**Syllabus**

**ATMO 469A/569A CxEE 569A: Air Pollution I : Gases**

**Class Hours**
09:30 am – 10:45 pm Monday, Wednesday

**Class Location**
Phys-Atmos. Science (PAS) Bldg., Rm 488

**Instructor**
Dr. Avelino F. Arellano, Jr. (Ave)
arellano@atmo.arizona.edu

**Office Hours, Mon/Wed 3:30-4:30pm or by appointment**

**Course Description**

This is the 1st course of a two-semester series introducing atmospheric chemistry and physics. For this particular course, we will cover topics related to natural biogeochemical cycles, atmospheric photochemistry, stratospheric ozone, urban ozone and particulate matter, atmospheric visibility, acid deposition, air pollution meteorology, chemical transport modeling, and air quality. The course is designed to provide a foundation in atmospheric chemistry suitable for advanced study in atmospheric sciences and professional employment.

**Textbook**

We will use the book by Seinfeld and Pandis (2006) as our main textbook. This will be supplemented, most especially in my lectures, by Jacobson (2012), and Jacobs (1999). See also the reference section of this syllabus for a list of other useful references. Additional materials (e.g. articles, websites) will be distributed in class during the course of the semester. Lecture notes and other materials will be posted in our D2L site.

**Goals & Expectations**

My intent as an instructor is to convey fundamental concepts of atmospheric chemistry, in a manner that will: a) enhance your understanding about the composition of the atmosphere and how it affects the environment, b) prepare you for more advanced fields in atmospheric chemistry and help you in your own research, c) stimulate your curiosity, and d) enable you to relate these concepts to real world applications.

The course is designed as an introduction to physical meteorology under a hands-on learning environment. You are encouraged to engage yourselves (before, during and after lectures).

Prerequisites for this class include a) a strong desire to learn concepts in atmospheric chemistry and b) a basic understanding of elementary mathematics (MATH 223), statistics, physics, and chemistry.
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Course Assessment

Students will be assessed on how they are able to grasp the key concepts, mainly through assignments and exams. Graduate students will be graded on separate criteria. Specifically, they will be a more advanced homework and examinations commensurate with the higher level performance expected of them. Graduate students will also be required to complete a term project.

The percentage distribution of your grade will be as follows:

Undergraduates:
- Assignments: 40%
- Mid-Term Exam 1: 20%
- Mid-Term Exam 2: 20%
- Final Exam: 20%

Graduates:
- Assignments: 30%
- Mid-Term Exam 1: 20%
- Mid-Term Exam 2: 20%
- Final Exam: 20%
- Project: 10%

A large part of your grade will be through assignments. Unless otherwise noted, assignments either follow the class exercises/problems. Assignments can be in the form of derivation, computer exercises, problem solving or science article review/discussion. Assignments are typically given after a major section has been discussed (i.e. weekly). See Course Outline section for details.

While assignments are best done individually, you can certainly discuss (and to an extent I do encourage you to discuss) your methods and the results with other students in the class. Students can sometimes learn more by discussing the ideas and methods with others than they can on their own. Given that you have different backgrounds/perspectives, the views of others can often be beneficial to a larger group. However, do NOT copy your solutions from anyone else (for programs, each student should write his/her own code). Please cite/acknowledge appropriately if your ideas/methods are not your own.

I am lenient about late assignments. I will accept assignments with full credit as long as the solutions have not been distributed in class. However, any assignments received after the solutions are distributed will not be accepted for credit.

Projects can be in the form of science article review, modeling, or data analysis. The individual project is due on Dec 5.

Mid-term exam 1 will be given on Sep 12, 2012 (during class hours). This will cover all topics discussed in class related to basic concepts of atmospheric composition. Mid-term exam 2 will be given on Oct 10, 2012 (during class hours). This will cover all topics related to stratospheric and tropospheric ozone. Final exam will be given during the final exam period (Dec 13, 2012 @ 8:00am-10:00am). This will cover topics discussed in class related to air pollution meteorology, aerosols, and impacts of air pollution including visibility, UV, acid deposition, and global warming.

