

# CSCI 240

## Programming for the Mathematical Sciences

Spring 2022

MWF 11:35am–12:45pm

MEY 154

<http://cs.wheaton.edu/~tvandrun/cs240>

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Office hours:

Drop-in: MWF 3:30–4:30pm;

Or by appointment through Calendly

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### Contents

**CATALOG DESCRIPTION.** An introduction to computer programming for students who want to apply programming to mathematics, statistics, or data science, but are unlikely to take more than one computer science course. Emphasis is put on applying programming logic to data analysis. Not open to students who have passed CSCI 235 or the equivalent.

**TEXTBOOK.** Wes McKinney. *Python for Data Analysis*, 2nd edition. O'Reilly, 2017.

**PURPOSE OF THE COURSE.** This course provides a one-semester experience in programming tailored to math majors and other students interested in data analysis. The course introduces problem-solving techniques with algorithms and data structures in the context of the Python programming language with an emphasis on analyzing and visualizing data. Students should leave this course with an understanding of the logic of programming, the ability to apply programming to their area of study, and the confidence to continue learning on their own.

**GOALS, OBJECTIVE, AND LEARNING OUTCOMES.** The goals of this course are that students will

1. Develop basic algorithms according to specifications.
2. Implement basic algorithms using the programming language chosen for this course.
3. Use libraries in the chosen programming language to build data analysis applications.

The objective of the course is that students will be able to apply their programming ability to their own field of study and continue developing their programming skills after this course.

In addition to these, together we have the general objective of seeing computer programming as a way of knowing God's world and a tool for doing good, to God's glory.

#### OUTLINE.

- I. A "quick burst" of programming elements
  - A. Programming environments
  - B. Arithmetic, variables, comparisons
  - C. Loops, lists, functions.
- II. Thinking more carefully about the elements
  - A. Types
  - B. State and invariants
  - C. Functions
  - D. String operations
- III. Data structures
  - A. Ranges and iterables

- B. Tuples
  - C. More about lists
  - D. Dictionaries
  - E. Comprehensions
- IV. Files and functions
- A. File input and output
  - B. Recursion
  - C. Mapping and piping
- V. Python libraries
- A. `scipy`
  - B. `numpy`
  - C. `matplotlib`
  - D. `pandas`
- VI. How to learn a new language
- A. SQL
  - B. Matlab
  - C. R

## *Course procedures.*

**HOW WE DO THIS COURSE.** This course is very “hands-on.” Most class sessions will involve practice problems that exercise the new concept or language feature of the day. Students are then given practice problems to do and turn in for the next class meeting, as well as a quiz to take through Schoology. Most of students’ work outside of class will be in these practice problems.

**IMPLEMENTATION PLATFORM.** This course uses the Python programming language. We use several environments for Python, such as the interactive interpreter, IDLE, and Jupyter Notebooks. Practice problems are distributed, turned-in, and evaluated using Github Classroom.

**ELECTRONIC COURSE ORGANIZATION.** Course material can be found on Schoology; additionally, the course schedule and some of the material can be seen through a course website I have made which presents the course as in a calendar format. Unless otherwise noted, assignments are to be submitted through Github Classroom.

All programming problems can be done on the machines in the CSCI lab. See the programming guide on Schoology for information on how to work on problems on your own computers. Students are required to make a Github account using their Wheaton email address.

When sending Python code to the instructor (such as to ask for homework help), please either (a) rename the Python file by adding `.txt` as a file extension (so, change `example.py` to `example.py.txt`) and attach that renamed file to an email, or (b) paste the text of the code into the body of an email. Please **do not** (a) send Python code through a Schoology message, (b) attach a file ending with `.py` to an email, or (c) attach a screenshot to an email.

**GRADING.** The graded elements of this course are in three categories: *Assignments*, mostly programming problems; *quizzes*; and a *midterm* and a *final exam*. *projects* (about six); and *tests*. These are weighted as

Assignments	40%	
Quizzes	20%	
Tests	40%	(20% each)

## *Policies etc*

**ACADEMIC INTEGRITY.** Projects are individual assignments. Accordingly, do not share your code, do not get solutions to assignment problems from print or electronic media (including the Internet) or other people, and do not program with another person when working on an assignment for this course. You may discuss problems in the abstract, help (or receive help) to figure out compiler errors or program bugs, but students should not show each other *working code*. Any violations will be handled through the college's disciplinary process. (See also the College's statement below.)

**LATE ASSIGNMENTS.** Unless specified otherwise, assignments will not be accepted late. If you are unable to get a problem, turn in your best attempt by the time it is due. Reasonable adjustments will be made to this in light of the campus health situation, and opportunities will be given to redo problems students didn't get the first time. Please note that most assignments and quizzes are due at **10:30 am** on the next class day—not only before class, but before chapel.

