

ATMOSPHERIC CHEMISTRY

CHEM F606 (cross listed as ATM F606) Overview and Schedule ---- Fall 2022

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| Instructor | Dr. Jingqiu Mao (Reichardt 188, 907-474-7118, jmao2@alaska.edu) |
| Office Hours | By appointment |
| Class | Tu, Th, 9:45A-11:15A. REIC 203 |
| 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 pollutants, including acid rain, the “greenhouse” effect, 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:

By the end of the semester, you will have a basic knowledge of:

- The atmospheric chemical composition
- The transformations of these compounds
- The importance of chemicals in the atmosphere for climate, human health, and ecosystem health
- Air pollution and atmospheric removal of pollutants

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.

Course Structure

Classroom sessions, held twice a week, discuss theoretical and practical aspects of atmospheric chemistry. The class-time lectures and discussions will follow the course’s textbook. Problem sets are 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 "W," the professor has the right to withdraw a student that "...has not participated substantially in the course."

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 for timely correction and return of the problem sets. **Everyone is allowed to hand in one problem set late (by 5pm Sunday) without penalty.**

Grading Criteria:

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| Midterm exam | 15% |
| Final exam | 15% |
| Problem sets | 40% |
| Term Paper | 15% |
| Presentations | 15% |

Graduate-level students also lead a term project and give in-class presentation, which is a graded activity, and all students are given credit for participation in the in-class discussions of oral presentations.

Tentative Grade Scale:

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| 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) to provide reasonable accommodation to students with disabilities. It is the student's responsibility to make an appointment with me to discuss appropriate accommodations. A letter from disabilities services must be provided.

Tentative Schedule:

| Wk | Dates | Topic | Reading |
|----|--------------|---|-------------|
| 1 | 30 Aug,1 Sep | Introduction/ Atmospheric chemical composition | 1,2 |
| 2 | 6, 8 Sep | Simple atmospheric models; lifetimes | 3,5 |
| 3 | 13,15 Sep | Atmospheric Transport and geochemical cycling | 4.1,4.2,4.3 |
| 4 | 20,22 Sep | Oxidation states of elements and geochemical cycles | 6 |
| 5 | 27,29 Sep | Aerosol particles / Radiative forcing | 7 |
| 6 | 4,6 Oct | Aerosol particles | 8 |
| 7 | 11,13 Oct | Kinetics & Equilibrium & Midterm Exam | 9.1-9.2 |
| 8 | 18,20 Oct | Photochemistry / Stratospheric ozone | 9.3, 10.1 |
| 9 | 25,27 Oct | Stratospheric ozone | 10.2-10.3 |
| 10 | 1,3 Nov | Aqueous / heterogeneous reactions | 10.4 |
| 11 | 8,10 Nov | Tropospheric oxidation | 11 |
| 12 | 15,17 Nov | Ozone Air pollution | 12 |
| 13 | 22 Nov | Acid deposition and aerosol production | 13 |
| 14 | 29 Nov,1 Dec | Arctic atmospheric chemistry/Student Presentations | |
| 15 | 6, 8 Dec | Student Presentations/Review | |
| 16 | | Final Exam | |

COVID-19 statement: Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website:

<https://sites.google.com/alaska.edu/coronavirus/uaf?authuser=0>

Further, students are expected to adhere to the university's policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

Student protections statement: UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: <https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

Disability services statement: I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

ASUAF advocacy statement: The Associated Students of the University of Alaska Fairbanks, the student government of UAF, offers advocacy services to students who feel they are facing issues with staff, faculty, and/or other students specifically if these issues are hindering the ability of the student to succeed in their academics or go about their lives at the university. Students who wish to utilize these services can contact the Student Advocacy Director by visiting the ASUAF office or emailing asuaf.office@alaska.edu.

Student Academic Support:

- Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor)
- UAF Math Services, uaf-traccloud@alaska.edu, Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, <https://www.ctc.uaf.edu/student-services/student-success-center/>)
- For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf)

Student Resources:

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)
- Student Health & Counseling [6 free counseling sessions] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Gruening 215)
- Center for Student Rights and Responsibilities (907-474-7317, uaf-studentrights@alaska.edu, Eielson 110)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

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UAF Department of Equity and Compliance

1692 Tok Lane, 3rd floor, Constitution Hall, Fairbanks, AK 99775

907-474-7300

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