**1.085/12.336: Air Pollution and Atmospheric Chemistry**

*Fall 2020*

*MW 9:30-11:00am (eastern), Virtual on zoom*

Instructor: Colette L. Heald ([heald@mit.edu](mailto:heald@mit.edu))

Office 48-335, Tel: x4-5666 (rarely in office in F20; please contact me by email)

Website: <https://canvas.mit.edu/courses/3239>

**OBJECTIVE:** Provide a working knowledge of basic air quality issues, with emphasis on a multidisciplinary approach to investigating the sources, transformations and effects of pollution.

**PRE-REQUISITE**: 18.03 or equivalent

**PRIMARY TEXT:**

Daniel J. Jacob, Introduction to Atmospheric Chemistry, Princeton University Press, 1999.

(Available online: http://acmg.seas.harvard.edu/people/faculty/djj/book/index.html)

**BACKGROUND TEXTS:**

John H. Seinfeld and Spyros N. Pandis, *Atmospheric Chemistry and Physics: from Air Pollution to Climate Change*, 2nd Ed. John Wiley and Sons, 2006. (Available as ebook through MIT Libraries: http://library.mit.edu/item/001383726)

**COURSE STRUCTURE & GRADING CRITERIA:**

All lectures will be given synchronously over zoom during the scheduled course time. Lectures will be recorded on zoom and available through canvas, however I strongly encourage you to attend live so that you can participate in the class discussion and ask questions about the material.

Periodic problem sets are assigned and are due by 5pm (eastern) on the date indicated on the assignment (planned dates indicated on syllabus and on canvas). Assignments will be published on canvas at least one week before due date. Please submit your problem sets online through canvas (you can use Adobe Scan or similar app to scan your written assignment with your phone). Late assignments will be docked 25% each day and will not be accepted after 3 late days. Exceptions will be made for medical or family emergencies, and will require documentation (e.g. doctor’s note, communication from S3) for instructor approval. Homework will be graded and I will provide feedback over canvas. Homework assignments can be discussed in groups, but MUST be written up independently. Evidence of copying will result in a zero grade for the assignment.

There will be two in-class quizzes through canvas. Quizzes are designed to test understanding of basic concepts and are closed book and closed notes. There is no final exam.

There are 2 projects associated with the class: an analysis of field measurements, and a final presentation. Further guidelines and grading criteria will be distributed early in the course. Note that for the final presentation topic proposals are due in October and will be reviewed to ensure project criteria are met.

Problem Sets: 50% Projects: 30% Quizzes: 20%

**DURING COVID:**

This is not a normal school year. This semester we will all be doing our best under difficult circumstances. I have tried to adapt the class to work well in online delivery, but there will be hiccups, and I welcome your feedback. Please communicate with me early and often if you need any accommodations. I am excited to teach you about air pollution; thank you for engaging and adapting in this challenging time.

Student Support Services

If you are dealing with a personal or medical issue that is impacting your ability to attend class or complete work, please discuss this with Student Support Services (S3). The deans in S3 will verify your situation, and then discuss with you how to address the missed work. Students will not be excused from coursework without verification from Student Support Services. You may consult with Student Support Services in 5-104 or at 617-253-4861 or via s3‑support@mit.edu.

**PRELIMINARY CLASS SCHEDULE:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Date** | | | **TOPIC** | **Reading**  **(Ch=Jacob; pp=Seinfeld&Pandis)** | **PS and Project Due Dates** |
| September | 2 | We | Intro/Atmospheric Composition | Ch. 1  pp. 75-93 |  |
|  | 7 | Mo | MIT Holiday | | |
|  | 9 | We | Air Quality Regulations & Health |  |  |
|  | 14 | Mo | Chemistry Concepts &  Atmospheric Pressure | Ch. 9  Ch. 2 |  |
|  | 16 | We | Models | Ch. 3 |  |
|  | 21 | Mo | Atmospheric Meteorology & Transport | Ch. 4 |  |
|  | 23 | We | Biogeochemical Cycles | Ch.6 | **PS 1** (*basic concepts / atmospheric pressure / box models*) |
|  | 28 | Mo | Radiation & the Greenhouse Effect | Ch. 7 |  |
|  | 30 | We | Stratospheric Chemistry  (distribute Project #2 guidelines) | Ch.10 | **PS 2** (transport, *biogeochemical cycles, radiation*) **due Oct 2** |
| October | 5 | Mo | Stratospheric Chemistry | Ch.10 |  |
|  | 7 | We | Tropospheric Chemistry  (distribute Project #1 guidelines) | Ch. 11 | **PS 3** (*stratospheric chemistry*) |
|  | 12 | Mo | MIT Holiday | | |
|  | 14 | We | **IN CLASS QUIZ #1** |  |  |
|  | 19 | Mo | Tropospheric Chemistry | Ch. 11 | **Project #2 Proposal due** |
|  | 21 | We | Ozone Smog & Urban Air Quality | Ch. 12 |  |
|  | 26 | Mo | Ozone Smog & Urban Air Quality | Ch. 12 | **Project #1 due** |
|  | 28 | We | Introduction to Aerosols | Ch. 8  55-63, 368-389 |  |
| November | 2 | Mo | Introduction to Aerosols | Ch. 8  55-63, 368-389 | **PS 4** (*tropospheric chemistry and smog chemistry*) |
|  | 4 | We | Aqueous phase chemistry | 284-324 |  |
|  | 9 | Mo | Acid Rain | Ch. 13  954-971 |  |
|  | 11 | We | MIT Holiday | | |
|  | 16 | Mo | Air Pollution Control &  Energy, Emissions & Air Quality |  |  |
|  | 18 | We | Indoor Air Pollution |  | **PS 5** (aerosols, *aqueous chemistry / acid rain*) |
|  | 23 | Mo | Thanksgiving Holiday | | |
|  | 25 | We | Thanksgiving Holiday | | |
|  | 30 | Mo | **IN CLASS QUIZ #2** |  |  |
| December | 2 | We | In-Class Presentations **Project #2** |  |  |
|  | 7 | Mo | In-Class Presentations **Project #2** |  |  |
|  | 9 | We | No class | | |