Phys. 469: Advanced Synoptic Meteorology

Location and Time: M & W 12:00PM–1:15PM at 119 Natural Science Building
Lecture: Mondays; Lab/forecasting: Wednesdays

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Office hours: M & W 1:15pm–2:15pm or other time by appointment.

Course Overview
This is a culminating undergraduate experience (CUE) course for the atmospheric science majors at UofL. This course focuses on analysis and forecasting of middle-latitude weather systems. We will examine the structure and dynamics of these systems by integrating weather observations with the current state of dynamic theory, numerical weather prediction models, and the physical principles of atmospheric thermodynamics and cloud and precipitation physics. The lab portion of the course is vital to the course content. Students who complete this course will have a good understanding toward the essentials of the Forecaster’s Art. We will pay close attention to daily weather during the course. Students will be required to give weather forecast discussions to develop an understanding of the weather forecasting process, and gain experience in communicating weather forecasts.

Prerequisite: Phys. 466 or concurrent enrollment in Phys. 466

Course Objectives
1) By attending the lectures, the students will gain an understanding of the observed behavior of the atmosphere through the application of basic theoretical principles. Concepts will be developed for studying atmospheric circulations, particularly extratropical cyclones and anticyclones.

2) The students will present the current weather and future weather forecasting orally to an audience of their peers in a clear, well-prepared, scientific manner.

All of the topics presented in lecture, assignments given, and weather discussions carried out over the course of the semester are designed with these goals in mind. The students will have plenty of opportunities to practice describing, diagnosing, interpreting, theorizing about, and predicting the weather throughout the course.


Optional references: Mid-Latitude Weather Systems (T.N. Carlson)
Synoptic-Dynamic Meteorology in Midlatitudes (Vols I and II, Bluestein)
Introduction to Dynamic Meteorology (Holton)

Course format:

1) Course lectures
Lectures will be held on Mondays of each week. Course lecture notes will be provided on blackboard. You are required to read the text of the book chapters that we will cover.

2) Weather discussions
Each student is required to give a 15-minute weather discussion presentation each week. The discussion is held on Wednesdays. The weather discussion examines recent, current, and future
weather scenarios and forecast challenges. The purpose of the weather discussion in this course is to develop your ability to organize effective discussion, improve your communication skills, and apply the concepts learned in class to the real-time weather situation. As part of the weather discussion, the student/group discussion must prepare:

A 15-minute presentation relating the past, present, and future weather conditions in Louisville and provide a quantified forecast of the following for Louisville:

1) Tonight’s Min Temperature  
2) Tomorrow’s Max Temperature  
3) Weather condition for the next 24 hours (wind direction and speed, sky cover, precipitation type and amount)  
4) A short-term (2-5 days from today) forecasting and a long-term (7-10 days) weather outlook  
5) How was your last forecasting compares to the actual weather

At the end of the presentation, you are required to write an Area Forecast Discussion (AFD) to accompany your weather briefings.

For the NWS AFD at Louisville, please refer to http://www.nws.noaa.gov/view/validProds.php?prod=AFD&node=KLMK

Each student is required to submit the forecasting presentation before Wednesday class starts (email preferred).

Each student is required to keep a record of his/her forecasting history, and do a curve or table comparing to the actual temperatures (1-2 from above), and update the total derivation each week (examples from previous students will be provided). The final total derivation will be compared, and the student with the least derivation will have 10 extra points added to their final grade.

Please also keep track of the derivation from MOS prediction of GFS and NAM for 1-2 above, and a blend product using half of GFS plus half of NAM.

