

Introduction to Synoptic Meteorology

Meteorology 3110 - Fall 2025

Class meetings: Lecture - Monday, 11-11:50 am; Lab Tuesday, 2:10-4:00 pm,
Lab/Supplemental Lecture - Friday, 11-11:50 am.

Credits: 2

Location: 3128 Agronomy Hall

Prerequisites: Meteor 3010

Instructor: Mr. Dave Flory

Office: 3101 Agronomy Hall

Phone: 294-0264

Email: flory@iastate.edu

Office hours: By appointment.

Text and Course Notes

Weather Forecasting Redbook, Second Edition (Recommended)

Tim Vasquez

Weather Graphics Technologies, ISBN: 978-0970684066

Website: <http://www.meteor.iastate.edu/classes/mt311>

Student Learning Outcomes

- Learn to obtain, analyze, and interpret weather data from surface, upper air, and satellite data to a degree sufficient to make reasonably accurate forecasts and assist others in their forecasting. This class is the main course in which you train in the coding of weather data; therefore, we will spend several weeks on this rather tedious but essential subject. More emphasis, however, will be given to the tools used to forecast the weather.
- Develop an understanding of conceptual models of synoptic weather features and apply them to help create a reasonably accurate forecast.
- Develop an understanding of standard mathematical methods and apply them to conceptual models of synoptic weather features.

Attendance Policy

Your learning in this and other classes depends on your attendance. You are expected to be in class for all lectures and labs. You should minimize absences as much as possible. If you miss a class, you are responsible for getting any information covered and making up any missed work. In addition, please read the **Public Health** and **Mental Health and Well-Being Resources** sections below.

Grading

32% Lab exercises (due at the beginning of the following lab; No late labs will be accepted)

4% Forecast contest

32% Mid-term exam

32% Final exam

Disputes with grades on any graded assignment or exam must be resolved with the instructor within one week from when I return them to you. After one week, all grades are final.

Important Dates

September 1: University Holiday.

October 14: Midterm Exam

November 24-28: Thanksgiving break

December 10: Senior Undergraduate Research Symposium (Wednesday!)

December 18: Final Exam (tentative)

Tentative Class Schedule

DATA AND ANALYSIS

Week 1: General principles of synoptic meteorology; terminology; Current organization of ISU weather lab. Exposure to ISU's current weather data software systems (Gempak, Garp, Ntrans, nwx, nsharp, nmap, IDV).

Week 2: Surface and Upper Air data - coding and plotting procedures.

Week 3: Analysis of weather maps; standard procedures for surface and upper air data.

Week 4: Vertical structure of the atmosphere seen via skew-T diagrams.

CONCEPTUAL MODELS OF SYNOPTIC WEATHER FEATURES

Week 5: Basic Norwegian cyclone model theory; evolution of systems; tilt of systems. (FORECAST CONTEST BEGINS).

Week 6: General circulation; air masses; fronts; jet streams and jet streaks.

Week 7: Hodographs

Week 8: Review, MID-TERM (October 14, material through Week 6)

Week 9: Use of satellite and radar data in meteorology.

MATHEMATICAL APPLICATIONS

Week 10: Important meteorological (Primitive) equations, finite differencing, important Variables.

Week 11: Numerical Weather Prediction; FOUS and MOS data.

Week 12: Kinematics of the atmosphere - divergence and vorticity; simple related forecasting rules of thumb; vertical motion.

Week 13: Balanced Wind approximations - geostrophic and gradient wind.

Week 14: No class - THANKSGIVING

Week 15: Thickness, Hypsometric Equation, Thermal Wind.

Week 16: Case studies and practical forecasting. REVIEW.

Week 17: Final Exam (Tentative Date: Thursday, December 18, 7:30 – 9:30 am)

Public Health

If you are not feeling well, you should stay home and focus on your health. If you miss class due to illness, you must work with your instructor to arrange accommodations and makeup coursework consistent with the instructor's attendance policy.

Mental Health and Well-Being Resources

At Iowa State, we're committed to your success and well-being. As a Cyclone, you can access 24/7 resources, services, and people dedicated to helping you achieve your goals and be your best in and out of the classroom. Whether you need academic support or just someone to talk to, we're here for you at Cyclone Support (cyclonesupport.iastate.edu). If you are struggling emotionally and need support, there's confidential help available 24/7/365. You can call or text 988 or use the chat at 988lifeline.org.

