

## Syllabus: Synoptic Analysis and Forecasting

Course ID# 24486 (undergrad) 24485 (grad)

3 Credit Hours

Course Overview: *Synoptic meteorology is the study of continental-scale (i.e. synoptic) atmospheric conditions and the processes that drive changes to these conditions. Topics examined include atmospheric forces and flow balances; development and evolution of low and high pressure systems, frontal systems, jet stream and upper-air features; quasi-geostrophic theory; observational tools; operational numerical weather models; and weather forecasting techniques.*

Instructor: Dr. Jana Houser                      Office: 1123 Derby  
 Email: [houser.262@osu.edu](mailto:houser.262@osu.edu)                      Office hours: Thurs 12:30-2:00, Open door

**\*PLEASE NOTE: If you email me a question that you can find the answer to on the syllabus, or online somewhere, I will refer you back to the syllabus without answering your question!**

Class Information:                      **Course Format:** Lecture  
**Meeting Times:** Tuesday/Thursday 11:10-12:30, DERBY 0140  
**Prerequisites:** Geog 5900, 5940, Math 1152, Phys 1251  
**Textbook:** *Midlatitude Synoptic Meteorology* by Gary Lackmann  
 ISBN: 978-1-878220-10-3 (NOTE: This is not required, but it is STRONGLY encouraged that you purchase the text book as it will aid in the delivery of course material.

\*IMPORTANT ILLNESS AND TRAVEL RELATED INFORMATION: This class will be offered in person. If you find yourself ill and/or needing to quarantine (or cannot attend class in person for some university sanctioned reason), I will live-stream our class via Zoom. HOWEVER: this is not a default option. YOU MUST CONTACT ME PRIOR TO THE START OF CLASS to make arrangements for me to start the Zoom. Additionally, there are a few times where I will be traveling over the semester (see the calendar on the last page). On these dates, I will deliver class via a remote lecture on Zoom.

ZOOM INFO: <https://osu.zoom.us/j/6862423614?pwd=b0JERIN0NncrdkE0V1F3RWtqd2xsUT09>  
 Meeting ID: 686 242 3614                      Password: 776825

Recommended course equipment: In order to complete activities, it is strongly recommended that you purchase a digital pen that will allow you to write directly on the digital word document assignments. If you don't know where to start, I recommend the XP Pen (I personally have the Deco 01), which can be used very easily with Macs or Microsoft systems by simply plugging in the tablet to a USB port.

**Big Picture Course Goal:                      Identify, explain, and forecast the behavior, evolution, and weather patterns associated with synoptic-scale weather systems using quasi-geostrophic theory to scientifically back arguments and observations.**

**Expected learning outcomes to assist in accomplishing the big-picture goal:**

- 1) *Interpret* weather conditions from surface, upper air, radar and satellite data.
- 2) *Identify* synoptic-scale features such as surface lows, Rossby waves, jetstreaks, etc.
- 3) Use governing and supporting physical equations to *explain* atmospheric behavior.
- 4) *Diagnose* regions of synoptic-scale upward and downward vertical motions, height rises and height falls expected from quasi-geostrophic theory.
- 5) *Predict* where midlatitude cyclones will develop.
- 6) *Forecast* the evolution of Rossby waves
- 7) *Predict* surface weather associated with various configurations, stages of evolution, and storm-relative locations of synoptic-scale systems and their associated fronts.

**Grading:** Final grades will be assigned according to the OSU standard system and will not be curved (In other words, if you have an 89.49% you earn a B+):

**Grade Scale**

A	A-	B+	B	B-	C+	C	C-	D+	D	E
>92.5%	89.5 – 92.5%	86.5 – 89.5%	82.5 – 86.5%	79.5 – 82.5%	76.5 – 79.5%	72.5 – 76.5%	69.5 – 72.5%	66.5 – 69.5%	59.5 – 66.5%	<59.5%

Assessment:

Exams (2): (2 midterms – 15% each, total 30%)

Weekly quizzes: 20%

Weekly Homework: 20%

WxChallenge: 10%

Class participation: 10%

FINAL PROJECT: 10%

**Exams (30%):** There will be two midterm exams worth equal weights for this course scheduled during class time. Exam dates are tentatively scheduled as shown on the last page.

**Weekly quizzes (20%):** At the beginning of TUESDAY’S class, there will be a quiz that will evaluate students’ preparation for that week’s material. The quiz will be taken twice, back to back, once independently and once in your group. Both grades will count for credit according to the percentages determined at the beginning of the semester. *If you are absent, you can make arrangements to take the quiz individually if you contact me **within 24 hours of the absence.*** If you are absent, your individual grade will also count as your group grade. You can have **2 make ups** during the semester unless there are extenuating circumstances *that we have been in communication about.* If you are late to class, you will NOT be granted extra time to complete your quiz. The lowest quiz grade (individual AND group) will be dropped.

