METR 4245 / ESCI 5251
ADVANCED SYNOPTIC METEOROLOGY
FALL 2025

Instructor: Dr. Matthew Eastin
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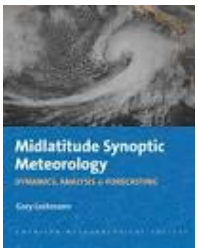
Class Time: Monday / Wednesday at 2:30 – 3:45 pm
Class Location: McEniry 118

Office: McEniry 209
Office Hours: Monday / Wednesday 10–11 am and 1–2 pm

Teaching Assistant: None

Text (Required): **Midlatitude Synoptic Meteorology**
Gary Lackmann
AMS 2021



Course Description: This course provides an integrated view of synoptic and dynamic meteorology with a focus on the structure, evolution, and dynamics of synoptic-scale mid-latitude systems. Topics include conceptual models and analysis techniques for synoptic waves, cyclones, fronts, jets, and regional precipitation events.

Course Student Learning Objectives (SLOs):

1. Know the limiting assumptions associated with dynamics-based analysis techniques.
2. Identify environmental conditions supportive of midlatitude cyclone intensification.
3. Forecast midlatitude cyclone evolution using dynamics-based analysis techniques.
4. Forecast surface front evolution using dynamics-based analysis techniques.
5. Prepare a concise and informative synoptic weather briefing on current events.

Programmatic Student Learning Objectives (SLOs):

1. Develop sufficient knowledge to describe, analyze, and forecast the three-dimensional structure, evolution, and dynamics of the atmosphere. (Meteorology – SLO1)
2. Demonstrate the ability to understand the climate system and apply this knowledge to improve human systems. (Meteorology – SLO2)
3. Practice oral communication skills to a degree whereby one can effectively communicate a scientific topic to the public. (Meteorology – SLO3)

Course Policies:

Attendance and Participation: Attendance is essential to maintaining an effective learning environment. Regular class attendance and participation are expected. Attendance will be taken twice each class – five minutes after the start of class (at 2:35 pm) and five minutes before the end of class (at 3:40 pm). You must be present both times to earn attendance credit for any given class day. **The use of smart phones, email, messaging, headphones, earbuds, or any form of social media (including its use on tablets and laptops) during class is strictly prohibited.**

Assignment Deadlines and Extra Credit: **I expect you to turn in assignments as scheduled** except due to extraordinary circumstances or participation in a college sanctioned event. I will not accept late assignments. There will be **no *individual* extra credit**.

Exams: All examinations will be administered in the classroom on the scheduled date unless you have formal accommodation through the Office of Disability Services. If you miss an exam for what you believe to be a valid reason, you must provide written documentation (supporting the reason for your absence) before any consideration of a make-up exam is made.

Accommodation: Students seeking disability accommodation must first consult the Office of Disability Services and follow the instructions of that office for obtaining accommodation.

Academic Integrity: Students are responsible for knowing and following the UNCC Code of Student Academic Integrity https://legal.charlotte.edu/policies/up-407 and the UNCC Code of Student Responsibility https://legal.charlotte.edu/policies/up-406 in all aspects of their work in this course. This code forbids cheating, fabrication or falsification of information, multiple submissions of academic work, plagiarism, abuse of academic materials, and complicity of academic dishonesty. Standards of academic integrity will be enforced in the course.

Course Etiquette: Open and mutually respectful communication of varied opinions, beliefs, and perspectives during classroom or online discussion encourages the free exchange of ideas that is essential to higher learning and to the ability to learn from each other. Students are expected to display tolerance for others' views in the course. They are also to refrain from the use of any inappropriate language anywhere within the course. Unwelcome conduct directed toward another person based upon that person's actual or perceived race, actual or perceived gender, color, religion, age, national origin, ethnicity, disability, or veteran status, or for any other reason, constitutes a violation of University Policy 406, The Code of Student Responsibility. Any student suspected of engaging in such conduct will be referred to the Office of Student Conduct.

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Course Requirements:

Class Participation (all students): Each student is required to attend class and actively participate (take notes, ask questions, and complete in-class activities) throughout the period. Attendance will be taken twice during each class – approximately five minutes after the start of class (at 2:35 pm) and approximately five minutes before the end of class (at 3:40 pm). You must be present at both times to earn attendance credit on any given class day. **Use of smart phones, email, messaging, headphones, earbuds, or any form of social media (including its use on tablets and laptops) during class is strictly prohibited.** Any student observed using such media during class (either during lecture or in-class activities) will lose all attendance points for that day.

Weather Briefings (all students): Each student is required to co-lead one weather briefing during the semester. Briefings should focus on **synoptic-scale** events that are occurring or could potentially occur across the **continental United States**. A list of expected briefing topics and the evaluation rubric are available on Canvas. Briefings will begin after the first exam.