Academic Dishonesty

The class will follow Iowa State University's policy on academic misconduct ([5.1 in the Student Code of Conduct](#)). Students are responsible for adhering to university policy and the expectations in the course syllabus and on coursework and exams, and for following directions given by faculty, instructors, and Testing Center regulations related to coursework, assessments, and exams. Anyone suspected of academic misconduct will be reported to the [Office of Student Conduct in the Dean of Students Office](#). Information about academic integrity and the value of completing academic work honestly can be found in the [Iowa State University Academic Integrity Tutorial](#).

Generative Artificial Intelligence

This course assumes that all work submitted by a student will be generated independently by the student. Any substantive portion of an assignment done by someone else, **including AI-generated content**, is prohibited and will be treated as academic misconduct. The instructor may occasionally allow Gen AI tools for an assignment. Specific instructions will be included for this assignment. When in doubt, the best approach is to ask the instructor and assume that AI-generated content is not allowed until you hear otherwise.

Free Expression

Iowa State University supports and upholds the [First Amendment protection of freedom of speech](#) and the [principle of academic freedom](#) in order to foster a learning environment where open inquiry and the vigorous debate of a diversity of ideas are encouraged. Students will not be penalized for the content or viewpoints of their speech as long as student expression in a class context is germane to the subject matter of the class and conveyed in an appropriate manner.

No employee, student, applicant, or campus visitor is compelled to disclose their pronouns. Anyone may voluntarily disclose their own pronouns.

Classroom Disruption

At the discretion of the instructor, disruptive conduct includes a single serious incident or persistent conduct that unreasonably interrupts, impedes, obstructs, and/or interferes with the educational process. Disruptive conduct may be physical and/or expressive in nature and may occur in person or in a virtual setting. Examples of disruptive conduct may include, but are not limited to, the following: speaking without being recognized, interrupting, or talking over others; **arrival to class late or leaving early without instructor permission; the use of technology, such as cell phones, computers, or other devices, without instructor permission, particularly in uses unrelated to course content**; creation of loud or distracting noises either carelessly or with intent to disrupt; eating, **sleeping**, or carrying out other personal activities in class that are unrelated to course content without instructor permission; non-protected malicious or harassing or bullying

speech or actions directed at instructors or students, such as personal insults, *ad hominem* attacks, name-calling, other abusive or ridiculing comments, or threats; gratuitous use of cursing/expletives or other speech that is not relevant to class discussion; inappropriate physical contact or threats of inappropriate physical contact directed at instructors or students; refusal to comply with instructor's request for appropriate conduct.

Accessibility Statement

Iowa State University is committed to advancing equity, access, and inclusion for students with disabilities. Promoting these values entails providing reasonable accommodations where barriers exist to students' full participation in higher education. Students in need of accommodations or who experience accessibility-related barriers to learning should work with Student Accessibility Services (SAS) to identify resources and support available to them. Staff at SAS collaborate with students and campus partners to coordinate accommodations and to further the academic excellence of students with disabilities. Information about SAS is available online at www.sas.dso.iastate.edu, by email at accessibility@iastate.edu, or by phone at 515-294-7220.

Prep Week

This class follows the Iowa State University Prep Week policy, as noted in the ISU Policy Library and the Senior Vice President and Provost's website.

Non-Discrimination statement

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding non-discrimination policies may be directed to the Office of Equal Opportunity, 2680 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515-294-7612, email eooffice@iastate.edu.

Religious Accommodation

Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request reasonable accommodation for religious practices. In all cases, you must put your request in writing. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time.

You or your instructor may also seek assistance from the [Dean of Students Office website](http://dso.iastate.edu/) (<http://dso.iastate.edu/>) or via phone 515-294-1020 or the [Office of Equal Opportunity website](https://www.eoc.iastate.edu/) (<https://www.eoc.iastate.edu/>) or via phone 515-294-7612.

Contact Information for Academic Issues

If you are experiencing, or have experienced, a problem with any of the above statements, email academicissues@iastate.edu.