



SYLLABUS Environmental Chemistry

The University of Toledo
Department of Chemistry and Biochemistry
CHEM 4210/6210/8210

Instructor: Amy Toole (pronouns: she, her, hers)
Email: amy.toole@utoledo.edu
Student Drop-in Hours: MW 3:30-4:30; TuTh 2-3:30 (Th virtual only at this [LINK](#)) and by appointment. Talking to students is the best part of my job!
Drop-in Hours Location: Bowman-Oddy (BO)2086G

Instructor Phone: 419-530-1503
Offered: Spring 2022
Course Website: [Blackboard Learn](#)
Class Location: Distance Learning – Exams on campus in BO1059.
Class Day/Time: Distance Learning – Exams on campus. See schedule at end of syllabus.
Credit Hours: 3

CATALOG/COURSE DESCRIPTION

This course will focus on the chemistry of air, water, and soil with specific emphasis on the effects of human-made chemical products and by-products on the environment. Connections with green chemistry will be highlighted.

COURSE STATEMENT

During this course we will study the chemistry of the air, water and soil and examine the environmental fate of anthropogenic chemicals released into the environment. We will see how chemical principles can be used to explain and predict reactions, partitioning, and concentrations of anthropogenic chemicals in different environmental compartments. We will examine some of the effects of pollutants on humans, other animals, plants and the nonliving parts of the earth. And, we will consider possible green chemistry, engineering and societal approaches to mitigating deleterious effects of pollution. The course will be beneficial to chemists, chemical and environmental engineers, and environmental scientists. The format of the course will be online with the exception of exams which must be taken on campus.

STUDENT LEARNING OUTCOMES

Global Course Learning Outcome:

At the conclusion of this course, students will be able to apply principles of environmental chemistry to the analysis and critique of current environmental problems and proposed solutions.

Specific Course Learning Outcomes:

At the conclusion of the course, students will be able to:

1. Identify and evaluate the relative importance of various reactions, physical processes and transport mechanisms affecting different chemicals in the environment.
2. Apply quantitative problem-solving skills to questions in environmental chemistry.
3. Interpret graphical data.
4. Compare/contrast the composition and temperature profile as well as predominant types of reactions in different regions of the atmosphere.
5. Describe chemical reactions and processes responsible for creating the “ozone hole”.
6. Compare/contrast the conditions and reactions that create photochemical and sulfurous smog.

7. Identify the sources of precursors, reactions that create and effects of acid rain.
8. Describe the scientific basis underlying global warming, its anticipated effects, and the American Chemical Society position on the issue.
9. Compare/ contrast the chemistry of different environments within the hydrosphere.
10. Calculate equilibrium concentrations of organic pollutants in environmental compartments based on partition coefficients. Assess the advantages and limitations of such calculations.
11. Describe key reactions in carbon, nitrogen and sulfur cycles.
12. Calculate expected aqueous concentrations of different chemical species based on equilibrium coefficients and environmental measurements of pH and Eh. Discuss the advantages and limitations of such calculations.
13. Describe and analyze intersections between environmental chemistry and society.

CHEM 6210 Masters students and CHEM 8210 Doctoral students will also be able to:

14. Apply their background in environmental chemistry and other chemistry courses to the summary and analysis of the textbook information on “Water pollution and water treatment” (Chapter 16).

CHEM 8210 Doctoral students will also be able to:

15. Apply their background in environmental chemistry and other chemistry courses to the summary and analysis of the textbook information on “The chemistry of solid wastes” (Chapter 19).

PREREQUISITES AND COREQUISITES

Prerequisite: [CHEM 2420](#) with a minimum grade of D-

TEXTS AND ANCILLARY MATERIALS

Required Materials:

- *Textbook:* ISBN 019874997X; Gary W. vanLoon & Stephen Duffy; Environmental Chemistry: A Global Perspective; Oxford University Press; 4th Edition; 2017.
- Dependable and regular computer access. Assignments, documents and web links will be provided through Blackboard. Please view the [technology considerations](#) for this course, including technical skills needed, general technology requirements, and technology privacy policies.

ACADEMIC POLICIES

The University of Toledo maintains academic policies intended to promote fairness and equity among students. These are wide ranging and include policies on adding and dropping a course, dual degree requirements, graduation with honors, academic dishonesty, confidentiality of student records and veteran assistance to name just a few. Please use the following URL to read a comprehensive list of academic policies that may pertain to you in this class and throughout your academic journey: <http://www.utoledo.edu/policies/academic/undergraduate/>. If you have any questions after reading through the policies, let me know.

