

Syllabus for ATMS 316 – Mesoscale Meteorology – Spring 2026

Description

“The devil is in the details.”

A quote intended to convey the importance of paying attention to the details, applicable in a career as a weather forecaster. If we have an understanding of the large scale (synoptic-scale) weather, but ignore how local effects can modulate the large-scale weather, we will find ourselves making a bad local weather forecast. The local weather effects quite often fall under the general category of “Mesoscale Meteorology.” This course is intended to give the student an appreciation of how middle-scale (mesoscale) effects can modulate the large-scale weather and we’ll examine several **specific** scenarios in which this modulation occurs.

Instructor

Doug Miller
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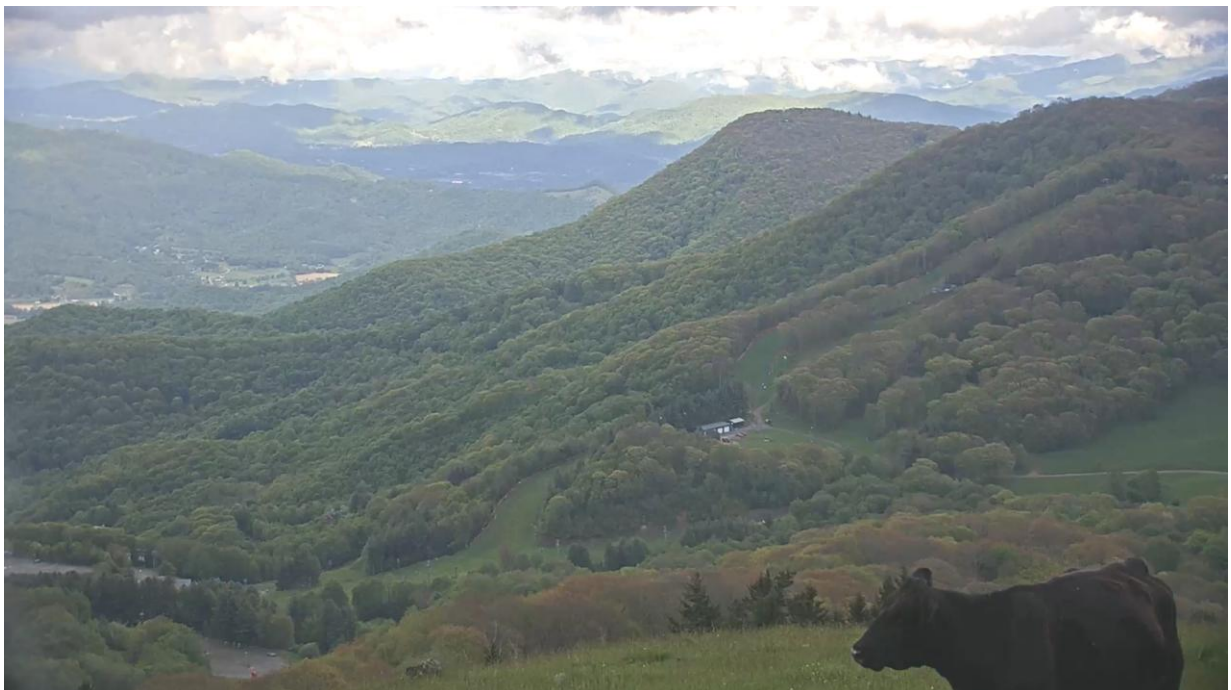
[http://www.atms.unca.edu/dmiller/
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Textbook

“Mesoscale Meteorology in Midlatitudes” by Paul Markowski and Yvette Richardson
Reference - “Mesoscale Meteorology and Forecasting” Edited by Peter S. Ray

Student Learning Outcomes

- Understand the uniqueness of cool and warm season mesoscale weather phenomena in terms of the forces and accelerations contributing to their evolution
- Utilize this understanding to predict how these phenomena can modulate weather patterns on the synoptic scale and force adjustments to a local weather forecast
- Refine research and communication skills in the preparation of oral presentations of two published journal articles



