

# Compilers and Program Analysis (CSCI 1260)

Robert Y. Lewis

## 1 Basic Info

- Fall 2024
- MW 3:00-4:20pm
- Website: <https://BrownCS1260.github.io>
- Instructor: Dr. Robert Y. Lewis
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- TAs: [cs1260tas@lists.brown.edu](mailto:cs1260tas@lists.brown.edu)
  - Christina Stepin (HTA)
  - Max Guo
  - Oscar McNally
  - Lukas Strelecky
  - Effy Pelayo Tran

## 2 Description

Have you ever wondered why C programs seem to run faster than Python programs? Have you ever been confused by an error message and wondered why Java couldn't understand your program? In CSCI 1260, we'll learn how compilers read in code in one language and produce code in another; in particular, we'll learn how to translate high-level languages to code that your computer's processor can understand. We will get hands-on practice developing compilers for a series of increasingly complex languages. Along the way, we'll learn some general best practices for developing and testing complex software systems.

The content of this course is adapted from materials created by Doug Woos and Sarah Chasins, further inspired by materials from Kathi Fisler and Shriram Krishnamurthi.

### 3 Classroom Setting

This is a friendly and collaborative class! Please be kind and respectful to your fellow students, and talk and get to know each other. We want to hear from everyone throughout this course. If at any point you feel uncomfortable or unwelcome, we encourage you to get in touch (directly or via the anonymous feedback form on our website) so that we can make things right.

Please be aware of your actions and understand that your classmates come from many different backgrounds. Your perspective on the course or assignments may not match theirs, and comments that (unintentionally) dismiss their perspectives can be very discouraging.

Professionalism goes both ways: we ask you to treat your classmates and course staff as adults, and you should expect the same from us. If for any reason you feel uncomfortable coming to Rob or the TAs about an issue, you are welcome to contact the CS department Diversity and Inclusion committee, the department chair (Roberto Tamassia), or the Brown Title IX office. As a department we are committed to taking seriously all complaints about unprofessional or discriminatory behavior.

### 4 Course Objectives

After completing this course, students will be able to:

- Develop programs to translate between different programming languages
- Understand the distinctions and relationships between compilers and interpreters
- Reason about compiler correctness
- Read and write assembly language

### 5 Prereqs

CSCI 0220, or CSCI 0320, or CSCI 0300, or CSCI 0330, or CSCI 1310, or CSCI 1330.

### 6 Textbooks

This course will not follow a textbook. Lecture notes will be posted on the course website following lectures.

### 7 Communication

We will use EdStem as the primary channel for discussion and announcements. When posting on EdStem, remember our classroom setting policies, and be kind and courteous! You may post questions publicly or to the course staff only.

## 8 Assignments and grading

- 10%: Drills are short online quizzes. They will be released right after class on Wednesdays and due Sunday nights, in time for us to look before class on Monday. These should take around 30 minutes to complete, and are designed to help us—and you!—understand which subjects you’ve internalized and which subjects we might need to spend more time on. Drills will be graded for completion; you will get credit as long as you appear to be taking them seriously. The questions here are good practice for the midterm and final exams. You can miss one drill and still get full credit for this part of the class.
- 60%: Homeworks, due every week or two, are designed to help you understand the course material and put it into practice. Programming assignments will be graded for correctness and test quality. Some of your homeworks will include short, written reflections on readings related to the course material. These written reflections will be graded lightly—we’re asking you to think seriously and carefully, but not to write full formal papers. Homework assignments should be completed and handed in individually (but see the collaboration policy below—you are free to discuss the homeworks with your classmates).
- 15% each: There will be a midterm exam (given in class) and a final exam. These exams are *not* designed to be challenging or stressful and are not weighted heavily. The questions will be similar to those on the drills; if you are successfully completing the drills and homeworks you will do well on the exams.

Submitting HW0 on time (before the late deadline) is required for participation in this class.

Students may submit assignments one or two days late, up to a total of six late days over the semester. For example, you could be one day late on six different assignments; two days late on three different assignments; or any combination in between.

Students with a university-approved reason (a letter from the SAS office, dean’s office, or health services) may request a two-day extension that does not consume late days. Longer extensions will be considered on a case by case basis; a university-approved reason is required. A form to request an extension is linked from the course website.

Students with SAS accommodations should contact the instructor at the beginning of the semester to discuss how we can best address your needs.

Assignments will be submitted on Gradescope, linked to from the course website. If you are unfamiliar with Gradescope please talk to Rob and/or the TAs.

## 9 TA hours

Our talented TAs are here to help! We’ll keep a schedule of TA hours posted on the course website. Rob will also have office hours during the week.

## 10 Collaboration

Your classmates are a fantastic learning resource and we encourage you to discuss course materials! However, we also want to see that each of you is succeeding individually in the course. We advocate the “erased whiteboard” policy: talk through your solutions with a classmate, but do not reference any written notes from that conversation when you implement your solutions.

- Drills should be done alone and without collaboration, as they are designed to help you and us assess whether you understand the concepts needed for the next lecture.
- Homeworks are submitted individually. We encourage students to talk about the assignments at a high level and to assist each other with debugging—for instance, talking about why code doesn’t compile or why a test is failing. Students should not, however, directly share code or try to find solutions on the internet.

The following examples of collaboration are allowed:

- Discussing how to solve a problem with a classmate without writing any code
- Showing your code to a classmate along with an error message or confusing output
- Googling the text of an error message
- Copying small snippets of code from answers on Stack Overflow
- Asking large language models like GPT conceptual questions, or to clarify OCaml syntax

The following examples are not allowed:

- Copying a large chunk of code from a classmate’s solution into yours
  - Talking another student through your solution as they type
  - Googling for complete problem solutions
  - Copying more than a few lines of code generated by a large language model
  - Posting your solution in a publicly-accessible location
- Exams are completed individually without discussion.

If you have questions about the boundaries of the policy, please ask. There is never a penalty for asking.

Above all, students should adhere to Brown’s academic code:

<https://www.brown.edu/academics/college/degree/policies/academic-code>

## 11 Attendance

In-person attendance is strongly encouraged but not required. If you are not feeling well, please do not attend class! Classes will be streamed and recorded, although active remote participation will not be possible.

Students interested in taking this course remotely/asynchronously should contact the professor directly.

## 12 Time requirements

Our class meets for 160 minutes per week. You can expect to spend roughly 12 hours per week on assignments and drills, for a total of at least 180 hours over the course of the semester.

## 13 Feedback

We very strongly encourage feedback on all aspects of the course: the textbook, classes, exercises, homeworks, projects, and more! Please contact the course staff with any feedback—positive or negative, big or small—or use the anonymous report form here:

<https://forms.gle/XDJ7eVP2o8xP1dmS9>

## 14 Further resources

We recognize that being a student is not easy and wish to provide support however we can. Beyond our staff, here are some resources that are available to you here at Brown:

- Counseling and Psychological Services: <https://www.brown.edu/campus-life/support/counseling-and-psychological-services/home>
- Student Accessibility Services: <https://www.brown.edu/campus-life/support/accessibility-services/>
- Student Advocates for Diversity and Inclusion: <https://cs.brown.edu/about/diversity/student-advocates-diversity-and-inclusion/>
- CS Health and Wellness Resources: <https://docs.google.com/document/d/1pHLq14jN0GvutTY0sj/edit>