

**COURSE NAME; NUMBER; SEMESTER; MEETING DAYS, TIMES, AND PLACE.**

Environmental Applications of Organic Chemistry / Environmental Organic Chemistry

375:340 / 375:522 Spring all years

Tu/F 10:55-12:15 131 Hickman

**PREREQUISITES:**

Elementary Organic Chemistry (160:209) or two semesters of Organic Chemistry (160:307 & 308). Or instructor approval.

**CONTACT INFORMATION:**

Instructor(s): Lisa Rodenburg

Office Location: room 348, ENRS building, 15 College Farm Rd.

Phone: 848-932-5774

Email: Rodenburg@envsci.rutgers.edu

Office Hours: by arrangement

**COURSE WEBSITE, RESOURCES AND MATERIALS:**

- See course site on sakai

**COURSE DESCRIPTION:**

This course uses concepts from organic chemistry and applies them to environmental systems. In the first half of the class, the physico-chemical properties of organic compounds will be discussed, with emphasis on Henry's Law and octanol-water partitioning. Student will learn how to use these physico-chemical properties to calculate the partitioning of organic chemicals in environmental systems. The second half of the course will focus on reactions of organic compounds that are important in the environment, including acid-base reactions, nucleophilic substitution reactions (especially hydrolysis), and redox reactions. The students will then use all of the concepts learned in the course to predict the lifetimes of organic chemicals in the environment.

**LEARNING GOALS:**

This course addresses goals 1, 2, 4, and 7 of the Environmental Science curriculum, namely:

Students completing this program will be able to:

1. apply knowledge from the sciences and mathematics to environmental problems and solutions;
2. use the skills and modern environmental science techniques and tools necessary for a successful career in the field;
3. function effectively on multidisciplinary teams;
4. function effectively on multidisciplinary teams;

**ASSIGNMENTS/RESPONSIBILITIES & ASSESSMENT:**

Weekly homework assignments, two mid-term exams, one final. Graduate students write a final project.

Homework will be completed on student teams organized by the instructor: each team will turn in one homework assignment per week.

**Undergraduate (340):** grades will be based on attendance (15%), homework (20%), two quizzes (10% each), one mid-term exam (20%), and one final exam (25%).

**Graduate (522):** grades will be based on attendance (5%), homework (5%), two quizzes (10% each), one mid-term exam (20%), one final exam (25%), and one final project (25%)

### ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

### ABSENCE POLICY

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

### COURSE SCHEDULE:

Homework assignments are due on Tuesdays by 10 pm and must be uploaded to sakai as excel files. For all assignments, including homeworks, quizzes, and exams, all calculations must be done IN EXCEL—no credit will be received for calculations performed outside excel and then typed into excel.

Class period	Topic	Reading	HOMEWORK
<b>Section I: Partitioning at equilibrium</b>			
1	Review of chemical structures and nomenclature, Thermodynamics review (First lecture.ppt)	Chs 1,2,3	
2	Molecular forces: van der Waals, polarity, and H bonding		1 Molecular forces
3	Vapor Pressure.ppt		
4	Vapor Pressure.ppt	Ch 4	2 Vapor pressure
5	Solubility in water (solubility.ppt)	Ch 5	
6	Solubility in water		3 Solubility
7	<b>QUIZ</b> and Henry's Law (Henry_s Law.ppt)	Ch 6	
8	Henry's Law		4 Henry's Law
9	Octanol-Water Partitioning (kow.ppt)	Ch 7	
10	Octanol-Water Partitioning		5 Kow
11	Calculating equilibrium partitioning in complex environmental systems (practice problem 7-4)		
12	Three phase water column partitioning and gas-particle partitioning (Gas-Part.ppt)		6 Eqbm partitioning
13	Review for midterm		No homework: midterm exam
14	<b>MIDTERM EXAM</b>		
15	Sorption.ppt	Ch 9	
16	Sorption (Groundwater partitioning)		7 Sorption
17	Predicting equilibrium constants & EPIWIN (Estimation.ppt)		8 Acids and Bases and EPIWIN
<b>Section II: Reactions</b>			

18	Organic Acids and Bases (acidity.ppt)	Ch 8	
19	Review of reaction kinetics (rxn1.ppt)	Ch 12	
20	Box models (sedimentation and volatilization) Case Studies.ppt		9 reaction kinetics & box models
21	<b>QUIZ</b> and Nucleophilic substitution reactions, including hydrolysis.ppt	Ch 13	
22	Hydrolysis.ppt		10 Hydrolysis
23	Redox reactions (redox.ppt)	Ch 14	
24	Reductive dehalogenation		11 Redox
25	Photolysis (photo.ppt)		
26	Case studies.ppt		12 Photolysis
27	Review for final		No homework:
28	<b>part 1 of final exam</b>		final exam
<b>Take home: part 2 of final exam due Monday May 7 by 11 am</b>			

### GRADUATE FINAL PROJECT TIMELINE

Graduate final project timeline:	Due by noon on:	% of project grade
Turn in your proposed topic	Tuesday of Week 4	5%
Turn in a list of references	Tuesday of Week 7	5%
Turn in Hypothesis, objectives, and tasks and budget	Tuesday of Week 10	5%
Turn in first draft of proposal	Tuesday of Week 12	50%
Turn in final draft of proposal	<b>Monday May 7</b>	35%

### FINAL EXAM/PAPER DATE AND TIME

The final exam will be in class on the last day of class and a take home exam due Monday May 7 by 11 am.

### ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.

- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing. Adherence to these principles is necessary in order to ensure that
  - everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
  - all student work is fairly evaluated and no student has an inappropriate advantage over others.
  - the academic and ethical development of all students is fostered.
  - the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

## STUDENT WELLNESS SERVICES

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901/ [www.rhscaps.rutgers.edu/](http://www.rhscaps.rutgers.edu/)

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / [www.vpva.rutgers.edu/](http://www.vpva.rutgers.edu/)

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.