ESCI 715/815: Global Atmospheric Chemistry
Fall 2007

Robert J. Griffin, office: Morse Hall 357, ph: 2-2021, email: rob.griffin@unh.edu
Office Hours: T 3-5PM
Class Hours: M,W 2:10 - 3:30PM
Location: James 103

Text: Seinfeld and Pandis, *Atmospheric Chemistry and Physics, 2nd edition*
Available at both the MUB bookstore and the Durham Book Exchange

Course organization: Lecture ***and*** discussion (every ~fifth class = a journal article discussion) based class. Full participation is expected ***and*** required. Current topics and local data will also be incorporated into homework assignments, exams, and projects.

Prerequisites: None officially listed. However, given that this is a 7/8 ESCI course, knowledge of basic chemistry and calculus are expected.

Course calendar:

Day/Date	Item	Day/Date	Item
W 9/5	Lecture 1	W 10/31	Journal Discussion 3, HW4 due
M 9/10	Lecture 2	M 11/5	Lecture 13
W 9/12	Lecture 3, HW1 out (L1-3)	W 11/7	Lecture 14, HW5 out (L12-14)
M 9/17	Lecture 4	**M 11/12**	**NO CLASS Veteran's Day**
W 9/19	Lecture 5, HW1 due, Journal 1 out	**T 11/13**	**Monday schedule**, Lecture 15, will have OH after class
M 9/24	Journal Discussion 1 (sub)	W 11/14	Lecture 16, HW5 due, Journal 4 out
W 9/26	Lecture 6 (sub), HW2 out (L4-6)	M 11/19	Journal Discussion 4
M 10/1	Lecture 7	**W 11/21**	**NO CLASS Friday schedule**
W 10/3	Lecture 8, HW2 due, Journal 2 out, HW3 out (L7-8)	M 11/26	Recitation for L15 and 16/Make up if behind
M 10/8	**NO CLASS, RG personal commitment**	W 11/28	Exam 2
W 10/10	Journal discussion 2, HW3 due	M 12/3	RJG seminar
M 10/15	Lecture 9	W 12/5	Field trip
W 10/17	Exam 1	M 12/10	Projects 1
M 10/22	Lecture 10	W 12/12	Projects 2
W 10/24	Lecture 11, HW4 out (L9-11)	F 12/14	Project write up due by 5PM
M 10/29	Lecture 12, Journal 3 out		

Order of topics:

I. Physical Processes in the Atmosphere/Introductory Material

Lectures 1-4, Reading: Ch. 1.3-1.6, 2.1, 3.1-3.5, 4.1, 4.5, 16.1-16.2, 21, 22.3 (NOTE: Readings are just guidelines and are subject to change - we will not cover all material from every section mentioned!)

Motivation
Atmospheric composition
Atmospheric structure (temperature and pressure distributions, stratification)
Introductory reaction kinetics and photolysis
Ideal gas law/mixing ratio/number density/standard atmosphere
Regional/global circulations and transport dynamics

II. Carbon in the Troposphere

Lectures 5-8, Reading: Ch.. 2.4, 2.5, 6.3, 6.4, 6.7, 6.9-6.12, 6.14, 22.2

CO_2, CO, CH_4, C_2-C_{10} hydrocarbons, halocarbons (CFC's and halons) and industrial tracers (C_2Cl_4, CH_3CCl_3, CCl_4, C_6H_6), biomass burning tracers (CH_3Cl, CH_3Br), OVOC's

Sources/Sinks
Global Budgets

III. Sulfur in the Troposphere

Lecture 9, Reading: 2.2, 6.13, 22.1

SO_2, SO_4^{2-}, H_2SO_4, CH_3SCH_3, CH_3HSO_3, OCS, H_2S, CS_2

Sources/Sinks
Global Distribution/Budgets

IV. Nitrogen in the Troposphere

Lectures 10-13, Reading: 2.3, 6.2, 6.5, 6.6

Reduced Nitrogen (NH_3, HCN, organic N), N_2O, Reactive Nitrogen (N_xO_y) [NO, NO_2, HNO_3, PAN, NO_3^-, N_2O_5, HONO, HO_2NO_2, $RONO_2$, NO_y]

Sources/Sinks
Global Distribution/Budgets
NO/NO_2 photostationary state

V. Ozone and HO_x

Lectures 14-16, Reading: 2.6, 6.1, 6.8 (review)

Stratospheric – O_3 production and destruction pathways

Tropospheric - O_3 fast photochemical production by peroxy radicals, CO and CH_4
Oxidation cycles, crucial roles of NO and HO_2.

Distribution and Sources/Sinks

VI. Other topics of interest (Seminar by RJG and student defined final projects)
Last three classes

Class Requirements:
1.) There will be 2 exams. The first will cover material from Lectures 1-8 and HW 1-3; the second will cover material from Lectures 9-16, HW 4-5, and our one recitation.

2.) Homework exercises will be assigned on a ~bi-weekly basis. A total of 5 assignments will be made during the semester. You are encouraged to work together though everyone is required to turn in their own copy of the assignment.

3.) At the end of the semester, two course periods will be devoted to student lead discussions of literature surveys of current research on a topic relevant to the class (i.e., read ~5 papers on the same subject and tell us about it). Students will make oral presentations (approximately 10-15 minutes) using power point as well as turn in written summary papers (minimum 5 pages, maximum 10 pages, double spaced). Topics need to be approved by Thanksgiving at the latest. Papers are due to me on December 14th by 5PM. For the oral presentations, they must be emailed to me (or given to me on a CD, jump stick, etc.) by 2PM on Monday December 10th. Oral presentations will be made in random order, and those going on the second day will not have the opportunity to alter their presentation.

Grading:
Exams 20% each
Project 20%
Homework 20%
Participation 20%

NOTE: If you are a student with a documented disability who will require accommodations in this course, please register with the Access Office in the Memorial Union Building, Room 118 (862-2607) for assistance in developing a plan to address your academic needs. Students who are already registered with the Access Office and wish to receive accommodations in this course are strongly encouraged to share their Accommodation Letter with me in a timely manner.