



## CLIM-438/CHEM-438 Syllabus

### Atmospheric Chemistry

Spring Semester, 2026  
Tuesday, Thursday, 12:00 - 1:15pm EST  
Music and Theater Building 1008

**Instructor:** Prof. Daniel Tong

#### **Catalog Description:**

This course reviews fundamental chemical processes of the Earth's atmosphere including chemical cycles, thermodynamics, reaction kinetics, photochemistry, radiative balance, ozone chemistry and environmental issues, including outdoor and indoor air pollution, acid rain, ozone hole, and climate change. Offered by jointly Atmospheric/Oceanic/Earth Sci and Chemistry. Limited to three attempts.

This course is listed under the Department of Atmospheric, Oceanic & Earth Sciences (AOES) as CLIM 438 and under the Department of Chemistry (CHEM) as CHEM 438.

Course credits: 3

Prerequisites: None

**General Course Goals:**

- The overarching goal of this course is to provide students with an overview of the atmospheric chemicals that affect air quality, climate, human and ecosystem health.
- This course is designed to help students to understand the science behind many pressing issues faced by today's society, such as climate change and air pollution.
- This course focuses on the general chemistry and principals of atmospheric composition, but not on detailed knowledge of air pollution and climate change.

**Learning Outcomes:**

Upon completion of this course, students will be able to:

- Understand the key physical and chemical processes that control the life cycle of chemicals in the Earth's atmosphere;
- Be familiar with various atmospheric chemical species that affect climate, human health and ecosystems;
- Apply the principals and conceptual models in interpreting existing and emerging phenomena related to atmospheric chemistry.

**Instructor and Contact Information:**

Prof. Daniel Tong

Research Hall, Room 264

Mail Stop 6A2

Email: [qtong@gmu.edu](mailto:qtong@gmu.edu)

Office Hours: 2:00-3:00pm, Tuesday; Additional hours by appointment

**Course Website:**

GMU Blackboard: <https://gmu.blackboard.com/>

- Class notes will be posted on GMU Blackboard
- In order to comply with student privacy laws, faculty and students need to use their GMU e-mail accounts when corresponding with each other.

**Textbook:**

*Chemistry of the Upper and Lower Atmosphere*

Barbara Finlayson-Pitts and James Pitts, Jr., Academic Press

ISBN-10: 0-12-257060-x

GMU Library e-Book: <https://doi-org.mutex.gmu.edu/10.1016/B978-0-12-257060-5.X5000-X>

Supplemental reading:

*Chemistry of the Natural Atmosphere*

Peter Warneck, Academic Press, ISBN 0-12-735632-0

**Tentative Course Schedule:**

Week	Content	Readings
1	Welcome History of atmospheric chemistry	Finlayson-Pitts & Pitts Ch 1
2	The Earth's atmospheric system	Finlayson-Pitts & Pitts Ch 2
3	Spectroscopy and photochemistry: Fundamentals	Finlayson-Pitts & Pitts Ch 3
4	Photochemistry of Key Atmospheric Species I	Finlayson-Pitts & Pitts Ch 4 A-G
5	Photochemistry of Key Atmospheric Species II	Finlayson-Pitts & Pitts Ch 4 H-V
6	Chemical Kinetics and Photochemistry	Finlayson-Pitts & Pitts Ch 5
7	Organics – NO <sub>x</sub> – Ozone Air Mixtures Midterm Exam Review	Finlayson-Pitts & Pitts Ch 6
<b>Spring Break</b>		
8	<b>Midterm Exam</b> Chemistry of Atmospheric Oxygen	Finlayson-Pitts & Pitts Ch 1
9	Chemistry of Inorganic and Organic Acids	Finlayson-Pitts & Pitts Ch 8
10	Stratospheric Ozone and Halogenated Organics	Finlayson-Pitts & Pitts Ch 12.C
11	Chemistry of Atmospheric Aerosols	Finlayson-Pitts & Pitts Ch 9
12	Chemistry of Indoor Air Pollution	Finlayson-Pitts & Pitts Ch 15
13	Global Atmospheric Chemistry and Climate Change	Finlayson-Pitts & Pitts Ch 14
14	Applications of Atmospheric Chemistry Final Exam Review	Finlayson-Pitts & Pitts Ch 16
15	No Class, Reserved for extra Office Hour <b>Final Exam or Project Report/Presentation Due</b>	

**Course Format:**

- 1) Lectures
- 2) Bi-Weekly homework assignments
- 3) Midterm exam
- 4) Final exam or Term Project (**mandatory for Graduate; optional for Undergraduate Level**)

**Important Notes:**

- Attendance Policy: Students must attend all classes.
- If you arrive more than 20 minutes late for an exam, or after anyone has finished the exam and left, you may not take it.
- Anyone caught cheating on an exam will be referred to the George Mason University Honor Council.
- The exams are closed book, closed to notes and all outside materials. Use of outside materials are not allowed.
- If you have a schedule conflict and cannot take an exam on the scheduled day, let me know ahead of time and I will try to arrange an alternative test date.

**Makeup Policy:**

- Late exams will be permitted if the instructor is provided with an acceptable explanation and if performed within one week of the original exam. Make-up exams must be scheduled **in advance** with instructor permission.

**Course Grading Policy:**

Homework 40%  
Attendance 10%  
Midterm Exam 20%  
Final Exam 30%

**Numerical Grade Ranges:**

A	94-100%
A-	90-93%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D	60-69%
F	Below 60%

### **Religious Holidays and Observations:**

<http://ulife.gmu.edu/calendar/religious-holiday-calendar/> is available to help minimize difficulties for students of different faiths. It is the student's responsibility to speak to the instructor in advance should their religious observances impact their participation in class activities and assignments.

### **Students with Disabilities:**

If you have a documented learning disability or other condition that may affect academic performance, you should: 1) make sure this documentation is on file with **Office of Disability Services** to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Office of Disability Services: <http://ods.gmu.edu>

### **Academic Integrity**

The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that:

- 1) all work submitted be your own;
- 2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and
- 3) if you are uncertain about the ground rules on a particular assignment, ask for clarification.

Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

Office of Academic Integrity: <http://oai.gmu.edu/>

Honor Code: <https://oai.gmu.edu/mason-honor-code/full-honor-code-document/>

### **Mason Diversity Statement**

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also

entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.

The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found in all settings, including individual work units and groups, student organizations and groups, and classroom settings; it is also found with the delivery of services and activities, including, but not limited to, curriculum, teaching, events, advising, research, service, and community outreach.

Acknowledging that the attainment of diversity and inclusion are dynamic and continuous processes, and that the larger societal setting has an evolving socio-cultural understanding of diversity and inclusion, Mason seeks to continuously improve its environment. To this end, the University promotes continuous monitoring and self-assessment regarding diversity. The aim is to incorporate diversity and inclusion within the philosophies and actions of the individual, group and organization, and to make improvements as needed.

<https://diversity.gmu.edu/>

### **Counseling and Psychological Services**

If are in crisis or need information or services for psychological stress, violence, or other issues that require counseling: <https://caps.gmu.edu/>.