

METR 3250 - DYNAMIC METEOROLOGY – SPRING SEMESTER 2009

COURSE WEB SITE:

<http://personal.uncc.edu/betherto/metr3250.htm>

COURSE TIME:

Lecture: Monday and Wednesday 3:30 P.M. – 4:45 P.M. (Room 123)
Laboratory: Friday 2:00 P.M. – 4:45 P.M. (Room 203)

COURSE INSTRUCTORS:

Lecture Instructor: Dr. Brian Etherton – Room 237
Office Hours: Monday - Friday, 2:00 - 3:00 P.M.
Lab Instructor: Mr. Eric Wenke – Room 202

COURSE DESCRIPTION:

This course is designed to introduce the student to the fundamentals of Atmospheric Dynamics. By the end of the semester, a student should be familiar with and have a basic understanding of the following concepts, terms, and approximations:

- Primitive Equations
- Hydrostatic Approximation
- Geostrophic Approximation
- Mass Conservation
- Thermal Wind
- Circulation Theorem
- Vorticity
- Quasi-Geostrophic Theory

In the lab component of this course, the student will be introduced to the application of computers to meteorology data.

REQUIRED TEXT:

“Synoptic-Dynamic Meteorology in Midlatitudes - Volume 1: Principles of Kinematics and Dynamics” by Howard Bluestein

EXAM SCHEDULE AND GRADING:

Exam #1	Wednesday – March 4 th – 3:30 P.M.	15%
Exam #2	Wednesday – April 22 nd – 3:30 P.M.	15%
FINAL EXAM (Cumulative)	Wednesday – May 6 th – 3:00 P.M.	25%
Homework Assignments	(5 during the semester)	20%
Labs / Computing Assignments	(5 during the semester)	25%

100 - 90	A	89-80	B	79-70	C
69-60	D	59-0	F		

COURSE POLICIES:

Attendance, Participation and Due Dates: Regular class attendance and active participation is expected. You are responsible for all information presented in class; if you are absent, you will need to contact a classmate to obtain the material.

Assignment Deadlines and Exam Dates: **I expect you to turn in assignments and take exams as scheduled** - except due to extraordinary circumstances or participation in a college sanctioned event. **I will not accept late assignments.** If you know you will not be in class on the due date, turn the assignment in early. **Exams will occur as scheduled and there are no make-up exams.** If you miss an exam for what you believe to be a valid reason, you must provide written documentation in order for me to consider allowing a make-up exam. There will be **no extra credit.**

Expectations: Responsibilities of both students and instructor for this course are reasonable and in keeping with UNC-Charlotte guidelines for academic ethics. As a student, you are expected to arrive for class on-time. **I am under no obligation to reiterate material for those arriving late.** To do so would interrupt the flow of class for all the other students.

TOPICS FOR THE COURSE:

LECTURE SECTION (BEFORE MIDTERM):

INTRODUCTION AND DEFINITIONS I.

MATH REVIEW – Partial derivatives, differentials, the total derivative, quick review of ordinary differential equations and solution techniques, Jacobians, complex numbers, vectors, vector products, differential operations (div, grad, curl), integrals. II.

PROPERTIES OF THE VELOCITY FIELD – Given a flow field, is that field diverging or rotating. We will learn how to construct trajectories and streamlines for this field. Streamfunction, natural coordinates, scale analysis are also studied. II.

THE EQUATIONS OF MOTION – Newton's second law of motion applied to the atmosphere. III.

SPECIAL CASES OF THE EQUATIONS OF MOTION – Simple solutions to the equations of motion, geostrophic flow, gradient flow, cyclostrophic flow, inertial flow, the thermal wind. III.

CONSERVATION OF MASS – The principle of mass conservation applied to the atmosphere, and used to derive the continuity equation. III.

LECTURE SECTION (AFTER MIDTERM):

CIRCULATION AND VORTICITY – Circulation defined, and its relation to vorticity. Vorticity equation and circulation theorems developed, and used to predict changes in Vorticity and Circulation. IV.

LARGE SCALE DYNAMICS – A simple baroclinic model based on quasi-geostrophic theory, height tendency, vertical motion, and vorticity. Geostrophic adjustment. V

LABORATORY SECTION (BEFORE MIDTERM):

UNIX/LINUX OPERATING SYSTEM – How to navigate in the unix/linux computing environment. How to copy files, change directories, run processes.

PERL – How to take text files, and pull out of them what you want. How to take an oddly formatted data file, like a METAR observation or a SOUNDING data set, and pull out important information.

GrADS – The ability to produce images of WRF Model output. How to plot things like pressure, wind speed, and temperature. How to use GrADS to take derivatives in time and space.

LABORATORY SECTION (AFTER MIDTERM):

FORTRAN – How to manipulate data to make scientific calculations. How to read in data from a file, perform calculations, and then output the new data to a new file.

MATLAB – Similar to grads and FORTRAN, but command line driven. Great for manipulation of big files of data and/or model output.

ACADEMIC INTEGRITY:

The UNC Charlotte Code of Student Academic Integrity governs the responsibility of students to maintain integrity in academic work, defines violations of the standards, describes procedures for handling alleged violations of the standards, and lists applicable penalties. The following conduct is prohibited in that Code as violating those standards:

A. Cheating. Intentionally using or attempting to use unauthorized materials, information, notes, study aids or other devices in any academic exercise. This definition includes unauthorized communication of information during an academic exercise.

B. Fabrication and Falsification. Intentional and unauthorized alteration or invention of any information or citation in an academic exercise. Falsification is a matter of altering information, while fabrication is a matter of inventing or counterfeiting information for use in any academic exercise.

C. Multiple Submission. The submission of substantial portions of the same academic work (including oral reports) for credit more than once without authorization.

D. Plagiarism. Intentionally or knowingly presenting the work of another as one's own (i.e., without proper acknowledgement of the source). The sole exception to the requirement of acknowledging sources is when the ideas, information, etc. are common knowledge.

E. Abuse of Academic Materials. Intentionally or knowingly destroying, stealing or making inaccessible library or other academic resource material.

F. Complicity in Academic Dishonesty. Intentionally or knowingly helping or attempting to help another to commit an act of academic dishonesty.

A full explanation of these definitions, and a description of procedures used in cases where student violations are alleged, is found in the complete text of The UNC Charlotte Code of Student Academic Integrity. This Code may be modified from time to time. Users are advised to contact the Office of the Dean of Students to assure they consult the most recent edition.

UNIVERSITY POLICY:

Students are expected to comply with university policy as it relates to academic integrity and student expectations. The Code of Student Responsibility can be found at the following website: <http://www.legal.uncc.edu/policies/ps-104.html>

Students with documented disabilities are eligible to receive assistance from the Office of Disability Services in Fretwell 230 (ext. 4355). For detailed information please see the current UNC Charlotte catalog.