Syllabus

CS 251: Principles of Programming Languages

Instructor: Carolyn Anderson
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SCI E104

Drop-in hours: W 4-5pm
F 2:15-4:15
Sci L-wing hallway
By appointment

Tutors: Anastacia Castro, Funing Yang

Tutor hours: **Mondays 4-5pm (L-wing hallway)**

Thursdays 1-2pm (L-wing hallway)

Sundays 7-9pm (Zoom)

Grader: Annie Liu

Announcements: We will use the Google Group TBA for announcements and course discussion. You are subscribed automatically. Please stay subscribed and check the list regularly. Feel free to post questions about assignments there, as long as you don't post code.

Class Meetings: TF 11:20-12:35
SCI L Wing 043

Flexibility and Feedback

I welcome feedback throughout the course. You can either email me with your thoughts, or, if you prefer to be anonymous, you can submit them through the Anonymous Question Form.

Course Description

This course introduces the principles underlying the design, semantics, and implementation of modern programming languages in major paradigms including function-oriented, imperative, and object-oriented. The course examines: language dimensions including syntax, naming, state, data, control, types, abstraction, modularity, and extensibility; issues in the runtime representation and implementation of programming languages; and the expression and management of parallelism and concurrency. Students explore course topics via programming exercises in several languages, including the development of programming language interpreters.

Distributions: MM - Mathematical Modeling and Problem Solving

Prerequisites(s): CS 230 or permission of the instructor.

Learning Goals

In this class, you will:

- Learn powerful programming language features — such as higher-order functions, tail recursion, and pattern matching — in languages that support them.
- Develop skills and strategies that will help you learn programming languages more quickly and effectively, by probing and analyzing programming language properties.
- Learn tools and models for reasoning precisely about the behavior of programs.
- Gain experience with key aspects of metaprogramming (programs that manipulate programs) and program analysis.

Course Work

Expectations

- In the past, CS251 has had a relatively high course load. Since it is no longer a required class, I have reduced the amount of work (and the course hours). When you submit a homework assignment, you will also be asked to report how long you spent on it. **This has no impact on your grade**; it will help me ensure the course load is reasonable.

- You are expected to come to class and to participate. This class involves a lot of live coding / in-class exercises, which are difficult to make up. However, you **should not** come to class if you are feeling sick (COVID or not); I'll work individually with you to catch up after you are feeling better so that you don't fall behind.

- Whenever you have questions about **any** course material, whether it is current material or from earlier in the course, please submit questions using the Anonymous Question Form. I strive to answer these questions within a day in the Q&A Document.

- You are expected to seek help from me and/or the tutors when you have trouble with the course material. Our job is to help you succeed! Sometimes students are embarrassed to seek help, especially when they are very far behind. We are **not** judgmental and are happy to help you with **absolutely any material related to the course**, no matter how long ago that material may have been covered.

Assignments

Typically, there will be a **weekly homework assignment**, composed of:

- exercises in reasoning about the execution of small programs to understand precise language semantics;
- small and medium-scale programming problems illustrating idioms in different programming languages and paradigms;

- written analyses of language designs, their motivating applications, and their suitability to new applications.

In addition, there is a **3 week cumulative interpreter project**. The final homework assignment will be a **group project**, culminating in a presentation.

Many problem sets will also include one or more **extra credit** problems. These are fun but challenging. You should not attempt them until you have finished the required problems.

Assignment Submission

We will use Google Drive for homework submissions. You will set up a Google Drive folder for your homework submissions and share it with me as part of Homework 1.

You will also fill out a Google Form for each assignment, which will ask you who you worked with (if anyone) and to estimate how much time you spend on the assignment.

Some homework problems will involve writing text, rather than code. You may intersperse these answers as comments in your Racket program, or submit them as a separate PDF.

Assignment Solutions

Assignment solutions will be provided in hardcopy only, and will be handed out in class.

Exams

There will be two exams: a midterm and final exam. **The midterm will be held in class, on October 29th.** The final exam will be held during finals period.

Guest Lectures

I have invited PL researchers to give research talks as part of this course. **Attending these talks is mandatory.** Due to scheduling constraints of the visitors, some lectures may need to be held outside of normal class hours. I will schedule these well in advance and at a time that is maximally convenience for the class. A recording will also be available.

Reading

There is no textbook for this class. The Readings/Reference page has links to relevant notes and reference materials. These additional materials were mostly collected by Ben Wood.

Collaboration

Collaboration enriches the learning environment. I encourage you to talk with other students about the course material and to form study groups, with the following restrictions:

- **You may not share code with other students.** This includes code for assignments that you have already submitted.
- You may not look at code from other students.

- If you discuss a homework problem with another student, **please note which students** on your assignment when you submit it.

Some of these rules will be relaxed for the final assignment, which is a group project.

Course Policies

Lateness Policy

Late policies seek to balance two goals: to provide flexibility for students, who often deal with unexpected life events and learning disruptions, and to ensure that students are able to progress in their learning when course content is cumulative.

In CS251, the course content is highly cumulative: to follow each topic, it really is necessary to understand what has been taught previously. In addition, some of the homework problems are designed to help you discover or explore a concept that has not yet been taught; it is important that we are able to discuss your findings in subsequent classes.

For this reason, the CS251 late policy will be relatively strict:

- **For any and all psets, you may take a no-questions-asked 2 day extension**. Regular psets are typically due at the end of a Monday, so you have until the end of the following Wednesday to submit the assignment. **You must still submit the homework form to say that you are taking the extension.** (This is so that I can estimate the grader's workload.)

