

Atmospheric Chemistry and Climate: AOSC & CHEM 433 / AOSC & CHEM 633

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Fall 2020: Tues – Thurs 2:00 to 3:15 pm

On line at <https://umd.zoom.us/j/95258479309>

Although I had aspired to teach in a hybrid fashion, developments since the time this decision had to be made have led to the decision to teach the class entirely on-line for Fall 2020, unless a particular student has a need for face-to-face interactions, in which case these will be arranged on a personal basis.

Website: <http://www.atmos.umd.edu/~rjs/class/fall2020>

Required Text:

[Chemistry in Context: Applying Chemistry to Society](#) 7th Edition American Chemical Society
(purchase if you'd like; I'll provide via PDF file to all registered students)

Supplemental Text (selected readings will be provided):

[Paris Climate Agreement: Beacon of Hope](#) by Ross J. Salawitch et al. (available for free via open access)

[Twenty Questions & Answers About the Ozone Layer](#) by Ross J. Salawitch et al. (also freely available)

[Global Warming: The Complete Briefing](#) 5th Edition by John Houghton (readings will be provided)

[Green Chemistry: An Inclusive Approach](#), edited by Béla Török and Timothy Dransfield (ditto)

[Beyond Oil and Gas: The Methanol Economy](#) by George A. Olah et al. (readings will also be provided)

Course Description. The effects of human activity on atmospheric composition, focused on global warming, the carbon cycle, air pollution, and the ozone layer. Fundamentals of atmospheric chemistry (spectroscopy, kinetics, isotopic analysis, and biogeochemical cycles) are related to the modern understanding of climate change, air quality, and ozone depletion, based on resources such as satellite missions, field campaigns, and scientific assessments published by international agencies. We also examine how society's future energy needs could be met in a more environmentally friendly manner than the present heavy reliance on combustion of fossil fuels. The course is taught at a level appropriate for upper class undergraduate chemistry or physical science majors, as well as all graduate students in a physical science program.

Prerequisites: (CHEM 131 or CHEM135 or CHEM146) and (MATH241); or permission of instructor.

Grades: Grades will be determined based on daily short questions (termed *admission tickets*) due prior to the start of lecture that are based on the readings (30%), problem sets (30%), two in class exams (13.33% each), a final exam (13.34%). In addition, students enrolled in 633 will be required to write a research paper on a topic of their choosing, give a presentation on this paper, and may be assigned an extra question on problem sets. For computation of final course grade, the graduate student paper/presentation will have equal weight as each exam.

Course Topics

- How to Build a Habitable Planet: Geological Evolution of Earth's Atmosphere
- Overview of Global Warming, Air Quality, and Ozone Depletion
- The Greenhouse Effect: Radiative Transfer; Cloud and Water Vapor Feedbacks
- Climates of the Past
- Modeling of Earth's Climate
- The Global Carbon Cycle
- Biogeochemical Cycles of Methane and Nitrous Oxide
- Pollution of Earth's Troposphere: Air Quality, Acid Rain, and Aerosols
- Pollution of Earth's Stratosphere: Ozone Depletion and Ozone Recovery
- World Energy Needs and Future Fossil Fuel Reserves
- The Kyoto Protocol and the Science of CO₂ Stabilization
- Hydraulic Fracturing aka Fracking
- Geo-engineering of Climate
- Renewable Energy I: Solar, Geothermal, Hydro, and Wind
- Renewable Energy II: Ethanol, Methanol, and Biofuels
- Nuclear Energy and The Hydrogen Economy

Updates based on 28 August 2020 email from our Provost:

On 28 August 2020, Provost Rankin wrote all Faculty:

The expectation that every undergraduate course will have a final exam is waived for Fall 2020 as it was for Spring 2020. Faculty are encouraged to use graded "lower stakes" assessments throughout the course, in order that students can build their course grade cumulatively over the course of the semester.

Response:

a) We will decide based on conversation, as the semester proceeds, whether to have a final exam. Class consensus will prevail, including an actual majority vote if necessary. If we do not have a final exam, the weights of other class components (i.e. *admission tickets* and *problem sets*) could be adjusted upwards. **Best to complete the ATs and P Sets.**

b) the design of the ATs has always been to have numerous, "lower stakes" assessments throughout the class. Please note lowest three ATs will be dropped.

and:

Policy on Excused Absences:

- Anticipating the potential for unanticipated absences during the pandemic, Self-certified notes will serve as documentation for COVID-19-related absences or missed course expectations.
- In providing academic accommodations for students, faculty should consider alternative assignments and make-up work. These course policies should be noted clearly in the syllabus.
- Please work creatively and compassionately with students who have experienced extended excused absences to find ways to allow course completion. If that is not feasible, please direct the student to consult with an academic advisor to explore administrative options, including withdrawing from the course.

Response:

a) self-certified notes it is!

b) an undergraduate student enrolled in 433 can either take a make-up exam, complete a paper instead of a make-up exam, or in an exceptional circumstance simply have the exams they take increase in relative weight, such that the overall weight of exams versus all else is preserved.

c) any student enrolled in 633 can either take a make-up exam, complete a considerably longer paper instead of a make-up exam, or in an exceptional circumstance simply have the exams they take increase in relative weight, such that the overall weight of exams versus all else is preserved.

d) we're all in this together: I've always considered myself to be compassionate with regards to expectations for this class. Students are more than welcome to consult with students who have taken this class in prior semesters to either confirm or refute this "self-assessment".

Last updated 31 August 2020