

Atmospheric & Oceanic Sciences 2/2L

Air Pollution

Spring 2015

AOS 2 offers an introduction to some of today's most pressing environmental problems, such as the ozone hole, smog, climate change, etc., which are typically classified under the common term **Air Pollution**. Throughout the class, the different aspects of air pollution, their causes, effects, and possible solutions will be introduced.

This quarter's AOS 2/2L course will be taught as an online class. Lecture material will be presented through online modules and activities. Discussion sections will be held online.

Online content: Access by logging in to our CCLE site via <https://ccle.ucla.edu>

Online lectures will consist of a series of short videos, with each video followed by activities to be completed by the students. This approach is intended to engage students with the material and thus improve the learning experience. To ensure progress, content is to be viewed and completed according to the schedule appearing later in this syllabus. The activities may need to be completed satisfactorily before students advance to the next instructional module. Online lectures will be released once a week. Students will have approximately one week to complete them. Timely viewing of the lectures, i.e. in the same week as they are assigned, will be rewarded and contribute to the overall grade. Keeping a schedule is necessary so that everyone is at the same level during the discussion sections.

Discussion sections

Discussion sections are conducted online by teaching assistants. They will direct individual and group activities related to course material, and review the online lecture material as needed. Discussion sections will be scheduled at a later time

Activities completed during discussion section will be graded. Close interaction with fellow students and the teaching assistants to complete the activities is strongly encouraged.

You must attend the section in which you enroll because of space restrictions and the way certain activities take place in the discussion sections. Please check your Official Study List to ensure that you are attending the correct section, since you will not get credit if you attend the wrong section.

Please note that some sections may be full. There is no preferential enrollment; no PTEs will be issued for full sections. If you are dropped for any reason (usually a late fee payment), you will not be able to immediately re-enroll in a section that has a closed or wait-listed status. You will have to get on an open wait list; you will not be given preferential enrollment. This includes students dropped due to registrar/computer error or other administrative problems.

Laboratory section

An optional lab section AOS 2L may be added upon enrollment in the AOS 2 lecture/discussion. This 1-unit section satisfies the "lab/demo" requirement for the General Education "Foundations of Scientific Inquiry". This lab section does not have formal classroom meetings, since all assignments are posted and submitted online in our CCLE site. However, this lab section must be taken during the same quarter as the lecture/discussion.

Instructors

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Office hours

Dr. Lew

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Jochen Stutz

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Teaching Assistants

TBA

Textbook (optional)

Jacobson, M.Z., *Air Pollution and Global Warming: History, Science, and Solutions*, 2nd ed. Available at the UCLA Store, various booksellers, and accessible to the UCLA campus as e-text through the UCLA Library Catalog. Also on reserve at the UCLA College Library (Powell Hall).

Grades

Course grades are based on 1000 points earned from:

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| 6 homework assignments (20 points each) | 120 points (12% of total grade) |
| Discussion section group activities | 120 points (12% of total grade) |
| Online Lecture (10 points each) | 110 points (11% of total grade) |
| Midterm examination | 250 points (25% of total grade) |
| Final examination | 400 points (40% of total grade) |

The optional lab section (2L) adds 200 points to this total. Students enrolled in the 2L lab section in addition to the regular course (2) will have a course grade computed from a percentage of the 1200 points earned during the quarter. These students will have the same final course grade posted on their transcripts for both 2 and 2L.

The course will be graded on a curve, following UCLA's average undergraduate grade distribution. Small adjustments may be necessary to the curve may be necessary for the final grade, but you are guaranteed to pass the class (i.e., achieve a grade of C or above) if your score is 65% or above

Homework

The six homework assignments include fill-in-the-blank questions, graph drawing, and short answer questions. Assignments will be submitted electronically in our CCLE site, either as a PDF file, Microsoft Word/Office document, or an online form. Typically homework is due one week after it has been released to the students. Homework submitted after the submission deadline, but within 48 hours will be accepted with a 25% point deduction. Homework will not be accepted more than 48 hours after the submission deadline.

We expect that students submit homework that represents what you as an individual would write, as if the assignment was given to you in an examination. It is permissible to consult with other students in the course or with tutors or instructors; however, it is not permissible for you to simply copy another student's answers, or text from another source (internet, books, etc.) and submit it as your own. It is also not permissible for other students to write up your homework assignment for you, unless this has been arranged through the Office of Students with Disabilities (OSD).

