Computational Meteorology

Meteorology 2270 – Fall 2025

Class meetings: MWF, 9:55 – 10:45 am, 0105 Kildee Hall
Credits: 3

Prerequisites: Credit or concurrent enrollment in MTEOR 2060; Credit or concurrent enrollment in PHYS 2310

Instructor: Dave Flory
Office: 3101 Agronomy Hall
Phone: (515) 294-0264
Email: flory@iastate.edu
Office hours: By appointment.

Student Learning Outcomes

- Become familiar with computers and their use in meteorology through self-created software.
- Develop problem-solving skills in a structured language.
- Acquire tools in FORTRAN to solve problems and write code capable of accomplishing a goal.
- Acquire tools in Python to solve problems and write code capable of achieving a goal.
- Using a step-by-step approach to develop efficient, modular code, learn and use a simple program design.

Texts

- Recommended: *Introduction to FORTRAN 90*, Nyhoff, Larry, and Leestma, Sanford, Prentice-Hall, Inc., 1999. ISBN-13: 978-0130131461.
- There will not be a Python text. We will use online resources to save you money.

Web Site: http://www.meteor.iastate.edu/classes/mt227

LMS: Canvas (http://canvas.iastate.edu)

Grading

- Exams (4): 12.5% each (50% total)
- Programs/Quizzes/Worksheets: 50%

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.

Attendance Policy

Your learning in this and other classes depends on your attendance. You are expected to be in class for all lectures. 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.

Computing Facilities

- All students in this course will have access to meteorology computer systems. Students will use Linux-based systems to build and compile their FORTRAN programs and web browsers to write and interpret their Python code.
- Students will use the GNU FORTRAN compiler to compile their FORTRAN programs. Students interested in using a different compiler and/or editor for the course do so at their own risk.

Course Topics

- Quick introduction to computers and Linux.
- Algorithm development and structured programming approach.
- Programming in FORTRAN 90 to include the following:
  - Data types, expressions, assignment statements, I/O
  - Relational operators, logical operators, conditional statements, and selective execution.
  - Repetitive execution.
  - Functions, modules, and subroutines.
  - Arrays.
  - File Processing.
- Programming in Python to include the following:
  - Data types, arrays, operators, regular expressions
  - Program control
  - File processing
  - Modules and functions
  - Classes
  - Plotting

Assignments

- Worksheets/Exercises: Given out in lecture and usually due the next class period. These are unannounced; therefore, attendance is important.
- Programs: There will be approximately ten programs assigned in this course. The length of time given to accomplish each will depend upon the complexity of the program.
- **Late Penalty:** Programs are due during the beginning of the class meeting on the day the programs are due. A program will be considered late if it is turned in during the lecture or at the end of class. There is **NO LATE TURN-IN POLICY!** If you are not done, turn in what you have done for partial credit.

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.
- **All programs are to be coded and authored by you.** Discussions between classmates and the instructor are learning tools, but each individual should write the program and code. Collaboration on programs will be considered academic dishonesty.
- If an incident of academic honesty is suspected, the students in question will meet with the instructor to examine the evidence. If academic dishonesty is still suspected, the instructor will assign a grade of zero to the assignment. The second suspicion of cheating will result in reporting the student to the Dean of Students.
- Academic dishonesty on tests will not receive a warning. I will report them immediately.

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/) or via phone 515-294-1020 or the Office of Equal Opportunity website (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.