

Introduction to Environmental Chemistry
CHEM 2240
Spring 2021 Quarter

Instructor: Associate Professor Keith Miller
Office Hours: Online – Zoom; by appointment
<https://udenver.zoom.us/j/3949013388>

Contact info: phone: 303.871.7721; email: keith.miller@du.edu
Lectures: MWF 9:00AM – 9:50AM MT; synchronous Zoom sessions; recorded CRN 2152

Lab Times/Location: 9:00 – 11:50AM (CRN 2154); 2:00 – 4:50PM (CRN 2153)
Both laboratory sections meet in Olin Room 225

Web Site: Canvas website

REQUIRE COURSE ITEMS

Textbook: *Environmental Chemistry: A global perspective*, 4th Edition
Van Loon and Duffy, Oxford University Press
E-book ISBN: 9780192522634; Print ISBN: 9780198749974
Sources: DU Bookstore, Amazon and Redshelf

Lab materials: Lab materials will be posted in both the lecture and laboratory Canvas sites. This will be uploaded in Canvas the second week of class. Updates and additions will be periodically distributed throughout course.

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 in-class exercises, problem sets, and assessments. You are responsible for understanding how to perform each of the operations on your calculator.

Computer: We will use your laptop computers in both the lecture and laboratories. You should bring your laptop to all laboratories.

Goggles/Clothing: Goggles are required for the laboratory. Goggles must be worn at all times when handling chemicals, heating glassware, or working with pressurized fluids. Appropriate clothing must be worn at all times in the laboratory. This includes closed-toed shoes and pants (a lab coat, of appropriate length, can be worn over shorts or skirts to fulfill the pant requirement). Students not having the appropriate clothing or goggles will be directed to leave the laboratory. (*Note: see late policy later in syllabus*).

IMPORTANT DATES

- **April 16 (Friday, Week 3) – Assessment 1**
- **May 7 (Friday, Week 6) – Assessment 2**
- **May 28 (Friday, Week 9) – Assessment 3**
- **May 31 (Memorial Day – Week 10) No Class**
- **June 7 (Monday, Week 11) – Final Assessment**

COURSE DESCRIPTION

Introduction to Environmental Chemistry is designed as the third of three core chemistry requirements, with a traditional focus towards environmental science or ecology majors. This year the department has expanded the quantitative nature of the laboratory portion of course, and it is expected that a handful of students from chemistry and other majors will be enrolled. The course is designed as a “survey” of topics in environmental chemistry; as such, we will not go into extreme detail on any one topic. The aim of the course is to introduce students to environmental chemistry issues and to expose ideas that will provide a basic framework to process complex issues that will face our world today and in coming years. The course is comprised of both lecture and lab portions. One final grade will be assigned, weighted as a mix of the two portions. As a result, it is not possible to withdraw from lecture or lab independent of the other.

LECTURES

While not in-person, I will attempt to conduct the class meetings over Zoom with 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. It is my goal that all lectures be conducted in an active learning environment. Therefore, we will stop periodically and apply what we have just covered. At times, I will ask you to work with other students to solve problems or answer questions. Experience has shown me that other students often succeed in describing chemistry concepts where instructors fail.

READING AND PROBLEMS

You are expected to complete any assigned reading prior to the class lecture. After our ZOOM lectures, you should reread the assigned text. I recommend that you understand the material and how to solve the sample problems before proceeding to the next section. 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. I will assign problems from the text as well as other sources weekly. I strongly suggest that you complete the problems. While you are not required to turn the completed problems in for a grade, I highly recommend that you attempt all of them.

ATTENDANCE/ENGAGEMENT POLICY

We will cover a large quantity of information in lecture and laboratory during the course. Thus, attendance is strongly encouraged. Attendance will be taken both in lecture and laboratory, and points awarded. To be counted “present” for synchronous lecture, I expect you to have your camera on unless you have notified me otherwise.

It is unreasonable for me to expect your complete attention. The pandemic has been exhausting, and I understand that you might just need a break. Thus, I will provide other opportunities for you to “earn” engagement points throughout the quarter that will count towards attendance/participation. You will be given multiple opportunities to reach the 100 - point maximum.

Please be aware that lab participation requires that you complete pre-lab assignments and arrive on time. Not completing your pre-lab assignment (if one is assigned) before your scheduled laboratory will count as a late arrival, result in lower participation points. Arrival in laboratory after one (1) hour from the designated start time has passed will count as a missed class unless otherwise excused. These policies will be modified accordingly for those students completing the laboratory portion of the course remotely.

GRADED EXERCISES

While the suggested problems will not be graded, a few problem sets will be assigned during the course. These problems are more difficult than the suggested problems and will require additional effort on your part. You will be encouraged to work together in small groups to complete the problems. The completed exercises will be handed in for a grade.

