EVSC 350: Atmosphere and Weather

Spring 2001: PHYS 205, 09:30-10:45 Tu, Th

Instructor **Jose D. Fuentes**
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Course web page: http://www.people.virginia.edu/~jf6s/350home.html

Office Hours 15:00-17:00 Tuesday
15:00-17:00 Thursday

Teaching Assistants
Jeff M. Sigler (Monday section)
Carmen Yip (Tuesday section)
Jordan Barr (Wednesday section)
Julian Adams (Thursday section)

Course Description

This course provides a basic understanding of the physical principles governing the behavior of the Earth's atmosphere. It gives a foundation in meteorology with emphasis on thermal structure and composition, air masses and fronts, environmental radiation, atmospheric thermodynamics, and atmospheric fluid dynamics. Upon completion of this course, students will have gained an overview to identify and understand atmospheric phenomena that influence weather and climate.

Required Textbook

Understanding Weather and Climate (Second Edition) by E. Aguado and J.E. Burt.
The textbook can be purchased from the University of Virginia Bookstore.

Additional (available in the Science and Engineering Library, Clark Hall)
Meteorology Today for Scientists and Engineers (Second Edition) by Roland S. Stull.

Evaluation

Several problem sets will be given through the semester. Problems and questions will help students enhance their understanding of the concepts presented in lectures. Although no credits will be given towards the final grade, it is expected of students to complete the problem sets. Consultations should be made with the instructor whenever in need of clarification of concepts. Most of the material covered in exams will be taken directly from lectures and class discussions. Therefore, class attendance is exceedingly important in this course. There will be two term exams and a final, comprehensive exam scheduled for the following dates.

Exam 1:	30%	Thursday, February 22 (regular class period)
Exam 2:	30%	Thursday, April 5 (regular class period)
Final Exam:	40%	Thursday, May 5 from 14:00 to 17:00 hours

Make-up exams will not be given unless students provide valid excuses before the date of the exam. Examples of valid excuses may include personal and family medical emergencies. The final grade will be determined according to the following scale:

A+: Above 95	A: 90-94	A-: 85-89
B+: 80-84	B:75-79	B-: 70-74
C+: 65-69	C:60-64	C-: 55-59
D+: 50-54	D: 45-49	D-: 40-44
F: Less than 40		

Laboratory

The laboratory is listed as an independent course, and is required for Environmental Sciences majors. Taking the laboratory will enhance understanding of the material covered in lectures and provide opportunities to become acquainted with modern meteorological instrumentation commonly used to probe the state of the atmosphere. Four laboratory sessions are offered. Students should enroll in one laboratory session only. A laboratory manual, available from the University Bookstore, is required. Graduate teaching assistants run the laboratories. Questions related to the laboratories should be addressed to the teaching assistants. At least two field trips will be scheduled during the semester to visit the meteorological observatory located in Fluvanna county (Pace Estate), and to release balloons carrying instrument sondes designed to investigate the thermodynamics of the lower atmosphere.

COURSE OUTLINE: SPRING 2001

1. UNITS AND NOTATION	Appendix A
2. COMPOSITION OF THE ATMOSPHERE Major and minor constituents Greenhouse gases Sources and sinks of greenhouse gases	Chapter 1
3. ATMOSPHERIC THERMAL STRUCTURE Vertical variations of temperature Latitudinal variations of temperature Seasonal variations of temperature Measuring temperature	Chapter 1, Stull 1 and 4
4. ATMOSPHERIC RADIATION Electromagnetic spectrum Radiation laws Diurnal and seasonal disposition of radiation Measuring radiation	Chapter 2
5. ENERGY BALANCE Global energy balance Energy balance at the Earth's surface	Chapter 3, Stull 3
6. ATMOSPHERIC MOISTURE Moisture variables Evaporation, condensation, and latent heat First and Second Laws of thermodynamics Atmospheric stability Measuring atmospheric humidity	Chapter 4, Stull 5
7. CLOUD DEVELOPMENT Cloud formation processes Cloud type Cloud coverage	Chapters 5, Stull 7
8. PRECIPITATION PROCESSES Growth of cloud droplets Forms of precipitation Measuring precipitation	Chapters 6, Stull 8
9. ATMOSPHERIC PRESSURE Ideal gas law	Chapter 7; Stull 9

Virtual temperature
The hydrostatic equation
The hypsometric equation
Reduction of pressure to sea level
Measuring atmospheric pressure

10. ATMOSPHERIC DYNAMICS — Chapter 8, Stull 9
    Winds: geostrophic, gradient, cyclostrophic, and thermal
    Divergence and vorticity
    Global-scale and local wind circulations

11. AIR MASSES AND FRONTS — Chapter 9, Stull 12
    Origin of air masses
    Fronts
    Cyclogenesis

12. TROPICAL WEATHER SYSTEMS — Chapter 12; Stull 16
    Cyclones
    Monsoonal
    El Niño

13. AIR POLLUTION — Chapters 14; Chapters 17
    Types of airborne pollutants
    Atmospheric controls on pollutants dispersion
    Atmospheric transport of pollutants