

**Environmental Chemistry III:  
Toxic Industrial Chemicals and Materials  
CHEM 3412  
Spring Quarter, 2005**

**Instructor:** Asst. Professor Keith Miller  
**Office:** SGM 105  
**Contact info:** phone: 303.871.7721; email: kmiller3@du.edu  
**Lecture Time/Location:** TR 4:00PM – 5:30PM; Olin 103  
**Office Hours:** By arrangement  
**Web Site:** <http://portfolio.du.edu/>

**REQUIRE COURSE ITEMS**

**Textbook:** *Environmental Toxicology and Chemistry*, by Donald G. Crosby (available at the DU Bookstore).  
**Calculator:** An inexpensive calculator is required. It should have the capabilities for square roots, logarithms, and exponential (scientific) notation operations. The calculator will be used for problem sets and exams. You are responsible for understanding how to perform each of the operations on your calculator.  
**Computer:** We will use your laptop computers for one or both the case studies. I will inform you by email or during class meetings when your laptop will be require in lecture.

**SUPPLEMENTAL COURSE ITEMS**

**Course Reserves:** Some of the material used in lecture will be taken from additional texts and source materials. I will place them on reserve in the library.

**COURSE DESCRIPTION**

This course focuses on the environmental chemistry and toxicology of industrial chemicals and materials that are released into the environment (both intentionally and inadvertently). We will first study the chemical and physical properties that govern the fate and transport of these chemicals when they are introduced into the environment. This will be followed by study of the basic toxicology of these industrial chemicals and materials. With this background, we will then survey the chemical industry production, storage and transportation of many beneficial, yet extremely dangerous chemicals. The course will culminate with a case-study of a catastrophic chemical plant accident, highlighting strengths and vulnerabilities of the chemical industry in this new age of terrorism.

**LECTURE**

The lecture format of class meetings will be a combination of traditional lecture format and group activities. During lecture, I will summarize new material and present illustrations and examples. In lecture, I WILL NOT identify and describe every detail you will read in the text and any supplemental materials. I will, however, emphasize the important topics covered in the reading as well as problem solving strategies when appropriate. You should stop me at any time if you have questions about the material being covered.

## READING AND PROBLEMS

You are expected to complete the assigned reading prior to the class lecture. The assigned reading is listed in the tentative schedule for the course. As the quarter progresses, topics and assigned reading may change. I will inform you immediately of changes in the suggested reading assignments. Since the selected text has few problems, I will assign problems from other sources weekly. I will post an answer key one (1) week after the problems have been assigned. While you are not required to turn the completed problems in for a grade, I highly recommend that you attempt all of them.

A 10% penalty will be assessed on all assignments turned in late. An additional 10% penalty will be assessed for each additional class meeting period the assignment is late.

## GRADED EXERCISES

Three (3) activities throughout the quarter will be assigned and graded this quarter. The expected activities are detailed below, but modifications might be made during the quarter. A 10% penalty will be assessed on all assignments turned in late. An additional 10% penalty will be assessed for each additional class meeting period the assignment is late.

1. Risk assessment activity – I will create groups early in the quarter based on inputs from each student. Each group will be assigned an environmental site that requires a risk-based corrective action (RBCA). Further guidance on the project will be given later in the quarter.
2. Laboratory – The fate of chemicals in the environment is governed in part by their chemical and physical properties. We will measure one of these properties in the laboratory as part of the course. One week will be spent determining the distribution coefficient,  $K_D$ , of a compound. Specific details of the laboratory will be provide later in the quarter.
3. Presentation – Each individual will be required to give a presentation near the end of class on the toxicity of a chemical or material that we have not cover in class, or some other topic relating to the course material. Additional guidance will be given in the third week of the quarter.

## EXAMS

A midterm exam and a cumulative final exam will be given during the quarter. Exam problems will be similar to the problems from the suggested problems. If you will be out of town for a University sanctioned function (e.g., athletic team or music group), you are responsible for making arrangements with Dr. Miller at least one week in advance to take the midterm exam early. **THERE WILL BE NO MAKE-UP MIDTERM EXAM.**

## GRADES

At the end of the quarter, you will be graded according to your performance on the graded exercises, and examinations. Your final grade will be determined by the following scale:

Graded exercises/participation	15%
Presentation	15%
Midterm exam	35%
Final exam	35%
Total	100%

## CELLULAR PHONE AND PAGER POLICY

I respect the need for each individual to stay in contact with family and friends. The use of cellular phones and pagers, however, is disrupting to the learning environment. Thus, I request that the ringers of all cellular phones and pagers be muted during class. If an emergency arises, and you need to make a call on your phone, I request that you quietly leave the room and conduct your conversation out in the hallway.

## LECTURE AND TESTING ACCOMODATIONS

I will make every effort to accommodate students diagnosed with a learning disability. I will do this in complete confidence. I do, however, request that any student requiring these accommodations inform me the first week of class. For further information, please see the University Disability Services' website at <http://www.du.edu/disability/dsp/index.html>.

## ACADEMIC DISHONESTY

While I advocate collaborative learning and teamwork, I also firmly believe that each individual should maintain the highest ethical standards in all of life's endeavors. As such, I support and will strictly enforce the Honor Code of the University of Denver. For your reference, I have included the links for the Honor Code Statement and Honor Code Procedures for Students below. For further information, please see the Office of Citizenship & Community Standards' website at <http://www.du.edu/honorcode/statement.htm> for the Honor Code Statement and at <http://www.du.edu/honorcode/studentprocedure.htm> for the Honor Code Procedures for Students.

## TENTATIVE SCHEDULE

Meeting	Date	Topic	Reading from Crosby (pages)
1	Mar 22	Introduction/environmental chemistry	---
2	Mar 24	Chemicals in the environment	1 – 10, 14 – 28
3	Mar 29	Chemical dynamics	35 – 47
4	Mar 31	Chemical dynamics continued	handout
5	Apr 5	Chemical transport	51 – 64, 304 – 315
6	Apr 7	Transformations	68 – 88, 95 – 108
7	Apr 12	Toxicology: Dose-response relationship	122 – 126, 143 – 156
8	Apr 14	Exposure and Risk	185 – 199, handout
9	Apr 19	Class exercise: risk assessment	handout
10	Apr 21	Midterm exam	
11	Apr 26	K <sub>D</sub> laboratory	handout
12	Apr 28	K <sub>D</sub> laboratory	
13	May 3	Industrial chemicals	245 – 260, handout
14	May 5	Chemical production	handout
15	May 10	Refractory chemicals and materials	261 – 276, handout
16	May 12	Reactive chemicals and materials	281 – 298, handout
17	May 17	Radioactive material	handouts
18	May 19	Security and transportation	handouts
19	May 24	Case Study: Bhopal	
20	May 26	Presentations	
21	Jun 2	Final: 4:00 to 5:45 PM	