Date	Topic	Reading/Homework*
M 12 Jan 2026	Introduction/ Overview	
W 14 Jan	What is the Mesoscale?	Chapter 1
M 19 Jan	<i>MLK Jr. holiday</i>	<i>No classes</i>
W 21 Jan	Lake-effect Convection	Chapter 4
M 26 Jan	"	Quiz #1
W 28 Jan	Northwest Flow Snowfall	Miller (2012), Project#1 due
M 2 Feb	"	Quiz #2
W 4 Feb	Polar Lows	Nordeng & Rasmussen (1992)
M 9 Feb	"	Quiz #3
W 11 Feb	Synoptic Fronts	Chapter 5, Project#2 due
M 16 Feb	"	Quiz #4
W 18 Feb	Mesoscale Gravity Waves	Chapter 6
M 23 Feb	"	Quiz #5, Project#3 due
W 25 Feb	Presentations, Round#1	Presentation#1 due
M 2 Mar	Lecture/ Review	
W 4 Mar	Exam I	12 Jan – 2 Mar material
M 16 Mar	Mountain Waves and Downslope Windstorms	Chapter 12
W 18 Mar	"	Quiz #6
M 23 Mar	Drylines and Outflow Boundaries	Chapter 5
W 25 Mar	"	Quiz #7
M 30 Mar	Convection Initiation	Chapter 7
W 1 Apr	"	Quiz #8, Project#4 due
M 6 Apr	Organization of Isolated Convection	Chapter 8
W 8 Apr	"	Quiz #9
M 13 Apr	Mesoscale Convective Systems	Chapter 9
W 15 Apr	"	
M 20 Apr	Hazards Associated with Deep Moist Convection	Chapter 10
W 22 Apr	"	Quiz #10, Project#5 due
M 27 Apr	Presentations, Round#2	Presentation#2 due
Final Exam Period	Exam II	16 Mar – 27 Apr material

*assignment completed before class meets on this date

Outline

Introduction - Overview of course
 What is the Mesoscale? {Chapter 1}
 Lake-effect convection {Chapter 4, p. 93 – 103}
 Northwest flow snowfall {Miller (2012) Weather and Forecasting article}
 Polar lows {Nordeng and Rasmussen (1992) Tellus article}
 Synoptic fronts {Chapter 5, p. 117 – 132}
 Mesoscale Gravity Waves {Chapter 6, p. 161 – 175}
 Mountain Waves and Downslope Windstorms {Chapter 12, p. 327 – 342}

Outline (continued)...

Drylines and outflow boundaries {Chapter 5, p. 132 – 149}
Convection Initiation {Chapter 7, p. 183 – 199}
Organization of Isolated Convection {Chapter 8, p. 201 – 224}
Mesoscale Convective Systems {Chapter 9, p. 245 – 249}
Hazards Associated with Deep Moist Convection {Chap 10, p. 273 – 306}

Grading

Projects	10%
Quizzes	10%
MesoNews	5%
Exam I	20%
Exam II	20%
Presentation #1	15%
Presentation #2	20%
Total	100%

92% < total score ≤ 100%	A
90% < total score ≤ 92%	A-
88% < total score ≤ 90%	B+
82% < total score ≤ 88%	B
80% < total score ≤ 82%	B-
78% < total score ≤ 80%	C+
72% < total score ≤ 78%	C
70% < total score ≤ 72%	C-
68% < total score ≤ 70%	D+
60% < total score ≤ 68%	D
total score ≤ 60%	F

Projects

Projects will be assigned throughout the semester and are intended to aid in improving your understanding of the course material contained in the lecture and reading assignments. Projects will be defined as *individual* or *group* assignments. When an assignment is designated for a *group*, everyone within the group will receive an identical grade.

Quizzes

Quizzes will be given weekly, at the end of each topic when we are discussing new material. Quizzes are given to help the student gauge their understanding of the weekly material from the assigned paper or textbook reading. The lowest quiz score will be ***dropped*** and not count toward the final course grade.

MesoNews

Each student will have one opportunity during the semester to find a significant mesoscale-influenced weather event over the past week and present the case study to the class. The presentation should be no longer than **FIVE** minutes and should consist of a synoptic discussion (SLP, 850, 700, 500, and 300 mb maps), show image loops (radar and/or satellite),

and discuss how mesoscale effects might have played a role in the weather event. The MesoNews presentations will take place at the beginning of class when a new topic is introduced.

Exams I and II

The mid-term exams (I and II) will be primarily testing new material introduced since the previous exam or since the start of the semester. Exam II will be taken during Final Exams week and will test the material presented during the second half of the semester.

Presentations

Each student will have two opportunities for finding a published journal article within the past 10 years (2016 – present) that cites references contained in the “Further reading” sections of the textbook or cites one of the papers read in this course and present the important information from the recent article during a 10 minute oral presentation. A one-page study guide will also be a requirement which describes the MOST IMPORTANT findings of the paper. The information from this study guide will be testable material on the mid-term exams and will be shared with all students in the class.