The oral discussion and forecasting presentation from each student must include the following components

1. Model forecast comparisons (GFS and NAM).  
2. Skew-T log-P for Louisville.  
3. Ensemble run.  
4. Event timing accurate to within 3 hours.  
5. Area Forecast Discussion.  
6. Illustrations from multiple Internet sources/websites.

and will be graded (100 points) according to the following guidelines:

1. Discussion content  
   a. Following the Snellman forecasting funnel from planetary-scale to local-scale (10 points)  
   b. Overview of system for the past couple of days (10 points)  
   c. Identity the problem of the day (10 points)  
   d. Identify the potential problem in the next couple of days (10 points)

2. Use of previous class materials and knowledge to answer why has it happened, why is it
happening, and why will it happen (AFD)? (10 points)

3. Discussion of past forecast. How well it compared to the actual weather and why? (10 points)

4. Is the weather discussion well organized? (10 points)

5. Overall impression of the discussion and how convincing it is (10 points)

6. Presentation time, style and professionalism (10 points)

7. Improvement from the prior discussion (10 points)

3) Homework

Homework for this course is mainly the weekly weather discussion presentation and due at beginning of the class on the weather discussion day (usually Wednesdays). Occasional Meted modules are assigned as well. Late homework will not be accepted (result a “0” grade).

Grading

The final numeric grades will be determined according to the following table:
3*15% exams on lecture materials
5% homework
50% Forecasts and weather discussions

Grades will be determined by the following grading scale.
A+ 97% A 93% A- 90%
B+ 87% B 83% B- 80%
C+ 77% C 73% C- 70%
D+ 67% D 63% D- 60%
F < 60%

No Mid-term or Final Exams for this course.

As you can see, half of the grade is based on weather discussions, discussion attendance and participation is very important. Here are the rules:

1) If you have to be absent from weather discussion day, email me the presentation before class results in 50 points out of 100 points for that discussion, email me after the class results in 0 point;
2) Since there is a forecasting competition, failing to email me the presentation before class results in instant disqualification of the competition;
3) After 1 absence: 2% course grade deduction for each discussion absence regardless if you have a reasonable excuse or not (Reliability is key for a forecaster).

Tentative Lecture schedule:

1. Chapter 1: Introduction, Background, and Basics
2. Chapter 10: Numerical Weather Prediction
3. Chapter 11: Weather Forecasting
4. Chapter 12: Manual Analysis
Exam #1
5. Chapter 8: Cold-Air Damming
6. Chapter 9: Winter Storms
7. Chapter 3: Isentropic Analysis
Exam #2
8. Chapter 2: Quasigeostrophic (QG) Theory
9. Chapter 4: The PV framework
Exam #3

Tentative Lab Schedule:

Week 1: Get familiar with online resources on weather data
Weeks 2-14: Weather discussion, forecasting and presentations

A note on Make-up Exams
Make-up exams will only be given for valid university excuses, and may be in a different format from the regularly scheduled exam. Planned absences during an exam, such as for university-sponsored travel, should be addressed as early as possible.

A note on Academic Integrity and Plagiarism
Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at the University of Wyoming, and all students are expected to act in accordance with this principle. Consistent with this expectation, all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment not to engage in or tolerate acts of plagiarism, falsification, misrepresentation, or deception. Such acts of dishonesty violate the fundamental ethical principles of the academic community and compromise the worth of work completed by others.

Evidence of plagiarism may result in expulsion from the course (with an F grade) as well as dismissal or suspension from the University of Louisville.

Students with disabilities
If you have a physical, learning, or psychological disability and require accommodations, please let the instructor know as soon as possible contact the UofL Disabilities Resource Center directly.

Title IX/Clery Act Notification
Sexual misconduct (sexual harassment, sexual assault, and sexual/dating/domestic violence) and sex discrimination are violations of University policies. Anyone experiencing sexual misconduct and/or sex discrimination has the right to obtain confidential support from the PEACC Program 852-2663, Counseling Center 852-6585 and Campus Health Services 852-6479.

Reporting your experience or incident to any other University employee (including, but not limited to, professors and instructors) is an official, non-confidential report to the University. To file an official report, please contact the Dean of Student’s Office 852-5787 and/or the University of Louisville Police Department 852-6111. For more information regarding your rights as a victim of sexual misconduct, see the Sexual Misconduct Resource Guide (http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure).

The instructor reserves the right to make changes in the syllabus when necessary to meet learning objectives, to compensate for missed classes, or for similar reasons.