LABORATORY

The goal for the laboratory portion of this course is to learn to use analytical methods to carefully and confidently make accurate and precise chemical measurements of analytes in various samples. These are skills that can be developed through practice and attention to detail. Early laboratory experiments in this course will be completed to help you develop these skills. Later experiments will involve complex matrices and/or determinations of multiple analytes. Each student will be evaluated based on their individual analytical technique. Additional practice on some analytical methods might be needed by some individuals to improve their techniques. Please do not hesitate to schedule additional laboratory time outside of your scheduled lab period if you desire to improve your skills in certain areas.

Laboratory reports will be required for all experiments. In general, these reports should be brief, but will require some data manipulation and interpretation. At least one of the laboratory grades will be dependent on individual accuracy and precision. Further instruction for the actual format will be included in the laboratory manual. Do not assume all experiments will have equal point values. *Late reports will be assessed a 10% penalty.*

ASSESSMENTS

Three (3) 50-min assessments and a cumulative final assessment (2 hour) will be given during the quarter. They are scheduled on lecture days; a window will be provided for students to complete the timed assessments. Assessment problems will be similar to the problems from the problem sets and suggested problems. Questions relating to each of the laboratories will also be included on the assessments. If you will be out of town for a University sanctioned function (e.g., athletic team), you are responsible for making arrangements with Dr. Miller at least one week in advance. **THERE WILL BE NO MAKE-UP HOUR ASSESSMENTS.**

In calculation of final course grades, the lowest 50-min assessment will be dropped and replaced with the final assessment grade IF the final grade is higher.

GRADES

The lecture and laboratory are part of one course. The final grade will be determined as follows:

	A		B			C			D		
Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	D-
Percentage minimum	95	90	86	82	77	74	70	65	61	57	55

The values listed in the table are the guaranteed minimum values. So, if your average is 90, you will receive an A- for the course. Your grade will be determined according to your performance on the graded exercises, examinations, and laboratory reports. The specific grade breakdown is as follows:

Attendance/engagement points	100
Graded exercises	100
Assessments (100 pts each)	300
Final assessment	200
Laboratory Activities	300

Total **1000**

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>.

RESTRICTION OF USE OF CONTENT IN ONLINE COURSES. At the University of Denver, we protect the intellectual property of all our faculty, and safeguard the privacy of all our students in online learning environments. To this end, students may not record, reproduce, screenshot, photograph, or distribute any video, audio, or visual content from their online courses. This restriction includes but is not limited to:

- Pre-recorded and live lectures
- Live discussions
- Discussion boards
- Simulations
- Posted course materials
- Faculty feedback forms
- Visual materials that accompany lectures/discussions, such as slides
- Virtual whiteboard notes/equations, etc.

As we engage in online learning as an academic community, it is imperative to be respectful of all. Keep in mind that if any student is identifiable in an online class recording, this may constitute a violation of the educational record protections provided under FERPA.

Students with disabilities who need to record classroom lectures or discussions must contact the Disability Services Program to register, request, and be approved for an accommodation. All students are advised that students may tape classroom activities for this purpose. Such recordings are to be used solely for individual or group study with other students enrolled in the class that quarter/semester. They

may not be reproduced, shared in any way (including electronically or posting in any web environment) with those not in the class in that quarter.

Students who violate this policy will be reported to [The Office of Student Rights & Responsibilities](#) and may be subject to both legal sanctions for violations of copyright law and disciplinary action under *Student Rights & Responsibilities Policies*.

RELIGIOUS ACCOMODATIONS. It is University policy to grant students excused absences from class or other organized activities for the observance of religious holy days, unless the accommodation would create an undue hardship. I will do my best to accommodate your requests if you make arrangement with me *in advance* of your absence. Please notify me by the end of the second week of classes of conflicts that may require your absence from class and/or prevent you from completing an assignment. More information can be found at: <http://www.du.edu/studentlife/religiouslife/about-us/policy.html>.

ACADEMIC DISHONESTY. While I advocate collaborative learning and teamwork, I also 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, the link to the Honor Code Student Conduct Policy and Procedures is: <http://www.du.edu/studentlife/studentconduct/>.

LECTURE TOPICS

Atmospheric

- Stratosphere and Troposphere
- Urban/Indoor air
- Climate change

Aquatic (hydrosphere)

- Distribution of species (pH, pE)
- Carbonic Acid system
- Acid mine drainage (AMD)

Terrestrial

- Soils

Nuclear Power

LABORATORY EXERCISES AND EXPERIMENTS (tentative: see Laboratory Syllabus)

1. Lab Safety
2. Statistics
3. Calibration (including glassware, pipets, pH meters, and spectrometers)¹
4. Analysis of unknown water: hardness by EDTA titration¹
5. Soil pH/ion content
6. Acid rain
7. Monitoring project²
8. Air quality monitor
9. Alkalinity modeling
10. Watershed sampling²
11. Spectroscopy -- soil or water analysis¹

¹ Required for in-person students

² Required for remote-learning students