Course Syllabus

Atmospheric Sciences 5952: Dynamic Meteorology II
Class Meetings: MWF 10:20-11:15 p.m.
Classroom: Cockins Hall 310

Instructor: Jay Hobgood
Office: Room 1100 Derby Hall
Office phone: 292-3999
Office hours: MWF 11:30-12:30
Email: hobgood.1@osu.edu

Course Prerequisites: Atmospheric Sciences 637 or 5951, Math 255, 415 or 2255

Course Objectives: The basic objective of this course is to provide students with knowledge of the fundamentals of atmospheric dynamics. The knowledge will facilitate students' comprehension of meteorological processes that determine the weather. In this course the processes of atmospheric dynamics are linked to processes at work in the planetary boundary layer and on the synoptic scale of motion. The increased comprehension of important physical processes will improve students' ability to analyze and to forecast the state of the atmosphere.

Course Structure: The class will meet three days per week for 55 minutes each day. Lectures during the classes will present material on thermodynamic processes and their application to atmospheric situations. Important equations will be derived and the implications of assumptions will be discussed. Examples of meteorological problems will be discussed. Homework problems that involve the application of material introduced in class will also be assigned and discussed in class.

Textbook: Holton, J.R., 2004: *An Introduction to Dynamic Meteorology*, fourth edition, Elsevier Academic Press.

Course requirements:

1. The **first examination** will occur on **September 28, 2016** and will comprise 25% of the course grade.

2. The **second examination** will occur on **November 2, 2016** and will comprise 25% of the course grade.

3. The **final examination** will occur at 10:00-11:45 on **Tuesday December 13, 2016** and will comprise 30% of the course grade.

4. Sets of problems will be assigned in class and will comprise 20% of the final grade.

Examination format: Each examination will begin with a series of terms to define in one or two sentences. You will have a choice of which terms you choose to define. The remainder of the examination will consist of short essay questions that you can answer with a few sentences and problems like the problems that will be assigned as homework. The examinations are designed to test your comprehension and understanding of the material, as well as your ability to recall basic dynamic principles.

Homework assignments: The homework assignments are designed to accomplish several goals. The first goal is to give students some experience solving basic dynamic problems using concepts introduced in class. A second goal is to make students think about the dynamic processes that occur in certain atmospheric phenomena. More challenging problems may require students to combine dynamic principles in order to arrive at the solution to the problem. Some problems will be similar to the tasks require of operational meteorologists. Other problems will deal with fundamental principles and calculations that are used to develop meteorological models and software. Homework assignments are expected to be the work of the student whose name appears on them. Copying another student's work is *plagiarism* and is considered to be *academic misconduct.*

Units: Numerical answers are incomplete unless they are accompanied by the correct units. Students will lose points on examinations and homework assignments if the units are incorrect or missing.

Academic Misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Informal discussions about homework problems are acceptable behavior but you are expected to do all of your own work on assignments and exams. Instructors shall report all instances of alleged academic misconduct to the Committee (Faculty Rule 3335-5-847). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Disability Services: Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 098 Baker Hall, 113 W. 12th Avenue; telephone 614-292-3307, VRS 614-429-1334; http://www.ods.ohio-state.edu/.

List of Topics

Part I: Circulation and Vorticity (2.0 weeks)

a. Review of the vorticity theorem in (x,y,z,t) coordinates
b. Review of the vorticity theorem in (x,y,p,t) coordinates
c. Helicity
d. Conservation of absolute vorticity
e. Potential vorticity

Part II: The planetary boundary layer and subgrid-scale processes (5.5 weeks)

a. Friction
b. Subgrid-scale transfers
c. The Boussinesq approximation
d. Turbulent Kinetic Energy
e. The Ekman approximation
f. Secondary circulations and spin down

Part III: Dynamics of midlatitude synoptic scale weather systems (5.5 weeks)

a. The quasigeostrophic approach
b. The geopotential tendency equation
c. The omega equation
d. Jet streaks
e. The ageostrophic wind

Part IV: Waves in the atmosphere (3.5 weeks)

a. Characteristics of waves
b. Sound waves
c. Shallow water gravity waves
d. Internal gravity waves
e. Rossby waves
f. Barotropic instability
g. Baroclinic instability