Assignment/Quiz/Exam Policy

Assignments are to be handed in before the start of lecture on the date they are due. Assignments handed in after the start of lecture are considered late until 4:00 pm on the date they are due and will have an automatic 10% deduction from their final score. Assignments handed in after 4:00 pm on the date they are due will receive no credit.

Quizzes and Exams are written tests and will be taken on the date they are scheduled, unless circumstances (e.g. medical or loss in the family) warrant. Make-up quizzes and exams for unexcused absences will consist of an individual oral graded question and answer session at a mutually agreed upon time outside of the usual class meeting time.

Office of Accessibility & Academic Accommodations

UNC Asheville is committed to providing an inclusive experience, accessible learning environments and equal opportunity to individuals with disabilities in accordance with the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act.

If you are a student experiencing barriers to access or full participation in this course on the basis of a disability, contact the Office of Accessibility to apply for reasonable accommodations and discuss available resources. You may contact the Office of Accessibility at academicaccess@unca.edu or 828-251-6292.

Students are responsible for discussing their Letter of Accommodations (LOA) with their faculty. Students and faculty are encouraged to discuss the LOA as early in the semester as possible to allow for extended access to accommodations. However, students may disclose a disability at any point in the semester. Accommodations are not retroactive and are activated when the LOA is discussed.

Sexual Harassment and Misconduct

UNC Asheville is dedicated to cultivating and maintaining a safe, respectful, and inclusive environment, free from harassment and discrimination. We strive to ensure that all have equal access to the educational and employment opportunities the University provides. If you or someone you know has been affected by sexual or gender-based harassment, including sexual assault, dating or domestic violence, or stalking, please know that help and support are available. UNC Asheville strongly encourages all members of the community to take action, seek support, and report incidents of sexual harassment to the Title IX Office. You may contact the Title IX Office or Heather Lindkvist, the Title IX Coordinator, directly at 828.232.5658 or at titleix@unca.edu or learn more by visiting titleix.unca.edu.

As a faculty member, I am a “responsible employee” and private resource. This means that if you share any information or discuss an incident with me regarding sexual or gender-based harassment, I must disclose this information to the Title IX Coordinator. Our goal is to ensure you are aware of the range of options available to you and have access to the resources you may need.

If you wish to speak with a confidential resource, contact University Health and Counseling Services at 828.251.6520. Off-campus confidential resources include Our Voice (24-Hour Hotline at 828.255.7576) and Helpmate (24-Hour Hotline at 828.254.0516).

Academic Alerts

Faculty at UNC Asheville have access to an Academic Alert system. The purpose of this system is to communicate with students about their progress in courses. Alerts can indicate concerns (e.g., academic difficulty, attendance problems) or reflect on the good work you’re doing. Professors use the Alert system because they are invested in student success and want to encourage open conversations about how students can improve their performance. When a faculty member submits an alert that expresses a concern, the student receives an email from Academic Advising notifying them of the alert. If a student receives three or more alerts, they will need to meet with a Student Success Specialist in the Academic Success Center. The instructor may also request to meet with the student to discuss the alert. It is in the student's best interest to address the alert quickly, as students who do so are more likely to earn credit for the course. Questions about the Academic Alert system can be directed to Anne Marie Roberts (amrober1@unca.edu) in the Academic Success Center.

University Writing Center

The University Writing Center (UWC) supports writers in one-on-one sessions lasting 10 to 45 minutes. Consultants can help writers organize ideas, document sources, and revise prose. If you visit the UWC, bring a copy of your assignment, any writing or notes you may have, and the sources you are working with. Make an appointment by visiting writingcenter.unca.edu and clicking on "Schedule an Appointment," or drop in during open hours Monday-Friday.

Academic Honesty

The university's policy on academic honesty states that "As a community of scholars dedicated to learning and the pursuit of knowledge UNC Asheville relies on the honesty and academic integrity of all the members of its community. Any act of plagiarism or cheating is academic dishonesty. A person who knowingly assists another in cheating is likewise guilty of cheating. According to the instructor's view of the gravity of the offense, a student may be punished by a failing grade or a grade of zero for the assignment or test, or a failing grade in the course. If it seems warranted, the instructor may also recommend to the Provost dismissal or other serious university sanction." I expect that you will exercise integrity in all quizzes, exams, and written assignments. Please email me or pop in during student hours if you have additional questions or need clarification on any point.