

Atmospheric Sciences 212 – Autumn Quarter 2008
Air Pollution: From Urban Smog to the Ozone Hole
<http://courses.washington.edu/atms212/index.shtml>

Class Meeting Times: Daily (M-F) 10:30-11:20 am.

Class Meeting Location: Atmospheric Sciences/Geophysics (ATG) building room 310c.

Instructor: Becky Alexander

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Course Description

This course is an introduction to air pollution on local, regional, and global scales. We will focus on the sources, transformation, and dispersion of pollutants responsible for urban smog, acid rain, climate change and the stratospheric ozone hole. We will examine the health and environmental effects of air pollutants, as well as current (or potential) technological solutions and policy regulations.

The class will be divided in three parts:

- **Introduction to air pollution (weeks 1-2).** We will define air pollution and present a brief history of current regional and global air pollution problems. We will discuss the factors controlling the natural composition of the atmosphere.
- **Local and regional pollution issues (weeks 3-8).** In this part of the class we will discuss the sources and fate of pollutants focusing on specific local/regional air pollution issues: urban smog, aerosols and acid rain, visibility, and indoor air pollution. For each of these issues we will discuss the health and environmental effects, technological solutions, as well as current national and international regulations.
- **Global scale pollution issues (weeks 9-10).** We will examine the causes and effects of two major global air pollution issues: stratospheric ozone depletion and climate change. We will discuss projections of future air quality in the U.S. and around the world. Will the future be cleaner? What choices will we make?

The course is intended for non-science, liberal arts majors and fulfills 5 credits of the Natural World (NW) distribution requirement. The course is also designated as a "W" course.

Prerequisites

None. Open to all undergraduates.

Textbook

Required textbook: *"Earth Under Siege"* by Richard Turco, Oxford University Press, 2002.

The lectures will generally follow the textbook. Each week the students will be given reading assignments directly relevant to the class. In addition, after each class, lecture notes will be posted on the web. These notes will summarize the main topics covered and provide additional material not included in the book (such as links to web sites and additional reading material).

Other useful textbook: *"Atmospheric Pollution"* by Mark Z. Jacobson, Cambridge University Press, 2002. This textbook is placed on reserve in the Odegaard Undergraduate Library. Max loan period: 2 hours (no overnight).

Grading policy

Your grade will be based on exams (two midterms and one final exam), assignments, a research project, and class participation:

Assignments 24%

Research project 25%

Midterms 20%

Comprehensive final exam 21%

Class participation 10%

You are expected to attend lectures and participate in class. There will be no make-up exams except in extreme circumstances, in which case you must contact the instructors in advance of the exam.

Research project and symposium

Students will research the details of some aspect of air pollution. The instructor will suggest some topics. Your grade on the project will be based on (1) a written report (which will need to be revised if you are taking this as a "W" class) and (2) a poster presentation scheduled for the last week of class (June 4 & 5, 2008).

Assignments

Assignments will require you to answer questions (mostly short answer) drawn from lectures and online resources. Some assignments will be a written critique of an article in the non-scientific media about some aspect of air pollution. We will select a few to be presented orally as a basis for class discussion.

Assignments are due in class at 10:30 am on the day indicated. *Late assignments will not be accepted without advance arrangement.*

Extra Credit

There will be a number of extra credit opportunities during the course of the quarter. Some will be in the form of extra credit questions on quizzes, homework assignments and exams, others will be based on attending a seminar related to air pollution, and writing a short paragraph or two describing what the seminar was about. We will post dates of some seminars you might find interesting. Each student can attend a maximum of 2 seminars for extra credit. Another possibility is finding a recent article in the popular press (newspaper article) related to air pollution science, regulation, or health effects. The students will write a short paragraph or two on the article. Extra credit is due within one week after the seminar or publication date.

