Introduction to Dynamic Meteorology
Meteorology 443
Spring 2007

Instructor: Adam Clark
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Office Hours: 11:00 AM – 12:00 PM MWF
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Course webpage: www.meteor.iastate.edu/classes/mt443/

Class meetings
MWF, 1:10-2:00 pm, 3128 Agronomy

Required Basic Background for the Course
- Fundamentals of classical physics (Phys 221 and Phys 222)
- Elementary Calculus (Math 165, 166, 265, and 266)
- Vector Analysis (see handout: Review of Vector Notation)

Course Objectives
- To learn the fundamentals of fluid mechanics necessary for understanding large-scale atmospheric motions.
- To develop the quasi-geostrophic theory which is used to depict and explain large-scale extratropical motions.
- Use Matlab to visualize and experiment with various aspects of dynamics not readily available through analytic problem solving.

Texts
Required: An Introduction to Dynamic Meteorology, Fourth Edition, Holton.
Supplemental: Atmospheric Science: An Introductory Survey, Wallace and Hobbs
Additional supplemental material may be provided on the course webpage and/or distributed in class when appropriate.

Schedule
**** This schedule is subject to change based on progress made in class. Examination dates may also change. Due dates for laboratories and homework assignments will be announced in class as they are assigned and posted on a continually updated schedule available on the course webpage.*

Classes will involve traditional lectures as well as working in small groups on Matlab exercises and in-class problem sets.

- Week 1 (Jan. 8, 10, 12): Course organization, Vector analysis review, Scale Analysis, Fundamental Forces (Holton 1.3-1.4)
- Week 2 (Jan. 17, 19): Noninertial Reference Frames and Apparent Forces (Holton 1.5)

- Week 3 (Jan. 22, 24, 26): Structure of the Static Atmosphere, Total Differentiation (Holton 1.6, 2.1)
- Week 4 (Jan. 29, 31, Feb. 2): Vertical Form of the Momentum Equation in Rotating Coordinates, Component Equations in Spherical Coordinates (Holton 2.2-2.3)
- Week 5 (Feb. 5, 7, 9): Scale Analysis of Equations of Motion, Continuity Equation (Holton 2.4-2.5)
- Week 6 (Feb. 12, 14, 16): Thermodynamic Energy Equation, Thermodynamics of the Dry Atmosphere (Holton 2.6-2.7), Review for Exam I
- Week 7 (Feb. 19, 21, 23): **Exam I, Monday Feb. 19 material covering Ch. 1-2 Holton,** Basic Equation in Isobaric Coordinates (Holton 3.1)
- Week 8 (Feb. 26, 28, Mar. 2): Balanced Flow, Trajectories and Streamlines (Holton 3.2-3.3)
- Week 9 (Mar. 5, 7, 9): Thermal Wind, Vertical Motion (Holton 3.4-3.5)
- Week 10 (Mar. 19, 21, 23): Surface Pressure Tendency, Circulation Theorem (Holton 3.6, 4.1)
- Week 11 (Mar. 26, 28, 30): Vorticity, Potential Vorticity (Holton 4.2-4.3)
- Week 12 (Apr. 2, 4, 6): Vorticity Equation, Barotropic Potential Vorticity Equation (Holton 4.4-4.5), Review for Exam II, **Exam II, Friday Apr. 6 material covering Ch. 3-4 Holton**
- Week 13 (Apr. 9, 11, 13): Observed Structure of Extratropical Circulations, Quasi-Geostrophic Approximation (Holton 6.1-6.2)
- Week 14 (Apr. 16, 18, 20): Quasi-Geostrophic Prediction, Diagnosis of Vertical Motion (Holton 6.3-6.4)
- Week 15 (Apr. 23, 25, 27): Idealized Model of a Baroclinic Disturbance (Holton 6.5), Review for Final Examination
- **Comprehensive Final Examination: TBA**

Email

I will communicate frequently with the class via email. The default email address I have for all students is their @iastate.edu address. Please let me know if you would prefer that I send class correspondence to a different address.

Course Policies and Procedures

- Professional Ethics

You will be expected to adhere to ISU standards of ethical conduct. For most students this should not be a concern. Students are expected to hand in their own labs and assignments unless otherwise specified. Working together in groups outside of class (and in class when appropriate) is encouraged; however, verbatim copying will not be tolerated. Instances of academic misconduct will be referred immediately to the Dean of Students.

- Grading

- Homework: 15%
- Exam I: 25%
- Exam II: 25%
- Final Exam: 35%

- The course grade is not determined by a standard scale (i.e., 90-100=A, 80-89=B, etc.) nor by a bell curve. Grades will be determined by assessing how students perform with respect to each other and how the class as a whole has done.
- ** It is not permissible for students to change test schedules, except with special circumstances.
- ** Submission of late homework will receive discounted credit.

- Attendance

Attendance is mandatory. As in any professional organization, absences should be justified and timely prior notice (email preferred) should be given to the instructor in the case of any absence.

- Misc.

Please make sure cell phones and other potential distractions are turned off before class. I believe laptops are a distraction. Please refrain from using them during class.

Academic Accommodations

My goal for the class is that every student will do his or her best. If you have a disability and require accommodations, please contact me so that your learning needs can be appropriately met. Contact me as soon as possible and no later than the end of the second week of classes (or as soon as you become aware of your need for accommodation). No accommodations can be made retroactively or less than one week before the assignment for which accommodation is needed. You will need to provide documentation of your disability to the Disability Resources office and request that a Student Academic Accommodation Request (SAAR) form verifying your disability and specifying the accommodation you will need be sent to the instructor. The Disability Resources office is located on the main floor of the Student Services Building, Room 1076. Their phone number is 515-294-6624.