

ATMOS 3100: Atmospheric Chemistry and Air Pollution Spring Term 2017



Department of

ATMOSPHERIC SCIENCES

MINES AND EARTH SCIENCES | THE UNIVERSITY OF UTAH

Syllabus edited on: Jan. 9th, 2017



(Photo: by J. Lin, on Jan. 3th, 2015)

Course Description:

Air pollution and adverse air quality in general continue to be an issue in many regions around the world, as the global population increases and increasingly residing in urban areas, in which emissions and exposure are intensified. A knowledge of the physical processes behind air pollution—both the chemistry and meteorology—are essential for devising effective policies to combat adverse air quality. This class will examine these physical processes and will also touch upon the U.S. national and international regulatory regime that has evolved to address air pollution.

Prerequisites:

- *Calculus 2*
- *General Chemistry*

Scheduled class time:

Tuesdays and Thursdays: 2pm to 3:20pm in WBB 517

Instructor

Course Instructor

Prof. John C. Lin

Associate Professor, Dept. of Atmospheric Sciences

E-mail: John.Lin@utah.edu

Office: 721 WBB (William Browning Building)

For Appointments

Prof. John Lin

Office: 721 WBB

Often right after class is a good time to talk briefly.

Otherwise just e-mail me to set up a time!

Course Objectives

- Introduce the chemistry underlying air pollution
- Obtain ability to carry out chemical calculations
- Understand meteorological phenomena leading to adverse air quality
- Learn about scientific instruments and measurements that quantify air pollution events
- Examine air quality data and carry out a small research project
- Think about regulatory framework and policy decisions to improve air quality

Rough Schedule and Topics that Will be Covered in Class

(NOTE: schedule could be subject to change, depending on the pace of the class and other events)

Class 1: Introduction

Class 2: Fundamental Chemistry Concepts

Class 3~4: Atmospheric composition and structure

Class 5~7: Aerosols and the wintertime particulate matter (PM) problem in Salt Lake Valley

Class 8: Lab Tour

Class 9~10: Tropospheric ozone

Class 11: U.S. Clean Air Act and state implementation plans and “exceptional events”

Class 12: Wildfires and dust

Class 13~14: Stratospheric ozone depletion (“ozone hole”)
Class 15~16: Atmospheric transport and air pollution
Class 17~20: Greenhouse gases, TRAX-based observations of greenhouse gases & air quality
Class 21: Carbon cycling in the Western U.S.
Class 22: Urban greenhouse gas and pollutant emissions
Class 23: Midterm Exam
Class 24~26: Modeling of air quality; climate-air quality nexus
Class 27~29: In-class oral presentations of final projects

Grading

Problem Sets:	40%
Midterm Exam:	25%
Research Project:	30%
Class Participation:	5% (attendance and participation)

Extra Credit

Throughout the course of the semester, we will read scientific papers that illustrate the concepts introduced in class. These papers are an integral part of the course. This will be an opportunity for you to get familiar reading the “primary literature”--i.e., the papers in which new science is published. Volunteers will be solicited to present the paper to the class. Each volunteer will receive extra credit for this additional effort!

Textbook

- Mark Z. Jacobson: *Air Pollution and Global Warming, 2nd Edition*, Cambridge University Press, 2012
- Lecture notes

Late Policy

Score gets halved each additional day after the deadline. For instance, if an assignment is late by 3 days, then even if it garnered a perfect 100% score, it will be marked down by a factor of $1/2^3=1/8$, or $100\%/8=12.5\%$.

Center for Disability Services

If you will need accommodations in the class, please give reasonable prior notice to the Center for Disability Services: <http://disability.utah.edu/>

Faculty and Student Responsibilities

All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. The Code prohibits cheating on tests, plagiarism, etc. Students should read the Code carefully and know they are responsible for the content.

Scheduling Accommodations:

Except in cases of sudden illness or emergency, you shall in advance of any absence arrange with the instructor to make up materials. If you miss an exam or assignment due to illness, you must provide medical documentation (i.e., letter from doctor) in order to make up missed work.

This syllabus is not a legally-binding contract. The instructor reserves the right to make modifications when the student is given reasonable advance notice.