

# METR 437: Mesoscale Meteorology

## Spring 2021

**Professor:** Dr. Josh Durkee, University Meteorologist

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**Office Hours:** Via Zoom by appointment

**Lecture:** TR 2:20-3:40p | via Zoom

**Pre-requisites:** METR 324, MATH 237, and PHYS 260



**Required Text:** *Mesoscale Meteorology in the Midlatitudes*, by Markowski and Richardson  
*Severe Convective Storms*, by C. A. Doswell (III) (Ed.)

**Supplemental Text:** (very useful but not required)

- *Mesoscale Meteorology*, by P. S. Ray
- *Storm and Cloud Dynamics*, by Cotton et al.
- *Weather Forecasting Handbook*, by Vasquez
- *Weather Forecasting Redbook*, by Vasquez
- *Weather Map Handbook*, by Vasquez

**\*NOTE:** I will also provide key articles on Blackboard that you will be responsible for reading throughout the semester.

### Course description:

This course deals with one of the most active and challenging areas of research and understanding in meteorology –the structure, evolution, forcing, and prediction of weather phenomena with particularly short spatial and temporal scales, as well as the techniques involved in analyzing such events. The discussion topics will follow closely along in time with the climatology of various mesoscale phenomena by starting off with winter weather phenomena before transitioning into severe convective storms, heavy precipitation events, high-wind events, and floods. The overall objective of this course is to develop a thorough fundamental understanding of the application of atmospheric dynamics and physics in order to accurately describe, diagnose, and predict various mesoscale weather phenomena.

### Course structure:

The course structure will be varied throughout the semester. Most days will be traditional where I will lead the discussion from the front of the room. At times, you will be required to read certain chapters or research articles and we will have a student-led group discussion. Other times, we will incorporate COMET Meted modules into our discussions. You are expected to register with COMET after reading this: [http://www.meted.ucar.edu/resource\\_modlist.php](http://www.meted.ucar.edu/resource_modlist.php). Be sure to put my email address (see above) in the appropriate space where quiz results are to be sent.

### Forecast Discussions:

Each day will begin with a student-led weather briefing that outlines current events around the country. These daily weather discussions are not meant to be a casual conversation. Rather, you are to present the material in a scientific manner, appropriate for well-educated atmospheric scientists. You have already been introduced to this routine in METR 324. Now it is time to polish off your skills! You will be held to a particularly high standard during presentations and discussions.

### **Class project:**

Each student will be required to conduct a thorough forecast analysis case study of a previous event. Please avoid popular or historic events! The project will consist of a 2800-3400 word paper (text only; default margins, Times New Roman 12 pt.), not including a title page with an abstract (200-250 words), and any necessary figures or tables. Please follow the American Meteorological Society reference and citation format; <https://www.ametsoc.org/index.cfm/ams/publications/authors/journal-and-bams-authors/formatting-and-manuscript-components/> Each student will also be expected to present their findings to the class during a 10-12 min oral presentation. Each student will also be expected to present their findings at the WKU REACH conference. Note, this is not a group effort!

### **Attendance Policy:**

We are all doing our best right now. Given the uncertainty of the day-to-day lives we each lead, we must all understand there may be times when either the professor or student(s) cannot attend a regular class meeting. The continuity of education is very important to me, but we must remain fluid and flexible to move and bend with any curveballs in the schedule. With that in mind, missing any material in an advanced professional core meteorology course will only add extra burden. Please avoid leaning on the extraordinary times to just skip class. If you've made it to METR 437, this should be your happy place so be present, dig in, thrive, and find your path toward being successful. Let me know how I can help.

### **Grading and Exams:**

Your course grade will be based on your earned score from three regular exams, homework exercises, participation in daily weather discussions, participation in the WxChallenge forecast contest, and the class project. During each exam, no one may begin an exam once another person has completed an exam and left the classroom, so be sure to arrive on time. Homework assignments may include (but are not limited to) traditional problem sets, hand-analyzed maps, COMET modules, and written summaries on key articles. There is absolutely zero tolerance for late assignments. Any late work will not be accepted.

### **Graduate Students:**

In addition to the course requirements described above, your grade will be weighted by additional material, primarily on exams and the class project. You are also expected to perform at a higher level for all other non-weighted material.

*\*please note that much of the material is integrative so having an understanding of the early material can only be beneficial for your learning outcomes throughout the semester, which typically results in a satisfactory grade of your desire.*

**Grading Scale:** Your final grade for this course will be evaluated from the following:

#### **Grading Scale (%)**

100-90	<b>A</b>
89-80	<b>B</b>
79-70	<b>C</b>
69-60	<b>D</b>
< 60%	<b>F</b>

#### **Course requirements: Course requirements: (weights are subject to change)**

<b>2 Regular Exams</b>	30% @ 15% a piece
<b>Homework</b>	15%
<b>Weather Discussions</b>	15%
<b>Class Project</b>	40%

**Note:** You should not expect a higher letter grade than what you earned on the scale in the event that you were “real close” or other outside factors aside from your work inside of the classroom.

