

Textbook. *Environmental Organic Chemistry* third edition (2017) by R.P. Schwarzenbach, P.M. Gschwend and D.M. Imboden. **ISBN-13: 978-1-118-76723-8**

Note: The 3rd edition is significantly different from the 2nd edition. We will be using the 3rd edition of the book. The 2nd edition cannot easily be substituted for the new edition and thus it is important to use the correct edition of the text.

Other materials. A scientific calculator or Excel will be useful for doing problem sets and exams.

Important Dates.

Jan. 17th First day of class

Jan. 26th: Deadline for adding classes, late registration, faculty-initiated drops.
Last day to drop with no appearance on academic record

Feb 19th: Exam I

Mar. 30th: Last drop date with W/Faculty initiated withdrawals.

Mar. 26th: Exam II

May 2nd: Last day of instruction

May 4th: FINAL EXAM, 10:15am-12:15pm

May 9th: Grades Posted

Course Goals. This course is designed to teach students how to determine what happens to a compound when released into the environment. We will focus on organic compounds, but the principles applied to the organic compounds can also be applied to inorganic compounds.

Student-Learning Outcomes. Broadly, students will become familiar with principles and techniques used to quantitatively describe the behavior, fate, and transport of chemicals released into the environment, including phase transfer, partitioning, adsorption, and transformation of environmental contaminants. At the end of the course, you should be able to perform an assessment to predict the fate of any compound released into the environment, and be able to critically review current research literature in fields of environmental fate and transport.

Course Structure. The coursework will follow the textbook as described on the Tentative Lecture Schedule. The instructor will lecture on the theoretical aspects of organic chemistry, using a combination of slides and whiteboard, providing copies of notes to the students via Blackboard. The instructor will make every attempt to record lectures and provide them on Blackboard via Kaltura.

Evaluation and Grade Assignment

Point Breakdown.

Homework (10 pts each)	110 points
EXAM 1 (Feb. 19 th):	100 points
EXAM II (Mar. 26 th):	100 points
Paper Reviews (30 pts each)	60 points
Paper (see rubric)	130 points
Final Exam	100 points

Total Course Points: 600 points

A =	≥ 90%	(≥ 540 points)
B =	80 – 89%	(480 – 539 points)
C =	70 – 79%	(420 – 479 points)
D =	60 – 69%	(360 – 419 points)
F =	< 60%	(< 360 points)

I may elect to lower the grade point cutoffs, but will not raise them. I will not be using +/- grading.

Grading.

Notes and Policies

Homework. Homework assignments are listed on the tentative course schedule in this syllabus and are due in class on the days shown. **Late assignments are not accepted.** Homework is a very important component of this class. You must practice using the concepts and doing the mathematics required to solve environmental problems to do well in the course. The homework problems provide you with an opportunity to learn how to approach a problem and the mechanics of actually doing the problem.

I encourage you to work in groups to solve the homework problems. However, your work must be your own - just copying someone else's solution violates the Honor Code (see below).

Exams. Exams will consist of a portion of in-class and/or out-of-class exams. For in-class exams, no resources are allowed during exams other than a non-programmable scientific calculator and the textbook. You must turn in your exam before leaving the room. *Use of cell phones or electronic devices other than a non-programmable scientific calculator during exams constitutes cheating and will result in an F in the course as per the policy of the Chemistry Department (see Honor code).* For out-of-class exams, d

Make-up exams are only allowed in the event of a legitimate excuse as determined by the instructor. If you anticipate an absence from an exam, bring it to my attention *before* the exam date, or in the case of unexpected absences, within one business day.

Honor Code. Chemistry Department policy states that any student caught cheating on graded work will be assigned a course grade of F. Course drop forms will not be signed in these cases.

Instructor-Initiated Withdrawals. Until **Friday, March 30th**, the instructor has the right to withdraw a student who has not participated substantially in the course. Any of the following constitute non-participation: 1) Exam I missed without an excused absence, 2) At least 2 incomplete homework assignments.

Class Projects

Literature Review Paper. Papers should consist of a literature review on your chosen topics of interest. Proposed titles are due Jan. 26th. Outline and annotated bibliography is due Feb 16th. First draft is due Mar. 9th. Peer reviews are due Mar. 23rd, and final paper is due Apr. 27th. Format Requirements: 10-15 pages (not including references), 1.5x spaced, 1" margins, Times New Roman 12 pt. font. References (at least 15) should follow an American Chemical Society journal format. You will be required to present a synopsis of your topic in class (8-minute talk and a couple minutes for class discussion) and participate in peer-review of student papers and discussions during student presentations. A more detailed point breakdown is posted on Blackboard.

Briefly, the introduction should provide a concise description of the chosen topic and the broader environmental context. The body of the paper should discuss the issues in the context of environmental partitioning and transformations (and transport), providing a review of information from the literature relevant to "understanding" environmental fate and transport. Your conclusions should provide a critical assessment of the literature on your topic, and suggestions for future investigations.

Paper Reviews (2). Two 1-page critical reviews of published journal articles of your choice relevant to the course material will be required during the term (see Tentative Schedule). Selected articles to review must be submitted to the instructor by Feb. 2nd. The first review is due Mar. 2nd. The second review is due Apr. 18th. Details and rubric are posted on Blackboard.