TEACHING METHODOLOGY

This course emphasizes reading and analysis, making connections between different concepts, applying chemistry, mathematical problem solving and communicating technical information. All assignments and assessments are intended to encourage these higher-level thinking skills.

Reading and Guided Notetaking: Much of your learning will be the result of reading and thinking about what you have read. Readings are assigned on a weekly basis and Guided Notetaking sheets accompany them. The sheets contain some blanks to fill in, but often prompt you to record a chemical reaction, equation, summary or list. Showing Guided Notetaking sheets completed in your own handwriting accounts for a portion of each exam score.

Reflections: In brief writing assignments, students will state and support their opinions regarding topics related to environmental chemistry. Please note that the emphasis of this course is chemistry, but by nature the course touches on topics with connections to our lives and society that shouldn't be ignored. Writing reflections gives students an opportunity to process and express their ideas regarding these topics.

Quantitative Problem Solving: Quantitative problems will be assigned throughout the semester. Students will have multiple attempts to solve the problems in advance of the deadline. Solving the problems will require an understanding of material in the text for the course, as well as in pre-requisite courses. You may work with others on these problems. Write out your work neatly: some of the problems may be repeated on the exams and you will want to be able to follow your notes.

Exams: Three exams will be given during the semester. The exams will ask a sub-set of the questions and problems from the Notetaking sheets and problem solving. **You may use the Notetaking sheets during the exam, as long as they are completed in your own handwriting.** There is nothing "tricky" about the exams, their purpose is to assess the extent to which you have thought about and applied your background in chemistry to understanding the text.

Students must take the exams on-campus during the times given on the course schedule or make alternative arrangements for a proctor. Please visit the [Student Requirements for Off Site Proctored Exams](#) webpage to learn more about this process. For students taking proctored exams, the exams must be taken at the same time or at a time in advance of the on-campus exam. **Proctored Exams:** Three midterm exams will be administered on campus. Specific dates and times are provided in the Course Schedule. Off-campus, proctored testing is an option. Learners pursuing this option will be required to locate an approved proctor and pay for any proctoring expenses. UToledo Online is available to assist students with off-campus proctoring arrangements. Please visit the [Student Requirements for Off Site Proctored Exams](#) webpage to learn more about this process. Students parking on campus for exams should contact [Parking Services](#) for parking permit options and costs.

Final Presentation: Working in pairs, students will give a live 15-minute oral presentation, built around the cross-section between a scientific or popular press article of their choosing (but will require my approval) and course content.

CHEM 6210 Masters students and CHEM 8210 Doctoral students will prepare guided note-taking pages plus answer questions related to the textbook information on "Water pollution and water treatment" (Chapter 16).

CHEM 8210 Doctoral students will prepare guided note-taking pages plus answer questions related to the textbook information on "The chemistry of solid wastes" (Chapter 19).

Workweek: In this online course, weeks begin at 12:01 AM Monday morning and end at 11:59 PM on Sunday night. All assigned work for any week is to be completed by the end of Sunday in that week. The materials for any week will be posted by Monday morning of that week under the appropriate folder. Begin each week by checking the schedule, then view the content for the week under Weekly Content.

Late Work: Late assignments and make-up tests will not be permitted unless arrangements are discussed and approved well before the required due date. Time management for this online course will be important. Anticipate spending an average of 9 hours per week.

COMMUNICATION GUIDELINES

Course Announcements: I frequently post Announcements regarding the course to Blackboard and forward them to your email. Please check your UToledo email or Blackboard Announcements daily.

Student to student communication: A link to Collaborate, a real-time conferencing tool, is on the course menu in Blackboard and available for students to use at any time. Brief introductions and reflections will take place through discussion board threads but you are also welcome to create your own thread to ask questions or pose thoughtful commentary to classmates. Finally, there is a link to email on Blackboard that you can use to contact other students in the course.

Communicating with me: My email and the hours I will be there are found at the start of this syllabus. You are always welcome to make an appointment to talk with me outside office hours. I am here to help: it is why I teach.

I prioritize responding to email, discussion board posts, reflections and exams in a timely manner.

OVERVIEW OF COURSE GRADE ASSIGNMENT

Midterm Grading: Midterm grades are assigned by the end of the 8th week of class and are used to assist students with determining their academic standing. Attendance is also recorded during that time to meet state and federal laws regarding financial aid disbursement. Please note, if you are not participating in class it could affect your financial aid (scholarships, grants, loans or Federal Work Study).

