Spring 2-1-2019

CHMY 291.01: ST - Chemistry in the Environment

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Spring 2019 3 credits
CHMY 291 / CHMY 595 Chemistry in the Environment

Instructor: Professor Lu Hu | CHEM Room 013 | 406-243-4231 | lu.hu@mso.umt.edu
Office hours: Tu/Th 1-2 PM or by appointment
Website: www.hs.umt.edu/luhu
Day, time, & place of class meetings: M/W/F 1:00 to 1:50 PM; LA 249
Course prerequisites: College introductory chemistry, CHMY121 or 141, or consent of instructor.

Course Description
Human activities have been making substantial changes to the chemical and physical properties of the atmosphere, ocean, and land. This introductory course will discuss such perturbations to Earth system and their implications for climate, air pollution, carbon cycle, water quality, and soil health. This course will begin by reviewing relevant basic principles of physical sciences. We will then apply these perspectives to understanding pressing global environmental issues, organized by case studies. The lectures will involve a lot of active learning activities, discussion, and interaction.

Course Outcomes
Upon completing this course, students should be able to
- Evaluate fundamental scientific arguments for discussing major global environmental issues
- Present scientific thinking in problem-solving for complex systems
- Place local and regional environmental issues in the global context
- Synthesize the scientific basis behind pressing and emerging environmental problems
- Discuss examples of the successful implementation of policies and how sciences could inform to environmental rules and regulations

Course topics
- Protecting the ozone layer
- London *fog*, Los Angeles *smoke*, and Beijing *haze*
- The chemistry of global climate change
- The climate in the past (Some of the sciences behind *The Day after Tomorrow*)
- Energy from combustion (*Volkswagen* emissions scandal, biofuels, and renewable energy)
- The fracking debate
- Flint water crisis: How did water pollution happen?
- Neutralizing the threat of acid rain
- Toxic heavy metals and organic compounds in soil and water
- Nutrients and food security
- Geoengineering

Required Text:
- Chemistry in Context: Applying Chemistry to Society **7th Edition** American Chemical Society (You can either buy a used one online, or check out one copy from Lu).
- Other selected readings (supplementary texts or scientific journal articles will be provided)

Your final course grade will be based on

- Warmup exercises 10%
- Homework assignments 35%
- Midterm exam 15%
- Final exam 15%
- Term paper 25%

Students will write a synthesis of the "state of issue" for one of the topics relevant to this course. This can be a topic we will cover in the class, or some other topic we don't cover but is interesting to you. Please discuss your potential topic with Lu and get an approval before your research. In addition, graduate students (CHMY 595) will have stricter requirements for the paper in the depth of content, and will be required to create and deliver a lecture on this topic (50-min).

Specific requirements for Term Paper

- 10-page maximum including figures and tables.
- Double spacing, 12-point Times New Roman font, one inch margins.
- Reference not included in the page limit.
- The term paper should summarize current knowledges of the topic of interest. Start from a recent review paper on the topic if you can find it, and then follow the literatures.
- Some questions to consider as you read research literatures and synthesize the "state of issue":
  - What are current knowns? How is the current knowledge achieved technically and scientifically, e.g., any important research tools or theories? What are those important advances?
  - What are current challenges in the field (unknowns)? How to overcome them?
  - Why is your topic important? What are the broader impacts of the relevant research? Does this research have practical application or public policy implications? How does it improve our knowledge for the environment?
  - Describe/summarize as specifically as possible about technology or theory of your interested topic.

Key deadlines

Today: Start thinking about your topic
2/01/2019: Discuss topics among your project team (TBA) and provide feedback
2/13/2019: Finalize your topic. Outlines and topic due.
Set up a meeting before 2/13 to discuss proposed topics with Lu.
3/6/2019: Midterm exam
3/13/2019: First draft to your group team
3/22/2019: First peer-review due
4/8/2019: 2nd draft due
4/15/2019: 2nd peer-review due
4/24/2019: Final draft due
4/30/2019: Tuesday 3:20-5:20; Final exam (TBC)

Students who are taking CHMY 595 should discuss their lecture dates with Lu before 2/13/2019.

Definition of Grades

A 4.0	• Represents achievement that is outstanding relative to the level necessary to meet course requirements. • Demonstrates excellent preparation: has sought out additional information other than that presented in class or lectures. • Combines pieces of the discussion to further the group's understanding of goals. • Demonstrates ongoing very active involvement.
B 3.0	• Represents achievement that is significantly above the level necessary to meet course requirements. • Demonstrates good preparation: has thought through the implications of lecture material and other resources. • Contributes well to discussion in an ongoing way: responds to other students' points, thinks through own points, questions others in a constructive way. • Demonstrates consistent ongoing involvement.
C 2.0	• Represents achievement that meets the course requirements in every respect. • Demonstrates adequate preparation: knows the basics of any assigned reading, but does not show evidence of trying to interpret or apply information. • Offers straightforward information (e.g., straight from the lecture or reading), without elaboration or very infrequently. • Does not offer to contribute to discussion, but contributes to a moderate degree when called on.
D 1.0	• Represents achievement that is worthy of credit even though it fails to meet fully the course requirements • Tries to respond when called on but does not offer much. • Demonstrates very infrequent involvement in discussion. • Misses class frequently and makes no plans to make up.
F	• Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see also I).
I	• (Incomplete) Assigned at the discretion of the instructor when, due to extraordinary circumstances, e.g., hospitalization, a student is prevented from completing the work of the course on time. Requires a written agreement between instructor and student.