SIO 217a Atmospheric and Climate Sciences I:
Fall 2009 Atmospheric Thermodynamics

Course Introduction

Instructor: Lynn Russell, 343 NH, 534-4852, lmrussell@ucsd.edu
Text: *Thermodynamics of Atmospheres and Oceans,* J. A. Curry & P. J. Webster (1999)

This course is part of an integrated 3-quarter series (SIO 217 A, B, C). Although it is formally a lecture course, we will try a pedagogical experiment using modern principles of constructivist learning theory. This form of teaching recognizes that students come to class with prior knowledge on the topics to be studied. Sometimes this knowledge is profound and accurate. Sometimes it is shallow and erroneous. Learning involves first confronting our prior knowledge. This form of teaching also stresses the similarity between the learning experience and the research experience. We learn by formulating questions and discovering the answers to them. This is very different from rote memorization of facts, lecture notes and pages of text. Two useful maxims are:

"A mind is a lamp to be lit, not a vessel to be filled."

"The teacher is a guide on the side, not a sage on the stage."

For these reasons, this class will not be a pure lecture course. Instead, it will involve intensive student participation, e.g., on group homework projects to be presented in class and in reports. Here are my expectations:

Come to every class. Buy the text. Always bring it to class. Take your own notes in addition to the posted slides. Study the assigned material in advance. I will generally not simply repeat the material in the text. Be an active participant in class; do not just sit and listen. There are 10 weeks in the quarter, and we will try to cover 10 chapters of the text, thus about a chapter per week. The ten chapters we will study are 1, 2, 3, 4, 5, 6, 7, 8, 12, and 13. In several chapters, I will specify some of the material to skip.

Expect an occasional surprise quiz on the readings. I will give guidance in advance on which material is most important. Be prepared to discuss the material you have studied. In particular, always know the definitions of every word in the assigned portions of the text. Quizzes and the mid-term and final exams will include definitions. Explore Curry's web site http://curry.eas.gatech.edu/Courses/5225/index.html. Download the errata file and the answers to homework file. Check out the links for each of the topics as we take them up. Formulate questions as you study, and bring them to class for us all to discuss.

Old lecture notes and exams from previous years are posted at http://aerosol.ucsd.edu. Lecture notes from this year are posted after lectures. Quizzes are not announced in advance and cannot be made up. Exams are announced in advance and cannot be rescheduled. Grading will be approximately as follows:

Homework and in-class participation: 40%.
Mid-term exam and surprise quizzes: 30%.
Final exam: 30%.

IMPORTANT: In this course, you must not remain silent. You must speak as well as listen. If English is not your first language, consider taking courses and making use of other opportunities to improve your English. Start now. You cannot succeed in this course if your spoken or written English prevents you from expressing yourself fluently. Much more importantly, your future as a scientist will depend critically on your English language skills. Work on your English!

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Self-Diagnostic Math Quiz

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1. Evaluate the following expressions.
   a. $\frac{d}{dx}\ln x =$
   b. $\frac{d}{dx}\left(\frac{1}{u(x)}\right) =$
   c. $\int\left(\frac{1}{u(x)}\right)dx =$
   d. $\int e^{u(x)}dx =$
   e. $\int e^{x^2}dx =$

2. Given that F is an exact differential, if

   $$dF = \left(\frac{\partial F}{\partial x}\right)_y dx + \left(\frac{\partial F}{\partial y}\right)_x dy \equiv Mdx + Ndy$$

   Then what is true about the mathematical relationship between the quantities $\left(\frac{\partial M}{\partial y}\right)_x$ and $\left(\frac{\partial N}{\partial x}\right)_y$?

3. If y and x are linearly dependent variables, then state the mathematical relationship that must exist between them.

4. If y and x are independent variables, what is true?

5. What is the meaning of “equilibrium” (in a thermodynamic sense)?

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Background and Schedule Survey

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Name:	
Email:	
Department:	
G/UG/other:	

Prior Coursework (list school, course number-title, UG/G, year taken)

Atmospheric Thermodynamics:
Other Atmospheric Sciences:
Multivariate Calculus:
Linear Algebra:
Differential Equations:
Fluid Mechanics:

Research Interests

Topic(s):
Potential Research Advisor(s):

Your Weekly Schedule (please include and label courses, TA duties, other weekly obligations)

	Monday	Tuesday	Wednesday	Thursday	Friday
9:00					
10:00					
11:00					
12:00					
1:00					
2:00					
3:00					
4:00					
5:00					