

COMPSCI 220 - PROGRAMMING METHODOLOGY

4 credits, Fall 2023

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Lectures:	Tuesdays and Thursdays, 4:00-5:15pm, ILC N151

Teaching Assistants:

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Supplemental Instruction: Prit Shah, pritpritamsh@umass.edu, see Canvas/Campuswire for schedule

Course Materials: This course does not use a textbook. All materials will be posted on the Canvas page.

Office Hours:

Times for office hours will be posed and updated on Canvas. We encourage you to participate in office hours: this is a smaller and more personalized setting where we can discuss differently than in a large classroom. Your contribution to office hours helps create a learning community: you interact with other colleagues; this can help both you and others who might have similar questions or benefit from seeing a different approach or viewpoint. It also helps us instructors get to know you and have a better view on how the course is progressing.

Course Objectives

The goal of COMPSCI220 Programming Methodology is to turn you into an advanced programmer with a deep understanding of modern programming methodology. We will emphasize good software engineering skills, including programming abstractions, testing, and debugging. Although the programming languages that we will use are JavaScript and TypeScript, we will emphasize general programming principles. Everything that you will learn in the class will be applicable to other modern languages, including (for example) C++, C#, D, Go, Java, Python, Rust, and Swift.

Learning Outcomes As a successful student, by the end of this course, you will be able to:

1. Write programs that use abstractions such as higher-order functions (for example: map, filter, and reduce), and object-oriented programming.
2. Employ an accurate mental model of programming languages that support mutable state, assignable variables, objects, higher-order functions, and garbage collection, as well as understand fundamentals of their implementation.
3. Design test cases to detect errors in code by applying systematic criteria, and write code predicates to validate the inputs and outputs of a potential solution to a programming problem.
4. Select and use appropriate design patterns such as builders, fluent APIs, publish/subscribe, state, memento, and promises for handling errors.
5. Reason about the correctness of code by establishing pre- and postconditions, and loop invariants.
6. Understand and make use of software version control utilities such as Git.

Prerequisites: To succeed in COMPSCI 220 you should be familiar with the following concepts:

- Loops
- Variables – declaration and scope
- Defining and using functions to decompose problems
- Recursive functions with integer arguments
- Algorithms/Data Structures – Lists, Trees, and Recursion

It is helpful to review these topics if needed. If you feel insufficiently familiar with one of these topics, please speak to course staff immediately. The Canvas site also has guidelines for writing and testing your code.

Grading, exam schedule and makeup policies: Your grade for this course will be composed of several different aspects weighted according to the break down below,

- **Homework (40%):** There will be programming assignments throughout the semester, usually with weekly deadlines. These projects will be programmed in Ocelot and submitted via Gradescope. The lowest homework grade per student will be dropped.
- **Quizzes(10%):** Weekly quizzes will be released, typically on Monday, open for 24 hours. Once started you will have a set amount of time to complete each quiz.
- **Lab Participation (8%):** Each lab session may have a short quiz or a small accompanying assignment that will be graded for completion.
- **Lecture questions (2%):** graded 70% for participation and 30% for correctness. The highest 20 lecture scores will count towards your grade.
- **Exams (40%):** This course will have two midterm exams and one final exam.

You must score **at least 1/3 of exam points** (33.33% exam average) to pass the course.

- **Midterm 1 (12%):** Wednesday 4 October, 7-9pm, location TBA
- **Midterm 2 (12%):** Wednesday 1 November, 7-9pm, location TBA
- **Final Exam (16%):** Friday 15 December, 3:30-5:30pm, location TBA

You must notify the instructor in advance if you are unable to take the exams at the scheduled time (e.g., due to illness). If a severe accident prevents you from communicating (or asking someone), you must notify the instructors as soon as possible. Failure to do this and missing the exam results in a grade of zero.

Tentative letter grade thresholds:

90: A 86: A- 82: B+ 78: B 74: B- 70: C+ 66: C 62: C- 58: D+ 54: D

Thresholds may be adjusted based on the overall performance in the course, but will not be more strict.

