METR 4110 / ESCI 5110
ATMOSPHERIC INSTRUMENTATION
FALL 2025

Instructor: Dr. Matthew Eastin
mdeastin@charlotte.edu

Class Time: Monday / Wednesday / Friday at 11:15 am – 12:05 pm
Class Location: McEniry 203

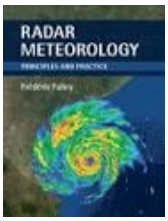
Office: McEniry 209
Office Hours: Monday / Wednesday 10–11 am and 1–2 pm

Teaching Assistant: None

Texts (Required):

Meteorological Measurements & Instrumentation
R. Giles Harrison
Wiley-Blackwell Publishing

Radar Meteorology – Principles and Practice
Frederic Fabry
Cambridge Press



Course Description: An overview of common atmospheric measurements systems and their applications. Particular attention is paid to surface, sounding, and radar systems.

Course Student Learning Objectives (SLOs):

1. Know how modern surface weather stations sounding systems, and weather radar systems operate and observe the atmosphere.
2. Identify potential errors associated instrument type, siting, and operating conditions.
3. Analyze observations from surface, sounding, and radar instrumentation.
4. Diagnose atmospheric structure using use raw observations collected by the instrumentation.

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)

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 during each class – five minutes after the start of class and five minutes before the end of class. 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 documented 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 any disability accommodation must first consult the Office of Disability Services and follow the instructions provided by 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 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, national origin, ethnicity, or disability, or any other reason, may constitute 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 period – approximately five minutes after the start of class (at 11:20 am) and approximately five minutes before the end of class (at 12:00 noon). 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 social media (including its use on tablets or 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.

Homework (all students): A total of 6 homework assignments will be given. Each will consist of several in-depth exercises related to recent topics and may involve the examination of case study data from observing platforms. You are required to show and/or explain your work on all homework assignments. **Access to both a personal computer and a color printer (or the ability to modify/draw-on a PDF file) is required.**

Paper Presentation (ESCI 5110 students only): Each graduate student will read and orally present a professional journal article addressing some aspects of instrumentation (i.e., instrument development, operation, quality control, and/or application). Presentations (18-20 minutes in length) should include a summary and critique of the article's methodology and results. The article may be chosen from the provided list or selected independently. All articles must be approved by the instructor. A list of potential articles and the evaluation rubric are available on Canvas.

Exams (all students): There will be a mid-term exam (**October 8**) and a final exam (**December 5**). The final exam day/time ***may not*** be rescheduled; plan your semester end to accommodate the final exam (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 4110	ESCI 5110
Class Participation	20	20
Homework (6 @ 30 pts. each)	180	180
Paper Presentation	---	50
Mid-Term Exam	100	100
Final Exam	100	100
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** 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	Reading
1	Mon	8/18	Introduction to the Course and Overview	
	Wed	8/20	Fundamentals of Measurement / Instrumentation	Harrison: Chapters 1 – 4
	Fri	8/22	Fundamentals of Measurement / Instrumentation	
2	Mon	8/25	Pressure	Harrison: Chapter 7
	Wed	8/27	Temperature	Harrison: Chapter 5
	Fri	8/29	Dewpoint / Humidity	Harrison: Chapter 6
3	Mon	9/01	**No Class – Labor Day**	
	Wed	9/03	Dewpoint / Humidity	
	Fri	9/05	**Weather Station Assembly**	
4	Mon	9/08	Wind Speed / Direction	Harrison: Chapter 8
	Wed	9/10	Wind Speed / Direction	
	Fri	9/12	**Weather Station Assembly**	
5	Mon	9/15	Radiation	Harrison: Chapter 9
	Wed	9/17	Radiation	
	Fri	9/19	**Weather Station Deployment**	
6	Mon	9/22	Precipitation	Harrison: Chapter 10
	Wed	9/24	Precipitation	
	Fri	9/26	**Weather Station Retrieval**	
7	Mon	9/29	Upper Air Observations	Harrison: Chapter 11
	Wed	10/01	Upper Air Observations	
	Fri	10/03	Upper Air Observations	
8	Mon	10/06	Upper Air Observations	
	Wed	10/08	**Mid-Term Exam**	
	Fri	10/10	**No Class – Fall Break**	
9	Mon	10/13	**No Class – Professional Travel**	
	Wed	10/15	**No Class – Professional Travel**	
	Fri	10/17	**No Class – Professional Travel**	
10	Mon	10/20	Overview of Radar Systems	Fabry: Chapter 1
	Wed	10/22	Overview of Radar Systems	
	Fri	10/24	Fundamentals of Radar Beam Pulses	Fabry: Chapter 2
11	Mon	10/27	Fundamentals of Radar Beam Pulses	
	Wed	10/29	Radar Equations and Reflectivity	Fabry: Chapter 3
	Fri	10/31	Radar Equations and Reflectivity	
12	Mon	11/03	Radar Equations and Reflectivity	
	Wed	11/05	Fundamentals of Radar Display	Fabry: Chapter 4
	Fri	11/07	Fundamentals of Radar Display	
13	Mon	11/10	Doppler Radar	Fabry: Chapter 5
	Wed	11/12	Doppler Radar	
	Fri	11/14	Doppler Radar	
14	Mon	11/17	Doppler Radar Interpretation	Fabry: Chapters 7 – 11
	Wed	11/19	Doppler Radar Interpretation	
	Fri	11/21	Polarimetric Radar	Fabry: Chapter 6
15	Mon	11/24	Polarimetric Radar	
	Wed	11/26	**No Class – Thanksgiving Break**	
	Fri	11/28	**No Class – Thanksgiving Break**	
16	Mon	12/01	Course Review	
	Wed	12/03	**No Class – Reading Day**	
	Fri	12/05	**Final Exam: 11:00 am – 1:30 pm**	