Letter grades are determined using the following scale:

A : \[ 90.0 \% \]
B : 80 to 89.9 %
C : 65.0 to 79.9 %
D : 55.0 to 64.9 %
E : below 55.0 %

Student Responsibilities

To learn this course, you are expected to be involved all throughout. As a student, you are responsible in a) actively asking and answering questions during class, b) doing your assignments (including reading materials) after class, and c) responding to d2l class announcements/surveys. Doing so will greatly enhance your learning experience. As your instructor, I invite you to make use of our office hours if you have some pressing questions.

From the University perspective, you are expected to devote a minimum of two (2) hours outside class (for study, reading, homework) for every contact hour (or 50 minutes) in classroom.
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Attendance
You will be responsible for learning this course. Regular, frequent and punctual attendance is strongly encouraged but not required.

Academic Integrity
Note that associated with your learning experience are sets of ‘rules’ to diligently follow. From the University perspective, you are expected to adhere to the University’s “Code of Academic Integrity” and “Student Code of Conduct”. You are responsible for knowing these codes (and revisions), including pertinent implications. If you still haven’t done this, please see deanofstudents.arizona.edu/policiesandcodes.

Classroom Behavior
You are expected to behave as courteous adults and in a manner consistent with enhancing the learning environment of your fellow students. You are expected not to talk to your neighbors during class, turn off your electronic devices (e.g. cell phones, pagers, blackberry, iPod, mp3, etc), and to remain seated until the instructor dismisses the class. Destructive behavior in the classroom or any perceived threatening behavior towards fellow students or the teaching staff will be dealt with. See University policy: policy.web.arizona.edu/threatening.pdf

Students with Disability
If you anticipate barriers related to the format or requirements of this course, please meet with me so that we can discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with Disability Resources (621-3268; drc.arizona.edu) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Main Reference Materials

Jacob, D.J. (1999), Introduction to Atmospheric Chemistry, New Jersey, Princeton University Press.


Useful Reference Materials


Course Withdrawal
Last day to drop the course without it appearing on your record is Sep 16, 2012. Last day to drop the course with a “W” grade is Oct 15, 2012.

Final Note
Some information in this syllabus may be subject to change with advance notice as deemed appropriate by the instructor. Your comments are welcome and appreciated.
Course Outline

Below is our tentative schedule. We may extend/shorten the lecture/discussion of some sections (e.g. special topics) depending on the average progress of the class. Exam dates, on the other hand, are fixed.

Course Syllabus/Introduction
Aug 20

Basic Concepts
The Atmosphere and Its Composition
Aug 22-27 (Ch 1-2 S&P; Ch 1-3,6 DJ; Ch 2-3 MJ)

Atmospheric Circulation and Meteorology
Aug 29 (Ch 16, 21 S&P; Ch 4-5 DJ; Ch 6 MJ)

Chemical Kinetics and Lifetime
Sep 5 (Ch 3 S&P; Ch 9 DJ; Ch 1 MJ)

Atmospheric Photochemistry
Sep 10 (Ch 4 S&P; Ch 7 DJ; Ch 2 MJ)

Mid-Term Exam 1
Sep 12

Chemistry of the Atmosphere
Chemistry of the Stratosphere
Sep 17-24 (Ch 5 S&P; Ch 10 DJ; Ch 11 MJ)

Chemistry of the Troposphere
Sep 26-Oct 8 (Ch 6 S&P; Ch 11 DJ; Ch 4 MJ)

Mid-Term Exam 2
Oct 10

Ozone Air Pollution
Oct 15 (Ch 20 S&P; Ch 13 DJ; Ch 8 MJ)

Atmospheric Aerosols
Properties and Dynamics of Aerosols
Oct 17-29 (Ch 8-9 S&P; Ch 8 DJ; Ch 5 MJ)

Atmospheric Diffusion and Transport
Oct 31-Nov 5 (Ch 18 S&P; Ch 3-5 DJ)

Air Pollution and Our Environment
Visibility, UV and Colors of the Sky
Nov 7 (Ch 15 S&P; Ch 7 DJ; Ch 7 MJ)

Acid Deposition
Nov 14-19 (Ch 20 S&P; Ch 13 DJ; Ch 10 MJ)

Climate and Air Pollution
Nov 21 (Ch 23-24 S&P; Ch 7 DJ; Ch12 MJ)

Local to Global Air Quality Models and Observations
Nov 26 (Ch 18, 25-26 S&P; Ch 3-5 DJ)

Final Notes
Nov 28

Final Exam
Dec 13