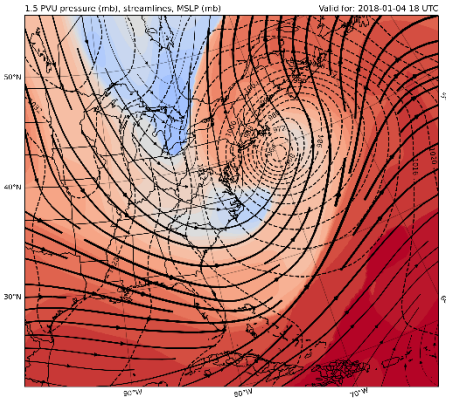
GEOG 5940 Synoptic Meteorology: Synoptic Lab

Spring 2025

INSTRUCTOR AND CLASS INFORMATION



Instructor: Joshua C. Steiner

Office: Derby Hall 1155

Office Hours: Tuesdays from 1-3 pm, and by appointment

Email: steiner.273@osu.edu

Class Meetings: Tuesday and Thursday 4:00 to 5:20 PM in Derby Hall 1080

Course Prerequisites: Physics 1250, and GEOG 5900 or AS 2940

COURSE MATERIALS

- Text: None
- Installed Python IDE of your choice but preferably Jupyter Notebook/Lab.
- Access to Carmen Canvas
- A package of colored pencils for hand analysis (you need these by the 4th class)

EVALUATION

Assessment	Weight
Quizzes	25 %
In-class Participation/Assignments	15 %
Take-home Lab Assignments	15 %
Midterm Practical	20 %
Final Project	25 %

Late work policy: All assignments are due at the time listed on the carmen website. Failure to submit assignments by their posted deadline will result in a 10% deduction per day for the individual with late work. No assignments, labs, or quizzes will be accepted beyond Reading Day unless the due date is set for the final exam time. Submitting a late assignment without a penalty will require permission from the instructor. If there are circumstances that prevented you from submitting or completing an assignment on time, please contact the instructor **as soon as possible.** Failure to do so will limit your chances of having an excused late assignment.

ASSESSMENT DESCRIPTION

Quizzes (25% of final grade)

Quizzes will be given the class after each lecture topic. Quizzes will be for the purpose of review throughout the course of the semester given the amount of material that will be presented in this class. Doing well on the weekly quizzes will ensure that you remember and internalize what is being taught as well as giving an incentive to attend class. You may not collaborate with your peers while taking these assessments. These quizzes will be 5-10 questions long and will pull from the lecture slides and class discussions. You will be given a 30-minute time limit on Carmen to complete each quiz. If you need accommodations for these assessments, please let the instructor know. Quizzes will only be available during a set period to ensure that students attend class. If this becomes too much of an issue, I may start to use paper quizzes. Make-up quizzes will only be allowed with prior permission from the instructor or there were sufficient attenuating circumstances that prevented a student from attending class on the day of the quiz.

Participation and In-Class Lab Assignments (15% of final grade)

Throughout the semester there will be in class activities and lab assignments that will be completed and submitted during the lab period. Examples of these assignments include completing a hand map-analysis over a study region and discussing the results. We will also periodically have in-class weather briefings as short five or ten-minute presentations. In class assignments may not be made up unless you have an excused absence or have approached me beforehand. There will be less leniency on in-class assignments than on the other assignments, quizzes and exams.

Take-Home Lab Assignments (15% of final grade)

Throughout the semester these assignments will be assigned for broad topics. Each take home assignment will have a deadline **one week** from the day assigned in class. These assignments will be much longer than in class assignments. Examples of these assignments could include decoding multiple METAR (and TAF) messages. Please note some of these assignments may be completed using Python (to be discussed).

Midterm Practical Exam (20% of final grade)

Students will be expected to demonstrate their mastery of the lab content during this assessment. Examples of content that may be included on the midterm would be analyzing a surface map and explaining the physical processes and the observed weather they entail. The midterm practical exam will be given in class on the date stated in Carmen, there will not be any makeups unless you have an excused absence.

Final Project (25% of final grade)

For the final class project, you will be expected to analyze a synoptic scale event and provide a breakdown of the meteorological phenomenon including discussion of the isobaric analysis, frontal development, and thermodynamic environment. These results will be submitted in the form of a paper discussion and in class presentation that will be given during class in the last two weeks of the semester. The paper portion of the final project will be due on reading day. More details about the presentation will be given in class and on carmen.