**Homework (20%):** Each Thursday, a portion of class time will be spent on homework problems. The goal of the homework is to get you to immediately apply what you have learned in class. Homeworks will be made available following TUESDAY’s class and will be due SUNDAY NIGHT at 9:00 PM.

**WxChallenge (10%):** Since this is a forecasting based class, you will be expected to exercise your skills by participating in the National Weather Challenge! Half of your grade in this category will be based merely on participation. If you manually enter 90% of the forecasts, you will earn full credit and you automatically receive half credit (5/10 points). The remaining 5% will be based upon accuracy. If you place in the national consensus at the end of the forecasting timeframe for a city, you automatically earn 1 point. If you place in the top 50% of the class for that forecast city, you will also earn 1 point (but note: people in the top 50% who also place in National consensus will NOT earn 2 points). If the whole class places in national consensus, the whole class will earn a point for that forecast city.

**Class participation (10%):** *This grade is earned based upon your attendance and your group peer-evaluation.* Each group member will anonymously evaluate the others’ preparation and participation in group quizzes and activities twice during the semester. The average of an individual’s responses will be used as this grade unless there is an obvious outlier in the evaluations. See Group Evaluation Rubric handout on Canvas document.

**Final Project (10%):** In lieu of a final exam, there will be a final project due during finals week at the end of the semester. This project requires you to follow the evolution and associated conditions of a mid-latitude cyclone and explain how and why it evolved the way it did. For more information including rubric, see the Final Project handout on Carmen.

**\*NOTE: This course is executed following the “Team-based Learning” pedagogical method. As such, there will be distinct differences between this course and the traditional lecture-style class.**

**Class Time:** You are expected to come prepared to class on TUESDAY having already read through the week’s course materials (book, Powerpoints and/or videos). Class material will be posted on Canvas and students may access this information at any time. In order to aid you in your preparation, I have provided you with book references matching the Powerpoint slide content. Book readings are not required, but are added to be an additional source of information. Content for assignments/exams will be based off powerpoints.

**Tuesday’s Class:** We will start class time immediately with the quiz. Following the quiz, we will identify topics/questions that students want to focus on for that week, and this material will be what we talk about in class time through a series of “mini lectures”. \*NOTE: There will be some powerpoint content that we do not explicitly talk about in class. But you will STILL be responsible for knowing this content. This is why it is SO IMPORTANT for you to come to class prepared. That way you know what to ask and what topics you need clarification on.

**Thursday’s Class:** We will finish up with any remaining mini-lecture topics that were not covered on Tuesday. Otherwise, Thursday will consist entirely of active learning activities including group discussion-based multiple choice questions, and application-based homework questions for the remainder of the class time. The homework questions are similar to exam questions and are therefore good study tools.

\*I will be working on campus on Tuesdays and Thursdays. Other days of the week, I will be working remotely.

**Academic Misconduct:** It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>. Don’t cheat. Don’t copy. Don’t plagiarize.

If academic misconduct is suspected, the professor reserves the right to impose one or both of the following consequences:

1. A grade penalty, such as an F, may be imposed on the project or in the course.
2. A formal student conduct referral may be filed with the Office of Community Standards and Student Responsibility.

**\*PLEASE NOTE: HAVING ANOTHER PERSON COMPLETE OR PROVIDE YOU WITH ANSWERED ASSIGNMENT OR EXAM QUESTIONS, INCLUDING MATERIALS FROM PAST YEARS IS CONSIDERED CHEATING **BY BOTH PARTIES** AND IS GROUNDS FOR ACADEMIC DISCIPLINE RANGING FROM RECEIVING A 0 ON THE ASSIGNMENT TO FAILURE OF THE COURSE**

**If a student is caught cheating in any capacity on any material, disciplinary action will be taken.**

### **Student Accessibility:**

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

**Other Details, Policies and Procedures: Synoptic Forecasting**

1. Classes will begin AT 11:10 whether you are here or not. Please try not to be late as this disrupts the class environment.
2. **Make-up exams will only be allowed if arrangements have been made PRIOR TO the exam date** or for unusual extenuating circumstances.
3. Assignments, course materials and grades will be updated and posted on Carmen.
4. If you have special needs for any reason, please see <http://www.ohio.edu/disabilities/> for information. I will only be able to grant you special permissions if you have the appropriate documentation of your disability and your needs.
5. **Cell phones and other electronic devices ARE ONLY PERMITTED** for use in the classroom or the lab for polling purposes, for completing assignments or if you have a specific need that requires their use. In such situations please notify me of your need and provide any university documentation that supports it.
6. **For remote lectures, students are expected to have their cameras ON during the entire duration of Zoom meetings.** I do not care if you just rolled out of bed, or if you are in last night's clothes, but I want to see your face, as do your classmates.