Class schedule
(as of 11/12/2008 – please see web site for updates)

Date	Lecture topic	Required reading	Due
PART I. INTRODUCTION TO AIR POLLUTION AND THE COMPOSITION OF THE ATMOSPHERE			
WEEK 1			
W 9/24	Introduction and course overview		
Th 9/25	Health effects of air pollution		
F 9/26	History of air pollution		
WEEK 2			
M 9/29	<i>Discussion – Carbon footprint</i>		
Tu 9/30	Basic concepts and definitions	Ch. 2 (p. 9-20)	
W 10/01	Basic concepts and definitions		
Th 10/02	Composition of the present day atmosphere: ingredients and properties		PS#1
F 10/03	Evolution of the atmosphere	Ch. 4 (p. 84-88; 91-98; 104-106)	
WEEK 3			
M 10/06	Air pressure, density, and temperature structure; Boyle's and Charles' laws	Ch. 2 (p. 24-36)	
Tu 10/07	Indoor air pollution	Ch. 8 (p. 223-252)	
PART II. LOCAL AND REGIONAL POLLUTION ISSUES			
W 10/08	Sources of pollutants to the atmosphere	Ch. 5 (p. 111-113)	
Th 10/09	Dispersion of pollutants; effect of meteorology on pollution	Ch. 5 (p. 113-118)	PS#2
Fr 10/10	NO CLASS		
WEEK 4			
M 10/13	Vertical transport of pollution	Ch. 5 (p. 118-125; 129-130)	
Tu 10/14	Vertical transport of pollution; Midterm review		
W 10/15	<i>Discussion – Vertical transport of pollution</i>		
Th 10/16	Midterm #1 (covers weeks 1-4)		
Fr 10/17	<i>Discussion - Project topic</i>		
WEEK 5			
M 10/20	LA Smog and London Smog	Ch. 6 (p.136-140)	
Tu 10/21	The ingredients of smog; Daily/seasonal variations in smog	Ch. 6 (p.140-158)	
W 10/22	Catalytic converter; Box model	Ch. 4 (p.88-91)	
Th 10/23	Smog and air quality standards		PS#3
Fr 10/24	<i>Discussion – Urban smog</i>		
WEEK 6			
M 10/27	Particulate Matter (PM)		
Tu 10/28	Haze and visibility	Ch. 3 (p. 55-68), Ch. 6 (p. 163-174)	
W 10/29	Sources of acid rain	Ch. 9 (p.259-287)	
Th 10/30	Effects of acid rain		PS#4
Fr 10/31	<i>Discussion – Aerosols and acid rain</i>		
WEEK 7			
M 11/03	Alternative fuels	Ch. 6 (p.176-180)	
Tu 11/04	How pollutants affect health / Assessment of health risk	Ch. 7 (p. 183-203, 212-215)	
W 11/05	Air pollution trends / US air quality regulations		
Th 11/06	The natural ozone layer	Ch. 13 (p. 407-422)	PS#5
Fr 11/07	Guest lecture – Dave Suess, DSG Solutions, LLC		

WEEK 8

M 11/10	<i>Discussion– Cost benefit analysis</i>
Tu 11/11	NO CLASS – University Holiday
W 11/12	<i>Midterm review</i>
Th 11/13	Midterm #2 (covers weeks 5-8)
Fr 11/14	<i>Discussion - Project</i>

PART III. GLOBAL SCALE POLLUTION ISSUES**WEEK 9**

M 11/17	Guest Lecture – Jim Nolan, Puget Sound Clean Air Agency	
Tu 11/18	Human threats to the ozone hole	Ch. 13 (p. 422-437))
W 11/19	The ozone hole	Ch. 13 (p.437-447
Th 11/20	Regulation of CFCs	Ch. 13 (p. 447-451)
Fr 11/21	<i>Discussion – The ozone hole</i>	

WEEK 10

M 11/24	Climate and the greenhouse effect.	Ch. 11 (p. 320-342)	PS#6
Tu 11/25	Is the earth really warming?	Ch. 11 (p. 349-359)	
W 11/26	Are humans causing climate change?	Ch. 12 (p. 365-380)	1st draft W paper
Th 11/27	NO CLASS – Thanksgiving Holiday		
Fr 11/28	NO CLASS – Thanksgiving Holiday		

WEEK 11

M 12/01	What will be the impacts globally and on the pacific northwest?		
Tu 12/02	Climate change policy. What will the future look like?	Ch. 12 (p. 381-397)	
W 12/03	Project poster presentations		Project paper
Th 12/04	Project poster presentations		
Fr 12/05	<i>Review for final exam</i>		

FINALS WEEK

M 12/08	COMPREHENSIVE FINAL EXAM 8:30-10:20 am		W paper
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