Attendance, late submission and exemption policies:

You are expected to attend lectures – this is the best way to engage in discussion and understanding of the material. Lecture questions (and attendance) are part of the course grade. If you cannot attend (e.g., for medical reasons), you are expected to watch the lecture recordings. Lab attendance is mandatory and part of the course grade. If you cannot attend a lab (e.g., for medical reasons), you must notify the TA leading your lab section ahead of time and discuss how to make up the lab activity.

Turning homework in late helps no one. When you turn homework in late, you cannot receive feedback on time and risk falling behind, as the course has moved on to the next topic. Instructors cannot detect what material needs to be reviewed or discussed again, etc. Because of this, the general rule is that late homework will not be accepted. The only exception to this are justified medical or personal situations that fall outside the ordinary. In these cases, you must notify the instructors ahead of time and request an extension. We will review your request and decide if an extension is warranted. You should start homework early. A sudden happening on the due date, when you had planned on doing most of the work is not a reason for an extension.

All homework will be due at 11:59 PM on the due date. Please allow time to check and make sure you've submitted everything properly, and avoid any unexpected issues (slow Internet connection, uploading the wrong file in a hurry, leaving extraneous code in, etc.) Also, expect assignments to require several programming and testing sessions to complete. We suggest you begin working on them early, so we can all collaborate and help each other with any questions in a timely way.

Academic Honesty:

You are encouraged to form study groups, learn and discuss the course material jointly with others. You are required to work individually on all items resulting in a grade. In particular, it is forbidden to share homework code or solution ideas.

You are encouraged to ask public questions, in office hours or on Campuswire. Your questions and the answers to them can be useful for others as well (and you are encouraged to help with answers). Public questions about homework should be of a general nature (clarification, applicable course material), and not involve code snippets or specific solution ideas. Use private questions otherwise if needed.

This course assumes that all work submitted by students will be generated by the students themselves, working individually or in groups. Students should not have another person/entity do the writing of any portion of an assignment for them, which includes hiring a person or a company to write assignments and using artificial intelligence tools like ChatGPT.

As members of the College of Information and Computer Sciences at UMass Amherst we expect everyone to behave responsibly and honorably. In particular, we expect each of you not to give, receive, or use aid in examinations, nor to give, receive, or use unpermitted aid in any academic work. Doing your part in observing this code, and ensuring that others do likewise is essential for having a community of respect, integrity, fairness, and trust.

If you cheat in a course, you are taking away from your own opportunity to learn and develop as a professional. You also hurt your colleagues, and this will hurt people you will work with in the future, who expect an honest and responsible professional.

As faculty, we pledge to use academic policies designed for fairness, avoiding situations that are conducive to violating academic honesty, as well as unreasonable or unusual procedures that assume dishonesty.

We will follow the [Academic Honesty Policy and Procedures](#) established by the university to ensure that the learning environment is both honest and fair. Integrity is essential in all aspects of higher education, academic dishonesty is prohibited in all university programs, including this course. Academic dishonesty as defined by the University's Academic Honesty Policy includes but is not limited to:

- Cheating - the intentional use or attempted use of trickery or deception in one's academic work.
- Fabrication - intentional falsification and/or invention of any information or citation
- Plagiarism - knowingly representing the words or ideas of another as one's own work
- Facilitating Dishonesty - knowingly helping or attempting to help another commit an act of academic dishonesty

Any violation of the Academic Honesty Policy could result in a failing grade in the course and initiation of the formal Academic Honesty Procedures of the University. Students are expected to be familiar with these policies, if you have any questions please email the course instructors for clarification.

The College of Information and Computer Sciences explicitly forbids any redistribution (including publicly available posting on an internet site) of any CICS course materials (including student solutions to course assignments, projects, exams, etc.) without the express written consent of the instructor of the course from which the materials come. Violations of this policy will be deemed instances of "facilitating dishonesty" (since a student making use of such materials would be guilty of plagiarism) and therefore may result in charges under the Academic Honesty Policy.

Accommodation Statement: Both the University of Massachusetts Amherst and your course staff are committed to providing an equal educational opportunity for all students. If you have a physical, psychological, or learning disability documented with Disability Services, please communicate your needs to us in the first two weeks of the semester so that we may make any necessary accommodations. If you are not sure if you qualify for an accommodation or if you have any questions on the topic of accommodations please contact Disability Services(<http://www.umass.edu/disability/>) for more information.