## Important COVID-19 related information:

1. If you feel sick, please do not come to class! If you receive a positive COVID test, please inform me as soon as you can, provide a copy for documentation (no sensitive information please!) and follow the medical advice you receive from health professionals.

**Mental Health:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

**Diversity, Equity, Inclusion, and Harassment:** This classroom is a SAFE SPACE. Harassment, mistreatment, bullying, and any other type of demeaning or discriminatory behavior will not be tolerated. If you create a hostile environment towards the professor or a fellow student, you may be asked to leave the classroom. The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Furthermore, violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at [titleix@osu.edu](mailto:titleix@osu.edu)

**Course Outline:**

**\*This course outline is subject to change based upon lecture/classroom pace and unforeseen circumstances**

<b><i>Class Date</i></b>	<b><i>Topics</i></b>	<b><i>Book Material</i></b>	<b><i>Homework</i></b>
8/21-8/27 Week 1	Introduction, Scales of motion, Units, Variables, Surface Analysis Review, Isoplething, Analyzing Fronts	Ch 1.1, 1.2, table 1.3, Ch 12, Slides	HW1 Due 8/27
8/28-9/3 Week 2	Intro to numeric weather prediction, weather models, Forecasting Techniques <b>*Dr. Houser will be traveling. ZOOM LECTURES this week</b>	Ch 10.1, 10.2, 10.3, 10.4 intro, 10.4.3, 10.4.4, 10.5 intro, 10.6 intro, 10.6.1, 10.6.3 intro, 10.7, Ch 11.2,11.3, Slides	HW2 Due 9/3
9/4-9/10 Week 3	Basic Governing Equations, Kinematics of the wind field	Ch 1.3 Ch 1.5 intro, 1.5.1, 1.5.2, Slides	HW3 Due 9/10
9/11-9/17 Week 4	Advection, vorticity equation, synoptic-scale forces and force balances	Slides	HW4 Due 9/17
9/18-9/24 Week 5	Jet streams, geostrophic wind, thermal wind, ageostrophic wind, Convergence, divergence and relation to surface patterns, and secondary circulations	Ch 1.4, Slides	HW5 – Practice for Exam
9/25-10/1 Week 6	<b>Exam 1: 9/26 - All material through 9/25</b> Intro to QG Dynamics, QG Omega	Ch. 2.1 – 2.3, Slides	NO Homework
10/2-10/8 Week 7	QG Omega, Trenberth	2.3, Slides	HW6 Due 10/8
10/9-10/15 Week 8	Q-G Height tendency equation and adiabatic influences <b>10/12 NO CLASS – FALL BREAK</b>	Ch. 2.4, Slides	HW7 Due 10/15
10/16-10/22 Week 9	Rossby Waves, Intro to midlatitude cyclones, conveyor belt theory, Midlatitude Cyclone Weather	Ch 5 intro	HW8 Due 10/22
10/23-10/29 Week 10	Behavior and evolution of midlatitude synoptic systems – QG perspective <b>Dr. Houser will be traveling. ZOOM LECTURES this week</b>	Ch 5 intro, 5.3. (stop before 5.3.5), Slides	HW9 Due 10/29
10/30-11/5 Week 11	QG and Midlatitude pt 2	Ch 5.3.5, Slides	HW10 Due 11/5
11/6-11/12 Week 12	Types of midlatitude cyclones <b>Exam 2: 11/9 - All material from 10/2-11/7</b>		NO HW
11/13-11/19 Week 13	Fronts, Frontogenesis, Frontal circulations	Slides	HW11 Due 11/20
11/20-11/26 Week 14	Dynamic frontogenesis 11/24: NO CLASS, THANKSGIVING		NO HW
11/28-12/4 Week 15	Thermal Hs and Ls Cold Waves	Ch 6.1 - 6.4, Slides	HW12 Due 12/4
12/5 Week of 12/11	Winter Storms <b>12/7 is a reading day – No class</b> <b>Final Exams (12/11 5 PM Final Project Due)</b>	Slides	NO HW NO HW

