

## **METR 4250 – ADVANCED DYNAMIC METEOROLOGY – FALL SEMESTER 2008**

### **COURSE WEB SITE:**

<http://personal.uncc.edu/betherto/metr4250.htm>

### **COURSE TIME:**

Tuesday and Thursday: 2:00 – 3:15 P.M., Room 123/203

### **COURSE INSTRUCTOR:**

Dr. Brian Etherton – Room 237. Office Hours: Mon./Wed. 1-2 P.M., Tues./Thurs., 10-11 A.M.

### **COURSE TEACHING ASSISTANT:**

Eric Wenke – Room 202. Office Hours: To be determined

### **COURSE DESCRIPTION:**

Advanced Dynamic Meteorology is important for understanding the principles governing atmospheric motions and to application of these principles to a variety of atmospheric phenomena. In this course, we develop a set of equations and relationships that explain the fundamental forces in the atmosphere. We then use these equations and relationships to understand the structure and behavior of certain atmospheric motions and systems – such as the implications of hydrostatic and geostrophic balance on the structures and evolution of synoptic-scale systems. A prime application is learning where waves in the atmosphere come from, and how they evolve.

### **REQUIRED TEXT:**

“Dynamic Meteorology”, 4<sup>th</sup> Edition (includes MATLAB CD), by James R. Holton

### **EXAM SCHEDULE AND GRADING:**

		U-Grad	Grad		
Exam #1	Tuesday – September 23 <sup>rd</sup> – 2:00 P.M.	15%	10%		
Exam #2	Tuesday – October 28 <sup>th</sup> – 2:00 P.M.	15%	10%		
Exam #3	Tuesday – November 25 <sup>th</sup> – 2:00 P.M.	15%	10%		
FINAL EXAM	Tuesday – December 16 <sup>th</sup> – 2:00 P.M.	30%	20%		
HOMEWORK	(6 during the semester)	30%	30%		
Presentation			10%		
Paper Review			10%		
100-90	A	89-80	B	79-70	C
69-60	D	59-0	F		

### **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.

## **TOPICS FOR THE COURSE:**

### **QUASI-GEOSTROPHIC THEORY (first third of course)**

BALANCE OF FORCES – Surface and body forces, noninertial frames of reference, scale analysis, conservation of mass and momentum, the equations of motion. H 1&2.

APPLICATIONS OF THE BASIC EQUATIONS – Geostrophic and gradient wind balance, thermal wind, vertical motion, surface pressure tendency. H 3.

CIRCULATION AND VORTICITY – Potential Vorticity. H 4.

QUASI-GEOSTROPHIC ANALYSIS – Quasi-geostrophic approximation, Quasi-geostrophic prediction, diagnosis of vertical motion, idealized model of a baroclinic disturbance. H 6.

### **WAVES IN THE ATMOSPHERE (middle third of course)**

PROPERTIES OF WAVES – Amplitude, phase speed, group velocity, growth rate. H 7.1, 7.2.

SIMPLE WAVES – Sound waves. H 7.3.

GRAVITY WAVES – Internal gravity waves, gravity waves modified by rotation. H 7.4, 7.5.

GEOSTROPHIC ADJUSTMENT – Mass and wind field adjustment. H 7.6.

ROSSBY WAVES – Phase and group velocity, growth rates. H 7.7

### **BAROCLINIC INSTABILITY & GLOBAL CIRCULATION (last third of course)**

TWO LAYER MODEL – Normal model baroclinic instability. H 8.1 & 8.2.

ENERGETICS OF BAROCLINIC WAVES - Baroclinic instability in a continuously stratified atmosphere. H 8.3 & 8.4.

NEUTRAL MODES – Eady Model. H 8.5.

ANGULAR MOMENTUM BUDGET – Hadley Cell. H 10.2, 10.3.

GLOBAL ENERGY CYCLE – Eddy and mean kinetic and potential energy. Sources and sinks. H. 10.4.

## **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.

## **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.