National Weather Forecasting Contest (all students): Each student is required to participate in the *WxChallenge* (http://www.wxchallenge.com/) forecasting contest. You will be competing against over 1000 students from across the country! You will be evaluated on your participation and overall performance with the five cities for which we will be forecasting. Details regarding sign-up and the evaluation rubric are Canvas.

Homework (all students): A total of six homework assignments will be given. Each will be related to lecture topics and will involve detailed analysis of observations and/or numerical models for specific cases. You are required to show/explain your work on all homework assignments. **Access to a color printer or the ability to modify/save (i.e., draw on) an image or PDF file is required.**

Reading Quizzes (all students): A total of ***six reading quizzes*** will be given. Each quiz will cover content from the assigned reading (see class schedule on the last page) that students are expected to complete ***before*** the material is covered in lecture. Hence, reading the assigned textbook sections ahead of time will be critical to passing the quizzes. Quizzes will be given during the first 10 minutes of a class. Your overall quiz grade will be based on your ***highest five scores***; the lowest score will be dropped. There will be ***no make-up quizzes for any reason***.

Paper Presentation (ESCI 5251 students only): Each graduate student will read and orally present a professional journal article on a synoptic-scale phenomenon. Presentations (18-20 minutes) should include a summary of the article's methods and results. The article must be approved by the instructor. A list of potential articles and the evaluation rubric are available on Canvas.

Exams (all students): All exams will be closed note and book during class. There will be two exams during the semester (**September 24** and **November 3**) and a final exam (**December 8**). The final exam day/time ***may not*** be rescheduled; plan your semester end to accommodate the university-designated final exam date/time (see https://ninercentral.charlotte.edu/courses-registration/registration-resources/exam-schedules).

Evaluation:

The grading scale will be a standard percentile scale. Your final grade will be calculated using the following point distribution.

	METR 4245	ESCI 5251
Class Participation	25	25
Weather Briefing	25	25
WxChallenge Forecasting	20	20
Homework (6 @ 20 pts. each)	120	120
Reading Quizzes (5 @ 6 pts each)	30	30
Paper Presentation	---	50
Exam #1	50	50
Exam #2	50	50
Final Exam	80	80
Total Points	400	450

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

Note: The **maximum total extra credit** that you can earn in the course is **20 points** (~5% of your overall grade). Each seminar summary is worth a maximum of 4 points (based on the length and depth of your summary). Additional extra credit opportunities may be offered throughout the semester.

Tentative Class Schedule:

Week	Date		Subject	Readings	Quizzes
1	Mon	8/18	Introduction to the Course		
	Wed	8/20	Quasi-Geostrophic Theory and Application	Chapter 2.1 – 2.2	**Quiz-1**
2	Mon	8/25	Quasi-Geostrophic Theory and Application		
	Wed	8/27	Quasi-Geostrophic Theory and Application	Chapter 2.3 – 2.5	**Quiz-2**
3	Mon	9/01	**No Class – Labor Day**		
	Wed	9/03	Quasi-Geostrophic Theory and Application		
4	Mon	9/08	Quasi-Geostrophic Theory and Application		
	Wed	9/10	Quasi-Geostrophic Theory and Application		
5	Mon	9/15	Quasi-Geostrophic Theory and Application		
	Wed	9/17	Quasi-Geostrophic Theory and Application		
6	Mon	9/22	Quasi-Geostrophic Theory and Application		
	Wed	9/24	**Exam #1**		
7	Mon	9/29	Baroclinic Instability	Chapter 7.0 – 7.2	**Quiz-3**
	Wed	10/01	Baroclinic Instability		
8	Mon	10/06	Mid-latitude Cyclogenesis	Chapter 5.0 – 5.4	**Quiz-4**
	Wed	10/08	Lifecycles of Classic Mid-latitude Cyclones		
9	Mon	10/13	**No Class – Professional Travel**		
	Wed	10/15	**No Class – Professional Travel**		
10	Mon	10/20	Lifecycles of Classic Mid-latitude Cyclones		
	Wed	10/22	Fronts – Definition and Observational Aspects	Chapter 6.0 – 6.5	**Quiz-5**
11	Mon	10/27	Fronts – Definition and Observational Aspects		
	Wed	10/29	Fronts – Definition and Observational Aspects		
12	Mon	11/03	**Exam #2**		
	Wed	11/05	Fronts – Kinematic and Dynamic Frontogenesis		
13	Mon	11/10	Fronts – Kinematic and Dynamic Frontogenesis		
	Wed	11/12	Fronts – Coupling to Jet Streaks		
14	Mon	11/17	Numerical Weather Prediction	Chapter 10.0 – 10.7	**Quiz-6**
	Wed	11/19	Numerical Weather Prediction		
15	Mon	11/24	Numerical Weather Prediction		
	Wed	11/26	**No Class – Thanksgiving Break**		
16	Mon	12/01	**Graduate Student Presentations** Course Review		
	Wed	12/03	**No Class – Reading Day**		
17	Mon	12/08	**Final Exam: 2:00 – 4:30 pm**		