**ATTENDANCE.** Students are expected to attend all class periods. It is courtesy to inform the instructor when a class must be missed.

**EXAMINATIONS.** Students are expected to take all tests, quizzes, and exams as scheduled. In the case where a test must be missed because of legitimate travel or other activities, a student should notify the instructor no later than one week ahead of time and request an alternate time to take the test. In the case of illness or other emergency preventing a student from taking a test as scheduled, the student should notify the instructor as soon as possible, and the instructor will make a reasonable accommodation for the student. The instructor is under no obligation to give any credit to students for tests to which they fail to show up without prior arrangement or notification in non-emergency situations. The final exam is Thursday, May 5, 10:30am–12:30 pm. Students are not allowed to take the final exam at a different time (except for urgent reasons, approved by the department chair, as per the college's policy), so make appropriate travel arrangements.

**ACCOMMODATIONS.** If you have a documented need for accommodations, I will have received a letter on your behalf from the Disability Services Office. But *please talk to me* about what accommodations are most useful to you. In particular, if you desire accommodations for test-taking, talk to me a reasonable amount time in advance (say, at least two class periods) so arrangements can be made. (See also the College's statement below.)

**OFFICE HOURS.** My *drop-in* office hours this semester are MWF 3:30–4:30pm. You can make an appointment through Calendly; I'm available most of the day on Thursday and sometimes on other days.

**ELECTRONIC DEVICES.** We are using the computers in the CSCI lab in class. Use these only for class activities—do not check email, social media, other websites, etc, during class. Please keep your own computer put away, and please also make sure any other electronic devices (phone, tablet, etc) are silenced and put away. **NO TEXTING OR SOCIAL MEDIA USE IN CLASS.**

*All this, the Lord willing.*

## *College syllabus statements*

THE COLLEGE REQUIRES THAT THE FOLLOWING STATEMENTS BE INCLUDED IN ALL SYLLABI.

**ACADEMIC INTEGRITY.** The Wheaton College Community Covenant, which all members of our academic community affirm, states that, “According to the Scriptures, followers of Jesus Christ will be people of integrity whose word can be fully trusted (Psalm 15:4; Matt. 5:33-37).” It is expected that Wheaton College students, faculty and staff understand and subscribe to the ideal of academic integrity and take full personal responsibility and accountability for their work. Wheaton College considers violations of academic integrity a serious offense against the basic meaning of an academic community and against the standards of excellence, integrity, and behavior expected of members of our academic community. Violations of academic integrity break the trust that exists among members of the learning community at Wheaton and degrade the College’s educational and research mission.

**GENDER-INCLUSIVE LANGUAGE.** Please be aware of Wheaton College’s policy on inclusive language, “For academic discourse, spoken and written, the faculty expects students to use gender inclusive language for human being.”

**ACCOMMODATIONS..** Wheaton College is committed to providing reasonable accommodations for students with documented learning differences, physical or mental health conditions that qualify under the ADA. Any student needing academic adjustments is requested to contact the Learning and Accessibility Services Office as early in the semester as possible. Please call 630.752.5615 or e-mail [las@wheaton.edu](mailto:las@wheaton.edu) for further information.

**COVID-19 SYLLABUS STATEMENT..** In accordance with the Wheaton College Face Covering Policy, CDC-approved face coverings are required while attending class. Failure to comply with wearing a face covering will result in dismissal from the class session and an unexcused absence. Multiple violations can lead to dismissal from the class. Student Health Services will officially communicate when a student must be absent from class due to quarantine or isolation. Remote learning will not be offered this fall, and the student is encouraged to coordinate with the instructor any needed adjustments to tests or deadlines. Learning & Accessibility Services will also provide assistance for students in quarantine if necessary.

**TITLE IX AND MANDATORY REPORTING.** Wheaton College instructors help create a safe learning environment on our campus. Each instructor in the college has a mandatory reporting responsibility related to their role as a faculty member. Faculty members are required to share information with the College when they learn of conduct that violates our Nondiscrimination Policy or information about a crime that may have occurred on Wheaton College’s campus. Confidential resources available to students include Confidential Advisors, the Counseling Center, Student Health Services, and the Chaplain’s Office. More information on these resources and College Policies is available at <http://www.wheaton.edu/equityandtitleIX>.

**WRITING CENTER.** The Writing Center is a free resource that equips undergraduate and graduate students across the disciplines to develop effective writing skills and processes. This academic year, the Writing Center is offering in-person consultations in our Center in Buswell Library, as well as synchronous video consultations online [<https://www.wheaton.edu/media/writing-center/A-Client's-Quick-Guide-to-Online-Writing-Consultations---Updated-08.15.20.pdf>] **Make a one-on-one appointment with a writing consultant here** [<https://wheaton.mywconline.com/>].