**Makeup tests?** In short, there are NO MAKEUP EXAMS or QUIZZES/DISCUSSION GROUPS. The final exam is mandatory for all students and must be taken only at the scheduled time. No excuses. With regards to this, please come see me only if you have some extremely undesirable circumstance that you feel needs to be discussed, and no later than 24 hrs within the missed test. Typically a missed regular exam (note: not quizzes) results in the final exam accounting for a greater proportion of your grade.

**Extra credit?** In fairness to all students, there will be NO EXTRA CREDIT given on an individual basis so please refrain from asking for extra credit. Please come see me as soon as you discover that you are having problems and I will be happy to try and help you resolve any difficulties that you may be having.

### **Academic Honesty:**

Students are responsible for the Scholastic Dishonesty Code, which is in your student handbook. Scholastic dishonesty includes but is not limited to: copying others’ work, using notes during tests, and sabotaging others’ work. If I discover any scholastic dishonesty, I will report it.

### **Blackboard:**

Test scores and grades will also be posted on Blackboard. You will be able to access Blackboard through the WKU portal at: <http://portal.wku.edu>. You will need your Net ID to do this. All professor-to-student communication will be conducted through your email address provided on TOPNET/Blackboard.

### **Lap Tops or other tablet-related devices?**

I do not mind if you prefer to use a laptop or other similar devices to log notes. However, there is zero tolerance if your portable device is distracting to the learning of you and your peers in the classroom (i.e., no internet, no email, no chats, etc.). Should such distractions occur you will be asked to refrain from using your device for the remainder of the semester.

### **A word about my notes:**

Although my notes are in PowerPoint, the notes are available as pdf files on Blackboard. You are strongly encouraged to write these notes down! Studies show strong evidence for enhanced learning retention when note-taking is written by hand...even over typing and especially over just reading! Also, there will be plenty of times where I add to the notes verbally, on the chalkboard/whiteboard, or some other form of demonstration (e.g., computer animation, etc.). This means do not show up to class empty handed and just sit there. Those students in the past who have chosen not follow the advice given here often come up short at the end of the semester. Subsequently, I refer them back to this part of the syllabus. This happens every semester.

**Title IX, Discrimination, Harassment and Sexual Misconduct Policy:** Western Kentucky University (WKU) is committed to supporting faculty, staff and students by upholding WKU’s Title IX Sexual Misconduct/Assault Policy and Discrimination and Harassment Policy. Under these policies, discrimination, harassment and/or sexual misconduct based on sex/gender are prohibited. If you experience an incident of sex/gender-based discrimination, harassment and/or sexual misconduct, you are encouraged to report it to the Title IX Coordinator or Title IX Investigators.

Please note that while you may report an incident of sex/gender-based discrimination, harassment and/or sexual misconduct to a faculty member, WKU faculty are “Responsible Employees” of the University and MUST report what you share to WKU’s Title IX Coordinator or Title IX Investigator. If you would like to speak with someone who may be able to afford you confidentiality, you may contact WKU’s Counseling and Testing Center at 270-745-3159.

**Disability Statement:** Students with documented disabilities who require accommodations (academic adjustments and/or auxiliary aids or services) for this course must contact the Office for Student Accessibility Resource Center, DSU 1074. The OFSDS telephone number is (270)745-5004; TTY is 745-3030. DO NOT request accommodations directly from the professor or instructor without a letter of accommodation.

**Additional help:** The Learning Center (DSU 2141) provides free supplemental education programs for all currently enrolled WKU students. For more information, or to schedule a tutoring appointment, please call TLC at (270) 745-6254 or log onto <http://www.wku.edu/tlc>.

**COVID-19:**

In the event you are directly or indirectly connected to COVID-19-related circumstances that may have an impact on your performance in this class, please reach out to me as soon as you can. We are all navigating this health crisis together, so remaining fluid and flexible on the professor and student sides of the fence is critical.

**Miscellaneous:**

Also, there is **zero tolerance** for any unacceptable behavior in the classroom and you will be asked to leave in the event that you show any disrespect (subject to my discretion) to your professor and your peers, and you will be reported. Lastly, the use of any tobacco products in the classroom is strictly prohibited.