EXPECTATIONS

Students

- To attend all classes and be on time
- To complete all assignments by the deadline listed in Carmen
- To obtain any missed materials from your peers and/or instructor
- To treat all members of the class with respect
- To attend office hours and seek assistance when needed
- Potentially lead weather briefings (tentative)

Instructor

- To teach the students all materials to make them successful
- To ensure that all course materials are accessible to students
- Come to class prepared for the lecture and in-class activities
- Lead weather briefings when needed
- To hold a minimum of 2 office hours each week for students to attend
- To grade all assignments within a reasonable time (1-2 weeks) of the posted deadline.

OBJECTIVES

Course objectives

The objective of the course is to introduce students to the various methods by which meteorological and weather information is gathered, measured, and displayed, for use in weather forecasting applications. Students will become familiar with methods of obtaining information, data, and weather forecasts using the Web, and learn how to perform basic meteorological analyses using web data. This training will facilitate weather map and web usage in more advanced synoptic meteorology courses and serve as a background of applied information for dynamic meteorology classes.
Specific aims of the course are to introduce:

1. basic meteorological data collection and data coding methods
2. the displaying of that information on surface and upper air synoptic charts
3. the interpretation and forecasting applications of these charts
4. the methods of gathering and displaying information from weather radar and upper air soundings
5. the basics of satellite meteorology and interpretation of satellite-based weather images
6. the basics of numerical modeling and model output interpretation,
7. the basics of isobaric analysis, frontal analysis and plotting and analysis of thermodynamic diagrams

Learning objectives

The learning objectives listed below include specific information students who complete the class will know. The number in parenthesis corresponds to the course objective it corresponds to. A student who has successfully completed this course will be able to:

- Identify sources of meteorological data and explain how the information is collected, used operationally, and where to extract the data for analysis. (1)
- Utilize meteorological data using programming languages such as Python to create plots for interpreting the data. (1)
- Identify each element of a station model and explain what it is. (1)
- Explain the uses of each pressure chart, what can be found, and why it is useful in meteorological forecasting (2)
- Explain what radar is, how it collects data, and identify basic radar signatures (4)
- Explain what the following weather characteristics are, and what they mean physically in the atmosphere: highs, lows, fronts, troughs, ridges, WAA, CAA, PVA, NVA (3,5,7)
- Explain what a satellite is, how it collects data, and identify weather systems (5)
- Explain how frontogenesis occurs and how frontal systems develop (6)
- Explain how numerical models work and how they are used operationally (6)

Skill objectives

The skill objectives listed below include specific technical skills that students will be able to do. The number in parenthesis corresponds to the course objective it corresponds to. Students who have successfully completed this course will be able to:

- Decode METAR and TAF messages (1)
- Use radar data to identify supercells, fine lines, squall lines, tornadic rotation (4)
- Use satellite data to identify fronts, and cloud types (5)
- Use MOS to create zone forecasts (6)
- Use numerical models to create forecasts (6)
- Identify using proper symbology (if applicable) highs, lows, fronts, troughs, ridges, WAA, CAA, PVA, NVA by hand and using Python (3,5,7)
- Plot and interpret a thermodynamic diagram by hand and by using python (7)
- Plot and interpret a hodograph by hand and through using python (7)

STATEMENT ON 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 at http://studentlife.osu.edu/csc/.

DISABILITY SERVICES

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. You are also welcome to register with Student Life Disability Services to establish reasonable accommodations. 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; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

TENTATIVE COURSE CALLENDAR

The following is a tentative schedule of when we will cover material in this class. This is subject to change depending on how course content goes. All changes will be sent out through carmen announcements and discussed in class.

Week	Date	Lecture Content
1	1/7	Syllabus and Knowledge Assessment
1	1/9	ASOS Surface Observations/Continued Intro
2	1/14	The Surface Station Model
2	1/16	METAR Code and Surface Maps
3	1/21	Fronts and Pressure Tendency
3	1/23	Lab Session
4	1/28	Surface Analysis
4	1/30	Lab Session
5	2/4	Upper Air Observations
6	2/6	Lab Day
6	2/11	Upper Air Analysis/Thermal Advection
7	2/13	Lab Session
7	2/18	Satellite Meteorology
8	2/20	Lab Session
8	2/25	Radar Meteorology
9	2/27	Lab Session
9	3/4	Cloud Types
10	3/6	Midterm Preparation Session
10	3/11	Spring Break – NO CLASS
11	3/13	Spring Break – NO CLASS
11	3/18	Atmospheric Stability
12	3/20	SKEW-T Lab
13	3/25	Hodograph and Wind Shear
13	3/27	Hodograph Lab
14	4/1	Numerical Weather Prediction I

14	4/3	Numerical Weather Prediction II
15	4/8	Forecasting Lab
15	4/10	In Class Workday
16	4/15	Presentations
16	4/17	TBD
17	4/22	Reading Day – No Class
Final	TBD	TBD