

# Introduction to Synoptic Meteorology

Meteorology 311 - Fall 2023

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

**Location:** 3128 Agronomy Hall

**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

**Web Site:** <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.

## Grading

35% Lab exercises (due at the beginning of the following lab; No late labs will be accepted)

5% Forecast contest

30% Mid-term exam

30% 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 4: University Holiday.

October 10: Midterm Exam

November 21-25: Thanksgiving break

December 4: Senior Undergraduate Research Symposium

December 14: 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: Synoptic climatology, teleconnections, analogs of specific weather events.

Week 8: Review, MID-TERM (October 11, 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 14, 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.

Other well-being resources for students are available at:

<https://www.cyclonehealth.iastate.edu/wellbeing-resources/>

Public health information for the campus community continues to be available on Iowa State's public health website. Direct all public health questions to [publichealthteam@iastate.edu](mailto:publichealthteam@iastate.edu).

### Mental Health

Iowa State University is committed to proactively facilitating all students' well-being. Resources are available on the [ISU Student Health and Wellness website \(https://www.cyclonehealth.iastate.edu/\)](https://www.cyclonehealth.iastate.edu/).

### 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.

### 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.

### 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](http://www.sas.dso.iastate.edu), by email at [accessibility@iastate.edu](mailto:accessibility@iastate.edu), or by phone at 515-294-7220.

**Prep Week**

This class follows the Iowa State University Prep Week policy as noted the ISU Policy Library; as well as section 10.6.4 of the Faculty Handbook. Visit the [ISU Policy Library website](http://www.policy.iastate.edu/) (<http://www.policy.iastate.edu/>) for policy wording.

**Discrimination and Harassment**

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515-294-7612, Hotline 515-294-1222, email [eooffice@iastate.edu](mailto: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 issues, email [academicissues@iastate.edu](mailto:academicissues@iastate.edu).