**METR 437 Lecture and Reading Schedule:** *This general course outline is subject to change*

Week	Day	Date	Topic of Lecture	Readings
1	T	01.19	Introductions; Forecast Discussion Review	Blackboard Review Folder
	R	01.21	IDV, RAOB, Buikit, Digital Atmosphere Workshop	<a href="http://www.unidata.ucar.edu/software/idv/">www.unidata.ucar.edu/software/idv/</a>
MESOSCALE APPLICATIONS/WINTER WEATHER				
2	T	01.26	Soundings and Hodograph Analysis	MR 2.6-2.7; Comet
	R	01.28	Defining Mesoscale/Mesoscale Classification	D 3.1a; MR 1; Comet
3	T	02.02	Active Microwave Analysis	MR Appendix A
	R	02.04	Radar Applications	MR Appendix A; Comet
4	T	02.09	Lake Effect Snow	MR 4.5; Comet
	R	02.11	Mesoscale Banded Precipitation; Heavy Banded Snow	Comet
5	T	02.16	Cold-Air Damming	MR 13.2; Comet
	R	02.18	Test I	
SEVERE CONVECTION				
6	T	02.23	Severe Convective Storms: An Overview	D 1
	R	02.25	Extratropical Synoptic-Scale Processes & Severe Convection (I)	D 2; MR 5
7	T	03.02	Extratropical Synoptic-Scale Processes & Severe Convection (II)	D 2; MR 5
	R	03.04	Mesoscale Processes & Severe Convection (I)	D 3; MR 6
8	T	03.09	Mesoscale Processes & Severe Convection (II)	D 3; MR 6
	R	03.11	Isolated Convection	D 5; MR 8
9	T	03.16	Mesoscale Convective Systems (MCSs)	D 9; MR 9; Comet
	R	03.18	Mesoscale Convective Complexes (MCCs)	D 9; MR 9; Comet; Readings
OTHER HAZARDS/FORECAST APPLICATIONS				
10	T	03.23	Convectively-Driven High Winds	D 7; MR 10.2-10.3
	R	03.25	Non-convective High Winds	Select Readings
11	T	03.30	Heavy Precipitation; Precipitation Efficiency	D 8; D 12; MR 10.5; Comet
	R	04.01	Floods and Flash Flood Forecasting	D 12; MR 10.5; Comet
12	T	04.06	Severe Local Storms	D 11
	R	04.08	Test II	
PRESENTATIONS & FINAL PAPER				
13	T	04.13	Presentations	
	R	04.15	Presentations	
14	T	04.20	Presentations	
	R	04.22	Presentations	
	T	04.27	Papers are due: By 3:00 pm	

MR = Markowski and Richardson

D = Doswell

***Failure to plan on your behalf, does not create a crisis on mine!***

### Test/Exam Schedule

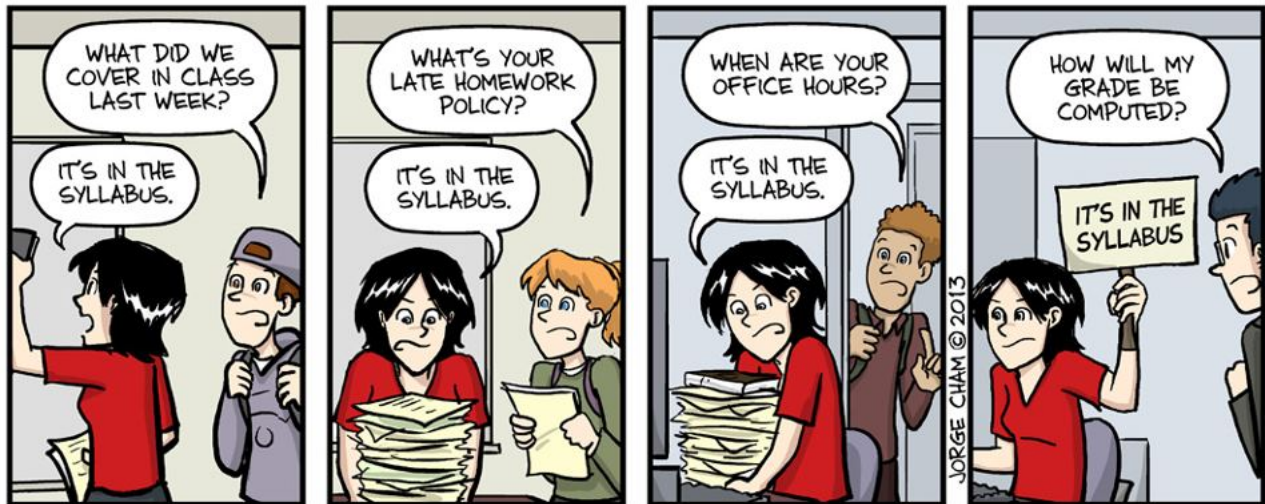
If unanticipated events occur, the test/exam schedule will be modified accordingly.  
There will be no make-up final exam and no tests/exam will be given prior to their scheduled time.

Exam	Date/Time
Exam 1	Thursday, Feb. 18
Exam 2	Thursday, Apr. 08
Final Paper	Papers due: Tuesday, April 27 <sup>th</sup> by 3:00 pm

### Other Important Dates (deadlines)

Type	Date	Day
Drop/Add	Jan. 26	Tuesday
Withdrawal	Mar 25	Thursday

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# IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.