Your midterm grade will be calculated as follows:

ASSIGNMENTS/EXERCISES/EXAMS	POSSIBLE POINTS	SLO ALIGNMENT
Exam 1 (including check of Guided Note-taking sheets)	175	1, 3, 4, 5
Reflection	30	13
Quantitative Problem Solving	100	2
TOTAL	300	

Based on the percentage of total possible points earned, corresponding letter grades will be assigned as indicated for final grading (below).

Final Grading is based on the percentage of total possible points as detailed below:

ASSIGNMENTS/EXERCISES/EXAMS	POSSIBLE POINTS	SLO ALIGNMENT
Guided Notetaking and Exams (The first two exams are each worth 175 points; the third exam is 100 points)	450	1, 3-9, 11, 13
Reflections (The first reflection is worth 30 points; the remaining two are each 40 points)	110	5-8, 13
Quantitative Problem Solving (Individual problems range from 5-10 points)	290	2, 10, 13
Final Presentation	150	Global Course Objective
TOTAL for CHEM 4210	1000	<i>All</i>
Additional Masters Level Assignment	100	13
TOTAL for CHEM 6210	1100	<i>All</i>
Additional Doctoral Level Assignment	100	14
TOTAL for CHEM 8210	1200	<i>All</i>

Below are minimum percentages of total points needed to receive the indicated letter grade.

		A	93%	A-	90%
B+	87%	B	83%	B-	80%
C+	77%	C	73%	C-	70%
D+	67%	D	63%	D-	60%

Drop, Withdrawal and Incomplete Grades: Dropped courses do not appear on your transcript. The deadline for dropping is February 1st. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is March 25th. W's do not affect your GPA but do appear on your transcript.

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the Basis of Disability (ADA): The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability – Americans with Disabilities Act Compliance](#).

Academic Accommodations: The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the [Student Disability Services Office](#) by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

Additional Policy Statements: Students can find other university policies listed by audience on the University Policy webpage (<http://www.utoledo.edu/policies/audience.html/#students>).

ACADEMIC AND SUPPORT SERVICES

The university provides a variety of academic and support services on campus to help you succeed and reach your fullest potential. Whether you need to ask a question, get help with an assignment, seek advice from a counselor, find a job or join a club, UToledo is there for you! You may contact me, or use the following resources to find the academic support or service you need:

Student Affairs: <http://www.utoledo.edu/studentaffairs/>

Office of Student Advocacy: <https://www.utoledo.edu/studentaffairs/student-advocacy/> (help with the non-academic challenges)

Library: <http://www.utoledo.edu/library/>

Career Services: <http://www.utoledo.edu/success/career/>

SAFETY AND HEALTH SERVICES FOR UTOLEDO STUDENTS

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

SPECIAL UNIVERSITY-WIDE COURSE EXPECTATIONS DURING COVID-19

Maintaining a safe campus during the ongoing COVID-19 pandemic remains a top priority. UToledo continues to follow the guidance of the U.S. Centers for Disease Control and Prevention and Ohio Department of Health to keep our campus safe.

ATTENDANCE

The University of Toledo has a missed class policy. It is important that students and instructors discuss attendance requirements for the course. Before coming to campus each day, students should take their temperature and complete a self-assessment for symptoms of COVID-19, such as cough, chills, fatigue or shortness of breath. Anyone with a temperature at or above 100.0 degrees Fahrenheit or who is experiencing symptoms consistent with COVID-19 should not come to campus and contact their primary care physician or the University Health Center at 419.530.5549. For more information on the symptoms of COVID-19, please go to <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>

COVID-19 testing for sick students is available on both Main Campus and Health Science Campus. Call 419.383.4545 for an appointment. Absences due to COVID-19 quarantine or isolation requirements **are** considered excused absences. Students should notify their instructors and follow the protocols summarized in this document on [Navigating COVID-Related Course Concerns](#).

In the event that you have tested positive for COVID-19 or have been diagnosed as a probable case, please review the [CDC guidance](#) on self-isolation and symptom monitoring, and report the disclosure to the Division of Student Affairs by emailing StudentAffairs@utoledo.edu or by connecting with their on-call representative at 419.343.9946. Disclosure is voluntary and will only be shared on a need to know basis with staff such as in the Office of Student Advocacy and Support, The Office of Residence Life, and/or the Office of Accessibility and Disability Resources to coordinate supportive measures and meet contact tracing requirements.