Support & Accommodations

Disabilities Services. The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. Students with documented disabilities who may need reasonable academic accommodations should discuss these with me during the first two weeks of class. I will work with the Office of Disabilities Services (*208 Whitaker, 474-5655) to provide reasonable accommodation to students with disabilities. You will need to provide documentation of your disability to Disability Services.

Veteran Support Services. Walter Cray (wecray@alaska.edu) is the Veterans Service Officer at the Veterans Resource Center, 111 Eielson Building, 474-2475. Fairbanks Vet Center: 456-4238. VA Community Based Outpatient Clinic at Ft. Wainwright: 361-6370.

Student Support Services. The Student Support Services (SSS) program located in 512 Greuning (474-6844), provides opportunities for academic development, assists students with college requirements, and serves to motivate students toward successful completion of their degree program.

Amending this Syllabus: *Before the drop date, I may slightly revise the syllabus to correct for any errors. Revision at a later time would require majority vote by students present in class on day issue is decided. Any revisions will be distributed to all students via Blackboard and announced in class. Adjustments to the tentative lecture schedule, homework due dates and readings will be made throughout the course at the instructor's discretion and if so, communicated to students via Blackboard.*

Tentative Lecture Schedule

		Date	Assigned Readings	Assignments
Week 1 <i>Organic Review</i>	W	1/17	Ch 1-3 – Intro, Review	HW 1 out – Ch 1-3
	F	1/19	Ch 4 – Thermo, Fugacity	
Week 2 <i>Thermo Review</i>	M	1/22	Ch 4 – Activity, Van't Hoff	HW 2 out – Ch 4
	W	1/24	Ch 4 – Acidity	HW 1 due
	F	1/26	Ch 4 – Hammett Relationships	Lit. Rev. Title Due
Week 3 <i>Partitioning</i>	M	1/29	Ch 7 – Partitioning, LFERs	HW 3 out – Ch 7-8
	W	1/31	Ch 8 – Phase transitions	HW 2 due
	F	2/2	<i>Examples & Problems</i>	Crit. Rev. Titles Due.
Week 4 <i>Vapor Pressure</i>	M	2/5	Ch 8 – Estimating π^*	
	W	2/7	Ch 9 – Activity	HW 4 out-Ch 9
	F	2/9	<i>Examples & problems</i>	HW 3 due
Week 5 <i>Solubility</i>	M	2/12	Ch 9 – Henry's Law	
	W	2/14	Ch 9 – Influences (T, I, pH)	
	F	2/16	<i>Examples & problems</i>	Lit. Outline Due, HW 4 due
Week 6 <i>Org liquid-air and water partitioning</i>	M	2/19	EXAM 1 – Ch 1-9	
	W	2/21	Ch 10 – Kow, LFERs	HW 5 out – Ch 10
	F	2/23	Ch 10 - Mixtures	
Week 7 <i>Surface Interactions</i>	M	2/26	Ch 11 - Surfaces, sorption	HW 6 out – Ch 11-12
	W	2/28	Ch 12 – Kd	
	F	3/2	<i>Examples & Problems</i>	1st critical rev. due, HW 5 due
Week 8 <i>NOM Sorption</i>	M	3/5	Ch 13 – NOM, Koc	HW 7 out – Ch 13-14
	W	3/7	Ch 13 – Acids & Bases Sorption	
	F	3/9	<i>Examples & Problems</i>	Paper draft due, HW 6 due
Week 9 <i>Ion Exchange</i>	M	3/19	Ch 14 – Ion Exchange	
	W	3/21	Ch 14 – Surface Complexation	
	F	3/23	<i>Examples & Problems</i>	Peer Revs Paper due, HW 7 due
Week 10 <i>Aerosols</i>	M	3/26	Exam II (Ch 10-14)	
	W	3/28	Ch 15 – Aerosol Partitioning	HW 8 out – Ch 15
	F	3/30	Ch 16 – Bioaccumulation	HW 9 out – Ch 16
Week 11 <i>Bioaccumulation</i>	M	4/2	Ch 16 – Bioaccumulation/Toxicity	
	W	4/4	<i>Examples & Problems</i>	
	F	4/6	Ch 21 – Organic Transformations	HW 8 due, HW 10 out–Ch 21-23
Week 12 <i>Hydrolysis</i>	M	4/9	Ch 22 – Hydrolysis	HW 9 due
	W	4/11	Ch 23 – Redox	
	F	4/13	<i>Examples & Problems</i>	
Week 13 <i>Redox</i>	M	4/16	Ch 24 - Direct Photolysis	HW 11 out – Ch 24-25
	W	4/18	Ch 24 – Direct Photolysis	2nd critical rev. due, HW 10 due
	F	4/20	<i>Environmental Chemistry Symposium</i>	NO CLASS
Week 14 <i>Photolysis</i>	M	4/23	Ch 24 – Direct Photolysis	
	W	4/25	Ch 25 – Indirect Photolysis	
	F	4/27	<i>Examples & Problems</i>	Final Paper due
Week 15 <i>Biotransformation</i>	M	4/30	Ch 26 - Biotransformations	HW 11 due
	W	5/2	<i>Student Presentations</i>	
	F	5/4	FINAL EXAM (Ch 15-26) 10:15 am – 12:15 pm	