

METEO 520: GEOPHYSICAL FLUID DYNAMICS FALL 2006

COURSE DESCRIPTION: This is a course about the fundamentals of fluid dynamics, with an emphasis on basic concepts that are important for geophysical flows. The "White book" description of Meteo 520 is "An introduction to the mathematical description and modeling of atmospheric and oceanic flows." The second course in this sequence, Meteo 521, takes the basic concepts in Meteo 520 and applies them to the atmosphere and ocean.

COURSE OBJECTIVES: You should leave this course with a solid foundation in fluid dynamics. You should have a thorough understanding of the fundamental conservation laws for fluids and some basic applications of them. This means you will have mastered the basics both mathematically and conceptually.

CREDITS: 3

MEETING TIMES: Monday, Wednesday and Friday, 10:10-11:00 AM.

ROOM: 116 Earth and Engineering Sciences Building

INSTRUCTOR: Raymond Najjar, Associate Professor, Dept. of Meteorology
Office: 522 Walker Building; Phone: 863-1586
Mailbox: 532 Walker Building; Electronic mailbox: najjar@meteo.psu.edu

COURSE WEB SITE: I will use ANGEL, PSU's course management system, to post assignments, answer keys, visuals, etc. Go to cms.psu.edu and use your PSU username and password to log on.

PREREQUISITES: As an introductory graduate course, there are no formal course prerequisites. I do, however, expect familiarity with differential equations and vector calculus, which will be drawn on extensively. I will briefly review math concepts as needed, but if you feel particularly rusty on these topics, consider reviewing them ahead of time on your own.

REQUIRED TEXTBOOK: Kundu, P.K. and I.M. Cohen. 2004. Fluid Mechanics, Third Edition, Academic Press, 759 pp.

Lectures will generally have a reading assignment associated with them. Read the text. Depending on your learning style, you should decide whether to read the text before or after the corresponding lecture.

HOMEWORK: I will assign problem sets approximately weekly, except when an exam is scheduled.

EXAMS: There will be two midterms and a final. The exams will be based on material from lectures, textbook readings and homework assignments. Midterms will take place in the evenings. Dates and times will be announced shortly. The final exam will be during finals week (December 18-22); the exact time and place will be announced when I find out.

CLASS PARTICIPATION: I think that the learning environment is enhanced when students are actively engaged. So I encourage you to ask questions and make comments on the material as you see fit.

OFFICE HOURS: Tues. & Thurs.: 1-4 PM

I will be in my office during these hours specifically to answer your questions. Exceptions will occur due to unavoidable meetings, illness and travel. I am often available outside of office hours, so feel free to stop by my office, call me or email me. I may not always be free, but we can at least arrange a time to talk.

GRADES:

A: 92-100%; A-: 88-91%; B+: 84-87%; B: 80-83%; B-: 75-79%; C+: 71-74%;
C: 63-70%; D: 50-62%; F: < 50%

Note that this scale may be more generous than you are used to! Your grade will be computed using the following weighting: homework, 25%; midterms, 45%; final, 30%.

ACADEMIC INTEGRITY POLICY: I expect all submitted work to be your own. Tests will be closed book and no crib sheets are allowed. Feel free to discuss homework assignments with others, but never copy another's work. For details see <http://www.ems.psu.edu/students/integrity/statement.html>.

ATTENDANCE POLICY: I expect you to attend all classes. I realize that there may be emergencies and other extenuating circumstances that prevent this. If possible, let me know ahead of time if you are going to miss a class.

ABBREVIATED SYLLABUS:

1. Introduction to fluids
2. Kinematics
3. Conservation laws
4. Vorticity dynamics
5. Gravity waves
6. Dynamic similarity
7. Laminar flow
8. Introduction to instability