CLIM-319 Syllabus
Air Pollution

Fall Semester, 2023
Tuesdays - Thursdays, 3:00 - 4:15pm EST
Innovation Hall, 316
Instructor: Zafer Boybeyi
Tentative Syllabus: August 11, 2023

Introduction:

CLIM-319 is a green leaf related course (3-credit) listed under the Department of Atmospheric, Oceanic & Earth Sciences (AOES). This course focuses on air pollution problem covering description of major types of air pollution and introduction to how their characteristics are influenced by interaction with the atmosphere. Topics include sources and distribution of pollution from local to global scales, effects of radiation and wind on pollution, modeling of plume dispersion and air quality, pollution effects on climate and air pollution control strategies, standards and regulations. This course would be useful for any student wanting a one-semester overview of the fundamentals of air pollution.

General Course Goals:

- The overarching goal of this course is to provide students with an overview of the physical, chemical, and dynamical processes which control the state and evolution of air pollutants.
- This course is designed to help students to understand the key scientific discoveries and remaining unanswered questions in air pollution and their impact on weather, climate, and environment.
- This course is also designed to provide students an overview of the primary scientific principles and analytical tools used in air pollution studies including numerical models.

Course Learning Outcomes:

By the end of the semester students will be able to demonstrate a basic understanding of:

- Atmospheric composition and air pollution problem
- Geochemical cycles of nitrogen, oxygen and carbon dioxide
- Air pollution fundamentals (primary, secondary, criteria and hazardous pollutants)
- Air pollution scale considerations, sources, sinks, inventories, and time trends
- Air pollution episodes
- Air pollution meteorology (transport, diffusion, inversion, topography, fumigation, etc.)
- Air pollutants impact on weather, climate, and environment
- The greenhouse gases and global warming
- Aerosols
- Chemical kinetics
- Stratospheric ozone
- Oxidizing power of the tropospheric ozone
- Acid Rain
- Air pollution control strategies, standards, and regulations

- A simple box model
- Air quality models
- Atmospheric transport and dispersion models (Gaussian plume models)
- Special applications (emergency response systems & risk assessments)

Instructor and Contact Information:

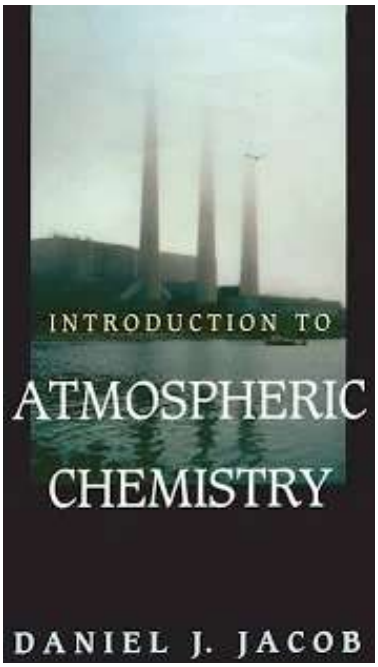
Prof. Zafer Boybeyi
Research I, Room 217
Mail Stop 6A2
Email: zboybeyi@gmu.edu
Online Office Hours: Tuesdays and Thursdays, 1:00-3:00pm EST
Additional hours by appointment

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.

Recommended Textbook (but not required):



Introduction to Atmospheric Chemistry
Daniel J. Jacob
Princeton University Pres
ISBN-13: 978-0-691-00185-2

Notes and articles will be provided by the instructor

Course Format:

1) Lectures
   - Covering material
   - Group discussion
   - Analysis of historical air pollution episodes

2) Bi-Weekly homework assignments

3) Reading assignments from supplemental material

4) A final project*

5) Surprise quizzes

6) Midterm exam

7) Final exam

* Identify an air pollution episode case and analyze the meteorological conditions, including synoptic maps and available supporting observations such as sounding, satellite images etc. Then, analyze key characteristics of the selected air pollution case such as intensity, duration, max concentration, etc. Finally, write few pages term paper, submit the paper electronically and present the results in class (10 minutes presentation).

Tentative Course Schedule:

Week 1 (Aug. 22 & 24)	Introduction to PBL & Measures of Atmospheric Composition
Week 2 (Aug 29 & 31)	Geochemical Cycles
Week 3 (Sep. 5 & 7)	Air Pollution Fundamentals
Week 4 (Sep. 12 & 14)	Air Pollution Dispersion Considerations
Week 5 (Sep. 19 & 21)	Air Pollution Meteorology
Week 6 (Sep. 26 & 28)	Air Pollution Control Strategies, Standards and Regulations
Week 7 (Oct. 3)	A Simple Box Model
Week 7 (Oct. 5)	**Midterm Exam**
Week 8 (Oct. 10)	**Tuesday Classes Do Not Meet This Week**
Week 8 (Oct. 12)	Air Quality Models
Week 9 (Oct. 17 & 19)	Gaussian Plume and Monte Carlo Particle Models
Week 10 (Oct. 24 & 26)	Greenhouse Gases
Week 11 (Oct 31 & Nov. 2)	Aerosols
Week 12 (Nov. 7 & 9)	Stratospheric Ozone
Week 13 (Nov. 14 & 16)	Tropospheric Ozone
Week 14 (Nov. 21)	Acid Rain
Week 14 (Nov. 23)	**Thanksgiving, No Classes**
Week 15 (Nov. 28)	Special Applications (Emergency Response & Risk Assessments)
Week 15 (Nov. 30)	**Final Project Presentations**

Final Exam (Cumulative): Dec. 7, Thursday 2022 at 1:30 – 4:30pm EST

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 constitute cheating.
- 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:

- Students will be permitted to submit late homework on a case-by-case basis.
- 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.

Important Course Dates:

- First lecture: Tuesday, August 22, 2023 (3:00 - 4:15pm EST)
- Midterm Exam: Thursday, October 5, 2023 (3:00 - 4:15pm EST)
- Final Exam: Thursday, December 7, 2023 (1:30 - 4:15pm EST)

Course Grading Policy:

Homework	15%
Participation*	5%
Final Project**	15%
Surprise Quizzes	10%
Midterm Exam***	25%
Final Exam****	30%

*Participation consists of attendance.
** The students will analyze and present a historical air pollution episode.
*** You are responsible for all material provided by the instructor.
**** The final exam is comprehensive (covering all material covered in the course).

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 are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

George Mason University Honor Code:

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely.

What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form.

Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind), please ask for guidance and clarification.

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

http://www.gmu.edu/departments/unilife/pages/honorcode.html