FACE COVERINGS

Face coverings are required while on campus, except while eating, alone in an enclosed space, or outdoors practicing social distancing. Students will not be permitted in class without a face covering. If you have a medical reason preventing you from wearing a face covering due to a health condition deemed high-risk by the CDC, submit an [online application](#) to request an accommodation through the Office of Accessibility and Disability Resources. Students will need to provide documentation that verifies their health condition or disability and supports the need for accommodations. Students already affiliated with the Office of Accessibility and Disability Resources who would like to request additional accommodations due to the impact of COVID-19, should contact their accessibility specialist to discuss their specific needs. You may connect with the office by calling 419.530.4981 or sending an email to StudentDisability@utoledo.edu.

VACCINATION

Doctors and other health care professionals agree that the best way to protect ourselves and each other is to get vaccinated. Case data clearly show that vaccines remain highly effective at preventing serious illness from COVID, including the highly contagious delta variant. If you have not yet received your COVID vaccine, the University encourages you do so as soon as possible. No appointment is needed to get the shot at the UTMC Outpatient Pharmacy, University Health Clinic or Main Campus Pharmacy. Once you receive the COVID vaccination, please register on the COVID Vaccine Registry site at: <https://utvaccinereg.utoledo.edu/>.

SPECIAL NOTES

It's important to note, that based on the unpredictability of the COVID-19 virus, things can change at any time. So please be patient and understanding as we move through the semester.

COURSE SCHEDULE

The anticipated schedule for the class is found below. As instructor, I reserve the right to modify the schedule of topics if I believe it to be in the best interest of the class, however, Exam dates will NOT change. The topics and Chapters are those in the text for this course.

Environmental Chemistry: CHEM4210/6210/8210 – Anticipated Course Calendar

Week	Dates	Topic	Student Learning Objectives	Assignments Due Sunday at 11:59 each week and Exam dates and times*
1	Jan 18-23	Environmental Chemistry a Global Perspective (Chapter 1)	1, 2, 3, 4, 13	<ul style="list-style-type: none"> • Reflection: Syllabus and Introduction • Guided note taking • Quantitative Problem Solving
2	Jan 24-30	The Earth's Atmosphere (Chapter 2)	1, 2, 3, 4, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
3	Jan 31-Feb 6	Stratospheric Chemistry – ozone (Chapter 3)	1, 2, 3, 4, 5, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
4	Feb 7-13	Tropospheric Chemistry – smog (Chapter 4)	1, 2, 3, 4, 6, 13	<ul style="list-style-type: none"> • Reflection: Smog • Guided note taking • Quantitative Problem Solving
5	Feb 14-20	Tropospheric Chemistry – precipitation (Chapter 5)	1, 2, 3, 4, 7, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
6	Feb 21-27	The Chemistry of Global Climate (Chapter 8)	1, 2, 3, 4, 8, 13	<p>EXAM 1 – Monday, Feb 21, 5:30-6:30 PM in BO1059 (Chapters 1-5)</p> <ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
7	Feb 28-Mar 6	The Chemistry of Global Climate (Chapter 8)	1, 2, 3, 4, 8, 13	<ul style="list-style-type: none"> • Guided note taking • Reflection: Climate Change
Mar 7-11 Spring Break				
8	Mar 14-20	The Hydrosphere (Chapter 9) Distribution of Species in Aquatic Systems (Chapter 10)	1, 2, 3, 9, 13	<ul style="list-style-type: none"> • Guided note taking
9	Mar 21-27	Distribution of Species in Aquatic Systems (Chapter 10) (Part 2)	1, 2, 3, 4, 9, 10, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
10	Mar 28-Apr 3	Gases in Water (Chapter 11) Organic Matter in Water (Chapter 12)	1, 2, 3, 4, 9, 10, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
11	Apr 4-10	Final Project Planning: Topic and sub-topics proposed		EXAM 2 – Tuesday, Apr 5, 6-7 PM in BO1059 (Chapters 8-12)
12	Apr 11-17	Environmental Chemistry of Colloids and Surfaces (Chapter 14)	1, 2, 3, 4, 9, 10, 12, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving

Week	Dates	Topic	Student Learning Objectives	Assignments Due Sunday at 11:59 each week and Exam dates and times*
13	Apr 18-24	Microbial Processes (Chapter 15)	1, 2, 3, 4, 9, 10, 13	<ul style="list-style-type: none"> • Guided note taking • Quantitative Problem Solving
14	April 25-May 1	Toxic Organic Chemicals (Chapter 20)	1, 2, 3, 4, 9, 10, 13	<ul style="list-style-type: none"> • Guided note taking EXAM 3 – Thursday Apr 28, 6-7 PM in BO1059 (Chapters 14, 15, 20)
Finals Week	May 2-6	Final Presentations		

*See Blackboard "Weekly Content" for details regarding Assignments. Refer to the guidelines on obtaining a proctor if you cannot make it to campus at the time of the Exams.