ENVIRONMENTAL CHEMISTRY  CHEM 4210/6210/8210  Spring 2018

Instructor: Dr. Andy Jorgensen  Email: andy.jorgensen@utoledo.edu  Office Hours: TBA & Online
Office Location: BO1096F  Office Phone: 419-530-4579  Term: Spring 2018
Lecture Location: Distance Learning  Lecture Day/Time: Distance Learning  Credit Hours: 3

COURSE/CATALOG 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 OVERVIEW
We will study the interactions among humans, other animals, plants and the nonliving parts of the earth. There will be sections on air, water and land as well as interactions like climate change. The format of the course will be online with all aspects completed without class meetings. The course will be beneficial to chemists, chemical and environmental engineers, and environmental scientists.

STUDENT LEARNING OBJECTIVES
Introduction to Environmental Problems
Be able to describe the following concepts: sustainability, Green Chemistry, triple bottom line, The Tragedy of the Commons, systems thinking, life-cycle assessment, cradle-to-cradle, carbon ecological and water footprints, history of environmental regulations and distinguish among the terms risk/exposure/hazard.

Stratospheric Chemistry: The Ozone Layer (Chapter 1)
Be able to describe the physics, chemistry, and biology of UV radiation, in particular how this applies to the formation and destruction of ozone including the Chapman mechanism and catalytic processes of ozone destruction. Calculations of the parameters of this chemistry will be required.

The Ozone Holes (Chapter 2)
Be able to describe the chemistry of ozone depletion, including the chemicals that cause ozone destruction, as well as CFC replacements and the international agreements which govern the use of CFC’s.

The Chemistry of Ground-Level Air Pollution (Chapter 3)
Be able to trace the chemical fate of trace gases in air as it involves the photochemical smog process as well as the source of sulfur-based and particulate emissions in air pollution. Be able to discuss how to improve air quality through limiting VOC and NOx emissions, and the use of catalytic converters. Calculations regarding the quantification of important chemicals in this area will be required.

Environmental & Health Consequences of Polluted Air–Outdoors & Indoors (Chapter 4)
Be able to discuss the sources and control of acid rain as well as other outdoor and indoor pollutants. Calculations regarding the quantification of important chemicals in this area will be required.

The Greenhouse Effect (Chapter 5)
Be able to explain the mechanism of the greenhouse effect, the origin of the enhanced greenhouse effect, the sources of greenhouse gases, the climate-modifying effects of aerosols and the concept of geo-engineering.
Energy Use, Fossil Fuels, CO₂ Emissions, and Global Climate Change (Chapter 6)
Be able to summarize global energy use and energy sources, the process of CO₂ sequestration as a means to control climate change and discuss international agreements on climate change. Be able to predict the effects of climate change on human health.

The Chemistry of Natural Waters (Chapter 10)
Be able to describe and carry out calculations on gas solubility, to write oxidation-reduction reactions, to use the pE scale, to describe and do calculations on acidity/alkalinity of water. Be able to describe drinking water chemistry issues.

The Pollution and Purification of Water (Chapter 11)
Be able to describe water disinfection, the chemistry of groundwater as well as its supply, chemical contamination, and remediation; to describe the treatment of wastewater and sewage.

Toxic Heavy Metals (Chapter 12)
Be able to describe the environmental consequences of heavy metals in nature, including mercury, lead, cadmium, arsenic and chromium.

The graduate versions of the course will have the following additional Learning Objectives:
CHEM 6210 Masters students will be able to research a course topic and prepare a presentation comprehensible to a chemistry group. The topic will expand on what is otherwise given in the course, but use the principles studied to place it in the large context of environmental chemistry.

CHEM 8210 In addition to the presentation parallel to masters students, doctoral students will also write a research paper which uses the principles of environmental chemistry as applied to a topic not in the class. This will involve the review and summary of selected primary and secondary literature.

TEACHING STRATEGIES
Course Work: Class material will be distributed for each topic. This will be in the form of text and outside readings, powerpoints, and videos.

Assessments: Assessments in various formats will be utilized. These will include questions keyed to the text and powerpoint/video combinations, both non-math and mathematical questions, online quizzes, creation of discussion postings on selected topics and the review and analysis of the postings by other students as well as to write reflective essays. The course will include a final exam.

COURSE PREREQUISITES AND CO-REQUISITES:
The pre-requisite for this course is successful completion of CHEM 2420, Organic Chemistry II.


TECHNOLOGY REQUIREMENTS
Blackboard (https://blackboard.utdl.edu/webapps/login/) will be used on a regular basis in this course. Students need to have access to a properly functioning computer throughout the semester. Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware. Updated software is available from the Online Learning Download Center (https://www.utoledo.edu/dl/main/downloads.html).

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 Disability Act Compliance.

ACADEMIC ACCOMMODATIONS
The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course, contact the Student Disability Services Office.

ACADEMIC POLICIES
Academic Honesty: In general to complete assessments you will be able to use all course material, including the text, powerpoints, videos and outside sources. For homework, you will be able to work with others in the class. However, you must complete the quizzes and the final exam without the assistance of other students. Standard rules on citing references and other plagiarism matters are to be followed. Questions on specific issues are encouraged. You are urged to refer to the university’s policy on Academic Dishonesty in the university catalogue.

COURSE EXPECTATIONS
Students are expected to read the assigned portion of the textbook, to watch the provided videos, to review the powerpoints and to complete all assessments before the specified deadlines. The instructor will be available electronically via email and course chats to provide assistance.

GRADING
Course Points Grades will be based on the work submitted for the various assignments (see below), each of which will be worth a specified number of points.

Grade Scale Courses grades will be assigned based the percentage of total points achieved:
A/A- 90-100%, B+/B/B- 80-90%, C+/C/C- 70-80%, D+/D/D- 60-70%.

Drop, Withdrawal and Incomplete Grades
The deadline for dropping is January 30th. Dropped courses do not appear on your transcript. You may withdraw from the course and receive a grade of W. The deadline for withdrawal is March 30th. W’s do not affect your GPA. Course registration changes might affect your financial aid. At the midterm instructors report student participation. The report can affect your financial aid, so you will want to be sure that you are continue to participate throughout the term. However, you will remain enrolled in the class independent of this report, unless you take the action of dropping or withdrawing. A course grade of Incomplete is given only to those who have completed all but a small percentage of course requirements for an acceptable reason.

COMMUNICATION GUIDELINES
As your instructor, I am here to help, and will do my best to respond to email within 24 to 48 hours. Students are expected to check their UT email account and Blackboard frequently for course information.

STUDENT SUPPORT SERVICES
Chemistry Help Center, Room BO 2043, is where the teaching assistants hold their office hours so it is a great place to receive assistance. It is generally open all day Monday through Friday & evenings Monday through Thursday. A schedule will be posted early in the term. No appointment is necessary.

Tutoring support for all UT students is available through the Learning Enhancement Center located in the Carlson Library.
COURSE ASSIGNMENTS

Assignments are described in the introductory course video and powerpoint. This table provides details on the distribution of points. The schedule of due dates for assignments is given in Blackboard.

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