

APPLIED ALGORITHMS

Fall 2021

Instructor:	Sam McCauley	Time:	MR 1:10-2:25
Email:	srm2@williams.edu	Place:	Schow 30A

Webpage: <https://williams-cs.github.io/cs358-f21/index.html>

Office Hours: Mon 3-5PM, TCL 306; Tue 3-5PM, TCL 312

TA Office Hours: Wed 8-10PM, TCL 312

Textbooks: There is no textbook for this course. There are some optimal textbooks that may be useful for reference. These are listed on the course website. Copies of these textbooks will be available in TCL 312.

Objectives: This course aims to study the interaction between practical and theoretical computer science. At the end of the course, students should be able to:

- analyze potential bottlenecks in code,
- analyze potential bottlenecks in a given algorithmic strategy,
- translate a high-level description of an algorithm into efficient code, and
- apply the algorithmic techniques discussed in class to solve computational problems.

Prerequisites: CS 256 and 237 or equivalent. Concurrently taking both this class and 256 is acceptable, but a student in that position may need to do extra work to catch up on some topics if we cover them before 256 does. (Probability and Dynamic Programming are likely in this category.) Similarly, taking both this class and 237 is acceptable, but students who do not much experience coding in C are encouraged to seek outside help (e.g. office hours or recommended texts), especially during the first few assignments.

Tentative Course Outline:

- Section 1: Time, Space, and Cache Efficiency
- Section 2: Hashing and Randomization
- Section 3: Linear Programming
- Section 4: Strings and Trees

Grading Policy: Assignments (20%), Mini-Midterm 1 (20%), Mini-Midterm 2 (20%), Mini-Midterm 3 (20%), Final (20%).

Attendance: Attendance is not required in this class; however, it is highly recommended.

Academic Honesty: For a full description of the Computer Science Honor Code, please see:

<https://csci.williams.edu/the-cs-honor-code-and-computer-usage-policy/>.

If you have any doubt about what is appropriate, please contact me; one way is via email at srm2@cs.williams.edu. Specific rules are outlined below, and are further explained in the “Handing in Assignments” handout, found at <https://williams-cs.github.io/cs358-f21/handouts/handingInAssignments.pdf>.

Mini-midterms are to be the sole work of each student. No collaboration or discussion is allowed whatsoever. Internet resources may not be used to obtain any mini-midterm solutions; however they may be used for diagnostic purposes (i.e. looking up an unusual compiler error, or how to (say) debug memory leaks). They are considered “Test Programs” under the CS honor code.

Assignments are divided into two parts: code and questions. Assignments allow for a great deal of collaboration between students on code, but not on questions.

- The student must submit their own answers to any questions that are a part of the assignment. On these questions, students may only discuss high-level strategies and small syntax issues. The best way to ensure that this rule is followed is to never write anything down during discussions with other students—instead, discuss at a high level, and write down the details alone after the discussion completes.
- On the coding part of an assignment, students may collaborate with proper citations up to and including sharing pieces of code—thus, these are closest to “Practice Programs” under the CS honor code. However, every student must be able to explain every part of their submission. Furthermore, this sharing must always be mutually agreed upon—stealing content from another student violates the honor code as it normally would.

Any online resources are considered to be **acceptable** for all assignments. For example, a student may use StackOverflow to help with their code or with the answer to a question, so long as this help is properly cited and the student is able to explain their response.

Assignments: Assignments are designed to give students practice with the course materials. Grading on assignments is intended to give students an idea of how solutions will be graded on the Mini-Midterms and Final. Most assignments will be accompanied by a coding competition. The students with the first, second, and third best competition scores will be assigned 30, 25, 20 extra points respectively (out of 100) on the assignment. Generally, students with similar scores will be considered “tied”; if a student is tied with a higher-ranked student they will receive the same number of bonus points as the higher-ranked student.

Late assignments will incur a 20% penalty per day. If you cannot submit an assignment on time, please let me know ahead of time. The primary goal of the late penalty is to discourage students from falling behind in the course—I am very much willing to give extensions that are consistent with this goal.

Mini-Midterms: Mini-midterms are designed to test student’s knowledge of the material. There will be one mini-midterm (or final) per section of the course. All work must be done individually. Mini-midterms will have two components: questions and a coding assignment. The coding assignment will not have an associated competition; however, the quality of the solution will be evaluated in part on performance. Each mini-midterm will include example benchmarks, along with the scores that will result from performance on that benchmark. Depending on student performance, the grade given for a given performance may be increased; however, it will never be decreased.

Final: 24 hour take-home final. For the purposes of grading and collaboration, the final is identical to a mini-midterm; all work must be completed individually. The final will be comprehensive (will cover all material in the course), and must be completed in 24 hours.

Accommodations: Students with disabilities of any kind who may need accommodations for this course are encouraged to contact Dr. GL Wallace (Director of Accessible Education) at 597-4672. I am happy to discuss accommodations personally as well. Also, students experiencing mental or physical health challenges that are significantly affecting their academic work or well-being are encouraged to contact me and/or speak with a dean so we can help you find the right resources. The deans can be reached at 597-4171.

The college generally reaches out to professors about accommodations. If any of your accommodations affect how you interact with the course (e.g. by changing a due date), I will reach out to you with these changes. If you have not heard from me about accommodations you should have, please let me know as soon as possible so that we can make sure any resources are prepared in time.

COVID and Public Health Rules: We will be following college-wide policies in this course. At the time this syllabus is written, students must wear a mask at all times indoors, including in the classroom and in the lab. You will be updated with any changes to these policies over the course of the semester.

If you feel ill, please do not come to class. I will be happy to work with you to make sure you can make up any missed portions of class.

Isolation and Quarantine: Please let me know if you are unable to attend class due to COVID restrictions.

I will work with you to develop a plan that allows you to continue making progress in the course during your time in isolation/quarantine.