

# CIVE 580A5 - ENVIRONMENTAL ORGANIC CHEMISTRY

Fall 2015

**Lecture:** 8:00-9:15am TR Classroom: ENGRG E 106

**Instructor:** Dr. Jens Blotevogel Telephone: (970) 491-8880  
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**Prerequisites:** CHEM 111 and MATH 160

**Description:** This course focuses on the prediction of fate and transport of anthropogenic organic chemicals in aquatic environments. The course mainly covers equilibrium partitioning and transformation processes. The equilibrium partitioning processes include sorption, volatilization, and uptake, the processes that control the distribution of organic chemicals between water, soil, air, and biota. The transformation processes include hydrolysis, photolysis, redox and biologically-mediated reactions that control the breakdown of organic chemicals. Throughout these subjects, we will develop predictive relationships for the parameters that control the fate and transport of organic chemicals by developing a thorough understanding of their chemical structure and properties.

**Objectives:** (1) Understand the fundamentals of organic compound structure and their role in contaminant partitioning and transformation; (2) Apply these fundamentals to predict and quantify the fate and transport of organic compounds; (3) Solve relevant problems of environmental importance.

**Course Web Page:** Canvas will be used to communicate with students, to post lecture notes, homework assignments and exams, and as a link to other relevant reference material.

**Textbook:** Environmental Organic Chemistry 2<sup>nd</sup> Ed (2003): R.P. Schwarzenbach, P.M. Gschwend and D.M. Imboden. Wiley, New York, NY, ISBN 0-471-35750-2.

**Homework Assignments:** Closed-colleague homework assignments will be given to develop your problem-solving ability and likely will be the most effective means to learn the material. Assignments turned in up to 24 hours late will incur a 25% penalty, additional 25% for each day late thereafter. A properly presented solution should contain all problem assumptions, known parameters, and governing equations.

**Examinations:** All exams will be take-home, open-book, closed-colleague. No credit will be given for late problem sets. Makeup exams will not be granted without prior approval and proper documentation for missing the exam.

**Grading:** Exam 1: 30%  
Exam 2: 30%  
Homework: 40%

## Tentative Course Outline

Lecture Topic	Suggested Reading
Introduction; Organic Chemistry Review	<i>EOC</i> - Ch 1-2
Molecular Interactions, Partitioning, and Thermodynamics	<i>EOC</i> - Ch 3
Vapor Pressure	<i>EOC</i> - Ch 4
Aqueous Solubility and Activity Coefficients	<i>EOC</i> - Ch 5
Air-Organic Solvent and Air-Water Partitioning	<i>EOC</i> - Ch 6
Organic-Water Partitioning	<i>EOC</i> - Ch 7
Organic Acids and Bases	<i>EOC</i> - Ch 8
Sorption Processes	<i>EOC</i> - Ch 9-11
<b>Exam #1</b>	
Thermodynamics and Kinetics of Transformation Reactions	<i>EOC</i> - Ch 12
Hydrolysis and Nucleophilic Substitution Reactions	<i>EOC</i> - Ch 13
Redox Transformations	<i>EOC</i> - Ch 14
Biological Transformations	<i>EOC</i> - Ch 17
Photolysis	<i>EOC</i> - Ch 15-16
Optional: Case Studies, Computer Models & Review	
<b>Exam #2</b>	

\*Course outline will be used by instructor as a general guideline, but is subject to change.