- **If you cannot make the Wednesday deadline, email me as soon as possible.** We will work together to figure out a plan that supports both your learning and your health and well-being. **You do not need to reveal any personal details to justify your request.** Our plan may involve additional meetings outside of class to ensure that you can catch back up.

- **I will drop 1 homework assignment grade.** (The language project cannot be dropped, since it is a group project.)

Collaboration Policy and the Honor Code

I have adapted this wording from Lyn Turbak

- Collaboration:
    - You **may** discuss high-level ideas or strategies with other students, but you must report who you worked with when you submit your assignment.
    - You must **not** communicate detailed algorithms, implementations, code, formulae, or other detailed solution steps.
    - You must **not**, under any circumstances, view, share, prepare, or accept written solutions or code outside your team.
    - **Wait 30 minutes after discussions with other students** before writing your solution. This helps you know if you actually understand the solution.

    - **You may not share code from homework problems with other students at any point in the course (even after the assignment deadline).**
- Reference:
    - You may consult course material from CS 251 Fall 2021 and external documentation of required tools.
    - You may consult external reference resources for general concepts and techniques, provided you cite them.
    - You **must cite all collaboration, assistance, and reference** (excluding course materials and Racket documentation) that you used to prepare your submission.
    - You must **not** consult solutions to this or any similar assignment from the current or previous semesters of CS251, books, or online resources.
- Code reuse and adaptation:
    - You may reuse and adapt provided starter code in your solution.
    - You may reuse and adapt code from CS251 materials in this term (slides, lectures, pset solutions, etc.) but **not** from any other term.
    - **You must not reuse or adapt any other code.**
- After the semester:
    - Some students may want to include work from CS251 in portfolios, resumes, etc. **Please do not post homework solutions publicly** (on GitHub, your website, etc.). You may, however, show your code to potential employers or others who are not students.
    - Key point: **Do not make your code accessible or viewable by current or future CS 251 students.**

Grading

- Homework 45%
- Interpreter project 15%
- Language project 10%
- Midterm 15%
- Final 15%

This course will comply with the Wellesley College grading policy.

If I make changes to this plan, they will be in favor of the student (any change will give you a grade **greater than or equal to** the one calculated according to the current plan).

Seeking Help

Lots of help is available in this course!

- **If you go 20-30 minutes without making progress, please ask for help!**
- You are encouraged to post questions to the Anonymous Question Form or the TBA Google group. However, you may not post code. For code-specific questions, email me directly.
- **Come to the tutor hours! You don't need a specific question to attend tutor hours or drop-in hours.**

- **Come to my drop-in hours!** Again, you don't need to bring a specific question. I'm also happy to talk about PL-related questions beyond the homework, as long as no one is waiting for help on homework.

- If the posted times aren't convenient or you don't feel comfortable meeting in person, email me to schedule a Zoom meeting.

- You can request a one-on-one tutor from the PLTC.

Disabilities and Accommodations

Thanks to Ada Lerner for some of this wording.

My job is to help each and every one of you learn, and part of that is making accommodations for any disabilities you might have. **Please feel free to speak with me about concerns or suggestions about how I can make the course more accessible to you**. I will never judge you or your disabilities, and I will keep the details of our conversations confidential. Though you are welcome to share any details that will help me assist in your learning, you are never required to share any private details of your life with me.

If you have a disability or condition, either long-term or temporary, and need reasonable academic adjustments in this course, it is also strongly recommended that you contact Accessibility and Disability Resources (ADR) to get a letter outlining your accommodation needs, and submit that letter to me. You should request accommodations as early as possible in the semester, or before the semester begins, since some situations can require significant time for review and accommodation design. If you need immediate accommodations, please arrange to meet with me as soon as possible. If you are unsure but suspect you may have an undocumented need for accommodations, you are encouraged to contact Disability Services. They can provide assistance including screening and referral for assessments.

Accessibility and Disability Resources can be reached at accessibility@wellesley.edu, at 781-283-2434, by scheduling an appointment online at their website www.Wellesley.edu/adr, or by visiting their offices on the 3rd floor of Clapp Library, rooms 316 and 315.

Faculty Responsibilities on Disclosures of Discrimination, Harassment, and Sexual Misconduct

Wellesley College considers diversity essential to educational excellence, and we are committed to being a community in which each member thrives. The College does not allow discrimination or harassment based on race, color, sex, gender identity or expression, sexual orientation, ethnic or national origin or ancestry, physical or mental disability, pregnancy or any other protected status under applicable local, state or federal law.

If you or someone you know experiences discrimination or harassment, support is available:

- Confidential reporting: Students can report their experiences to Health Services (781.283.2810); Stone Center Counseling Service (781.283.2839); or Religious and Spiritual Life (781.283.2685). These offices are not required to report allegations of

sexual misconduct to the College.

- Non-confidential reporting:
    - You can let me know. As a faculty member, I am a mandatory reporter: I am obligated to report allegations of sex-based discrimination to the Nondiscrimination/Title IX Office.
    - You can report directly to the Nondiscrimination/Title IX Office (781.283.2451) to receive supports, and to learn more about your options for a response by the College or about reporting to a different institution.
    - You can report to the Wellesley College Police Department (Emergency: 781.283.5555, Non-emergency: 781.283.2121) if you believe a crime has been committed, or if there is an immediate safety risk.

Acknowledgments

The first half of this course makes use of materials from previous semesters of CS251 at Wellesley taught by Lyn Turbak and Ben Wood. The latter half draws heavily on material developed by Rich Wicentowski at Swarthmore College (the interpreter project) and Valerie Barr at Mount Holyoke College (the language project).