Examinations

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| Midterm (after air pollution toxicity) | TBA |
| Final (cumulative) | TBA |

Examination Policies

- 1) There will be **no makeup and no alternate-scheduled** (i.e., “early”) exams, unless otherwise required by OSD and California Education Code Section 92640(a).
- 2) Students who normally require the assistance of OSD to take exams must consult with the instructor as soon as possible regarding test-taking procedures.
- 3) Examinations are multiple-choice, fill-in-the-blank, and short-essay. They include material from the lecture, homework, and the discussion sections.
- 4) To take the exam, you must present your photo identification, either student ID, driver's license, or passport. All exams are closed-book unless otherwise noted beforehand.

Laboratory Assignments

The 1-unit 2L laboratory section is an optional add-on to the standard 4-unit course, essentially making this course into a 5-unit physical science GE course with lab/demo credit. Students who do not need the lab/demo credit because they have already satisfied or intend to satisfy it with a different 5-unit GE science course may opt to not enroll in the 2L section and instead earn only 4 units of credit with the regular course. Those students do not need to complete any laboratory assignments.

Students enrolled in the 2L laboratory section will perform four experiments or simulations during the quarter. These assignments will be posted online in our CCLE site; there are no formal classroom meetings associated with the lab assignments. At the end of each assignment, a report will be submitted electronically via our CCLE site, either as a PDF file, Microsoft Word/Office document, or an online form. The report may include numerical computations, graphs, and short-answer/short-essay questions. The purpose of the laboratory is to learn how to perform experiments to test scientific hypotheses, interpret observations, and summarize results in a concise, written form.

Schedule of Topics

WEEK 1

- 1. Introduction / Motivation**
 - 1.1. What is “Air Pollution”?
 - 1.2. How does air pollution impact our lives?
- 2. Measurements, Chemistry, and Concentrations**
 - 2.1. Introduction / Definitions
 - 2.2. Chemistry
 - 2.3. The Steady State Box Model

WEEK 2

- 3. Atmospheric Evolution**
 - 3.1. Primordial Atmosphere
 - 3.2. Secondary Atmosphere
 - 3.3. Nitrification
 - 3.4. Catastrophic Atmosphere-changing Events
 - 3.5. Human Impact
- 4. The Atmosphere**
 - 4.1. Atmospheric Structure
 - 4.2. Atmospheric Gases
 - 4.3. Aerosol Particles

WEEK 3

- 5. Global Climate Change**
 - 5.1. Introduction
 - 5.2. Atmospheric Radiation
 - 5.3. Atmospheric Greenhouse Effect
 - 5.4. Global Climate Change
 - 5.5. Remediation

WEEK 4

- 6. Stratospheric Ozone Depletion**
 - 6.1. Introduction
 - 6.2. Ozone Layer
 - 6.3. Health Effects
 - 6.4. Chlorofluorocarbons (CFCs)
 - 6.5. Ozone Chemistry
 - 6.6. Ozone Hole
 - 6.7. Regulation and Abatement

WEEK 5

- 7. Air Pollution Toxicity**
 - 7.1. Risk Assessment Tools
 - 7.2. Quantifying Health Effects
 - 7.3. Physiological Effects on Humans
 - 7.4. Examples

WEEK 6

MIDTERM EXAMINATION

8. Air Pollution Meteorology

- 8.1. Transport Processes
- 8.2. Atmospheric Stability and Convective Dispersion
- 8.3. Temperature Inversions
- 8.4. Impact on Daily and Seasonal Smog Variation
- 8.5. Application: Chimney Plumes
- 8.6. Plume Type vs. Stability
- 8.7. Enhancing Plume Dispersion

WEEK 7

9. Acid Rain / London Smog

- 9.1. Brief History
- 9.2. London Smog
- 9.3. Acids / Bases
- 9.4. The Sulfur Cycle
- 9.5. The Nitrogen Cycle
- 9.6. Acid Rain
- 9.7. Environmental and Health Effects
- 9.8. Abatement

WEEK 8

10. Los Angeles Smog

- 10.1. History of Smog in Los Angeles
- 10.2. Components of Los Angeles Smog
- 10.3. Ozone Formation

WEEK 9

- 10.4. Smog and Visibility
- 10.5. Smog Meteorology
- 10.6. Air Pollution Mitigation
- 10.7. The Future of LA Smog

WEEK 10

11. Indoor Air Pollution

- 11.1. Indoor Air Pollution
- 11.2. Sources and Health Effects
- 11.3. Indoor Air Pollution Remediation