ATMOSPHERIC CHEMISTRY

CHEM F406 (cross listed as CHEM F606 and ATM F606) Overview and Schedule ---- Fall 2020

Instructor	Dr. Jingqiu Mao (Reichardt 188, 907-474-7118, jmao2@alaska.edu)
Office Hours	Tu, Th 11:20A-12:20P and any other time by appointment
Class	Tu, Th, 9:45A-11:15A. Hybrid mode (online for the first two weeks and face to face teaching will be decided for the following weeks).
Text:	Introduction to Atmospheric Chemistry, Daniel J. Jacob
	(Available online: http://acmg.seas.harvard.edu/people/faculty/djj/book/index.html)
Supplements	Atmospheric Chemistry and Physics: from Air Pollution to Climate Change, John H. Seinfeld and Spyros N. Pandis, 3rd Edition.

Course Description (from catalog):

Chemistry of the lower atmosphere (troposphere and stratosphere) including photochemistry, kinetics, thermodynamics, box modeling, biogeochemical cycles and measurement techniques for atmospheric pollutants; study of important impacts to the atmosphere which result from anthropogenic emissions of ect, urban smog and stratospheric ozone depletion. Special fees apply. Prerequisites/Co-requisite: ATM F601 or permission of instructor. (Cross-listed with ATM F606. Stacked with CHEM F406.) (3+0)

Course objectives / Learning Goals:

You will be able to understand the conversations of atmospheric chemists, seminars on atmospheric chemistry, and discussions with fellow students studying atmospheric chemistry. You will also develop skills in higher-order analysis that will assist both in chemistry pursuits and general studies.

Prerequisites:

Because students may come to this class with a variety of backgrounds, I have made accommodations for students who are either from a pure atmospheric or a pure chemistry background. In either case, I will provide tutorials on the topic that you are missing. A fully prepared student will have the following:

layers, vertical profiles of pressure and temperature) (A)

If you feel you have a lack in either (A: Atmospheric structure) or (B: Basic chemical principles), you should attend the tutorial sessions. These sessions will be held during the first three weeks of classes at a time that is convenient for interested students. In addition to these basic topics, we will cover the following topics, but some knowledge in this area would be beneficial:

Chemical equilibrium, Chemical kinetics, Oxidation states, Chemical catalysis, Basic photochemistry

Course Structure

Classroom sessions, held twice a week, discuss theoretical and practical aspects of atmospheric chemistry. The class-
assigned every two weeks. The solutions to problem sets are due at the beginning of class on Tuesday. Please begin the problem set early so that you do not have a deadline crunch and are able to ask questions regarding the problems.

The other half of the material will come from a term paper and an AGU-type presentation. The guideline is attached at the end. All students will participate the term project. Undergraduate student can choose to work with any graduate student on their project. Graduate student will give an oral presentation on their project at the end of the semester and submit a term paper.

Course Policies

Behavior and Collaboration- Students are expected to conduct themselves professionally at all times. Disrespect of the classroom learning environment, instructors, and fellow students is not tolerated! Collaboration and working in small groups is a key component of classroom time.

Honor code and Academic integrity- Students are expected to conduct themselves in accordance with the UAF Honor code. The Chemistry Department policy states: Any student caught cheating will be assigned a course grade of F. The student s academic advisor will be notified of this failing grade and the student will not be allowed to drop the course.

Instructor-Initiated Withdrawals- Any time up to and including the final date to drop a course with a

Problem sets and Late work: You are welcome, and encouraged, to discuss the problem sets with each other. However, problem sets should always be solved and written up individually. All calculations, graphs, etc., should be completed individually. Show all work, explaining in sufficient detail how you arrived at the answer. Some questions will be easy to answer, and you may be able to do them in your head but you must still explain how you arrived at your answer.
Homework problem sets are due on Tuesdays at the beginning of class. **Ten points will be deducted (out of 100 total points) for each day late, up to the third day, after which the problem set will receive no credit.** If you have to travel for a conference or have another emergency, I will make every reasonable attempt to accommodate these issues as long as you either inform me before a planned absence or immediately after an emergency. Meeting deadlines is important to allow 82(to)-20.H 1 3imme(

This course is graded with letter grades but no +/- grades. This class is a stacked course, meaning that both senior-level undergraduates and graduate students can take the course. Undergraduates taking the course (those taking CHEM F406) will be graded by the following scheme:

Midterm exam	20%
Final exam	20%
Problem sets	40%
Presentations	20%

Students taking CHEM F406 complete a few fewer problems on the problem sets than the graduate students in addition to not writing term paper. However, undergraduate students are expected to do the term project and give the in-class project presentations.

Tentative Grade Scale:

A	90 - 100%
B	80 - 89%
C	70 - 79%
D	60 - 69%

If I find that students are close to a borderline between grades, I may choose to lower the threshold for the higher grade, but I will not raise the thresholds above the scale listed above.

Disability Services- I will work with the Office of Disabilities Services (208 Whitaker Bldg, 474-5655)

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16		**Final Exam**	

Student protections and services statement
Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

Guidance for Term paper and Presentation (Aug 2020)

In-depth review of narrow topic, showing familiarity with at least 3 journal papers, or a paper describing and drawing conclusions from your own research project.

Due Friday NOV 30 by MIDNIGHT in my inbox jmao2@alaska.edu.

Do not turn in late. If you do, each day late will be marked down one whole letter grade.

Overall Objective of final project:

Practice

- **Title** should describe in a specific manner the content you are covering. If you are focusing on a specific location or season, be sure to include that in the title.

- **Abstract** should include a brief statement of the scientific question to be addressed and why it matters; the approach(es) to address this question; and must summarize key messages and findings.

- **Introduction** provides the context for the question being addressed. What background information must the reader know in order to understand the rest of the paper? Remember to assume the reader has taken this course, so it should not be a textbook discussion. What work has previously been done, and what questions remain, that you are addressing here? often effective to end your first paragraph of the intro with a statement communicating the objective of the paper so the reader immediately knows where headed. The objective and how you are tackling it can be elaborated on in the final paragraph of the introduction.

- **Approach** (or describes the techniques or methods used to address the question. Be sure to discuss their strengths and limitations. Include any background material the reader may need i.e., few sentences on how the instrument works or how the lab experiment was set up, or what goes into the model (with references that point to more detailed information).

- **Results and Discussion**. (A side point on writing style-- , ¶ generally not in favor of having a section titled ³ 5 H V X and when a separate section of ³ ' L V F X V V This is clearly a difference from the typical structure for a scientific publication! I prefer to organize headings summarizing what is actually in the section and discussing the results where they are presented, but again, this is my own style.)

  Subsections are appropriate, even under Results and Discussion headings. For example:

  2. Sensitivity of climate to changes in air pollutant emissions

  Include text describing general points here.

  2.1 Ozone precursors (subsections here of NOx, CO+NMVOC, CH4)

  Include specific points on ozone here.

  2.2 Aerosols

  Include specific points on aerosols here, or even have further subsections on individual aerosol cm6912 0 612 792 reW*TJET/F2 12 Tf1 0 0 1 ETQ/F2 0 1 32

Very-short lived halogen species and stratospheric chemistry
Stratosphere-troposphere exchange and impacts on chemical budgets
Oxidizing capacity as determined from observed methyl chloroform or ^{14}CO
Isotopes in atmospheric chemistry (sulfate, nitrate, water, or hydrocarbons)
Methane trends (paleo, preindustrial-to-present, or recent decades)
Methane role in oxidizing capacity and/or air quality
Chemistry occurring on dust or other aerosols
Sources of baseline ozone levels in surface air