Equity and Inclusion Statement: We are committed to fostering a culture of diversity and inclusion, where everyone is treated with dignity and respect. This course is for everyone. This course is for you, regardless of your age, background, citizenship, disability, sex, education, ethnicity, family status, gender, gender identity, geographical origin, language, military experience, political views, race, religion, sexual orientation, socioeconomic status, or work experience.

Because of that, one of the things we all need to realize is that we will be bringing different skills to the course, and we will all be learning from and with each other. Some of us are great artists, some of us aren't. Some of us have had previous experience with community organizing, and for some of us that may be something new. Some of us have very definite plans for our professional careers, some of us are still exploring. Each of these skills will help us succeed, both individually and as a group. Please be kind and courteous. Respect that people have differences of opinion, and work and approach problems differently. There is seldom a single right answer to complicated questions.

Please keep unstructured critique to a minimum. Criticism should be constructive. Disruptive behavior is not welcome, and insulting, demeaning, or harassing anyone is unacceptable. We follow the university's guidelines for classroom civility (http://www.umass.edu/dean_students/campus-policies/classroom). In particular, we don't tolerate behavior that excludes people in socially marginalized groups. If you feel you have been or are being harassed or made uncomfortable by someone in this class, please contact a member of the course staff immediately, or if you feel uncomfortable doing so, contact the Dean of Students office.

This course is for all of us. We will all learn from each other. This is our welcome.

Communication policy and response frequency We use Campuswire for communication. We will attempt to answer all questions within 24 hours and often much sooner. However, you should not rely on last-minute questions for help on homework. When needed, use private instructor-only posts rather than e-mail, this will make them more readily seen, and any of the staff team can answer them. For sensitive private matters, email the instructor.

Chosen names and pronouns Everyone has the right to be addressed by the name and pronouns that they use for themselves. Students can indicate their preferred/chosen first name and pronouns on SPIRE, which appear on class rosters. Please let me know what name and pronouns I should use for you if they are not on the roster. A student's chosen name and pronouns are to be respected at all times in the classroom.

Title IX Statement Title IX of the Education Amendments of 1972 is a federal civil rights law that prohibits discrimination on the basis of sex in any education program or activity that receives federal funding. Sex discrimination includes sexual harassment, sexual battery, sexual assault, and rape. Title IX applies to all public and private educational institutions receiving federal financial assistance.

If you have been the victim of sexual violence, gender discrimination, or sexual harassment, the university can provide you with a variety of [support resource](#) and accommodations. UMass is committed to providing these resources with minimal impact and costs to survivors on a case-by-case basis. Resources are available to survivors with or without them filing a complaint. No upfront costs are charged to any currently enrolled students for University Health Services or the Center for Counseling and Psychological Health, and no fees exist for services in the Dean of Students Office, the Center for Women and Community, Student Legal Services, or by live-in residential staff.

Schedule (tentative, a current schedule will be maintained on Canvas)

Lecture #	Date	Description
1	9/5	Introduction and Higher-Order Functions
2	9/7	Basic TypeScript Features. Type Signatures.
3	9/12	More Higher-Order Functions
4	9/14	Unit Testing
5	9/19	Closures
6	9/21	Lists
7	9/26	Mental Models
8	9/28	More Lists/HOF/Review
9	10/3	Midterm 1 Review
Exam	10/4	Midterm 1
10	10/5	Property-based Testing
11	10/12	Object-Oriented Programming
12	10/17	Streams
13	10/19	More Streams
14	10/24	Observers
15	10/26	Builders and Fluent Interfaces
16	10/31	Midterm 2 Review
Exam	11/1	Midterm 2
17	11/2	Asynchronous Programming
18	11/7	Asynchronous Programming
19	11/9	SOLID Principles
20	11/14	Program Correctness
21	11/16	Program Correctness
22	11/21	Building an Interpreter
23	11/28	Building an Interpreter
24	11/30	Extending Libraries
25	12/5	TBD/Review
26	12/7	Final Review