

CS 270
DATA STRUCTURES

Spring 2018

Instructor

John Stratton, Assistant Professor of Computer Science

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Office hours: You can walk in any time my door is open, or email to make a specific appointment. Official office hours are 1:00-3:00pm Wednesdays and Fridays

Textbook: *Data Structures and Algorithms in C++ 2nd edition*, by Goodrich, Tamassia, and Mount. You can purchase from the Whitman College Bookstore or any major online bookseller, as well as from the publisher.

Website: <http://cs.whitman.edu/~strattja/cs/270/2018S/>

Class Meetings

Mondays, Wednesdays and Fridays, 10-10:50, Thursdays at 9-9:50 in Olin 124

Prerequisites

CS 167 or equivalent programming experience. Specific knowledge of Python programming is not required.

Course Overview and Purpose

In this class, we will study the management and organization of data. Organization of data is just as important as the expression of computation in most software projects. Data structure choices can often make the difference between a fast and efficient program and an unusably slow one. In the course of learning to use and build efficient data structures, we will also study the object-oriented programming language features designed specifically to support the implementation and use of data structures in large pieces of software.

In computer science curricula, this course is sometimes referred to as “CS II” because it is a natural extension of the concepts learned in an introductory programming class. This course uses C++ specifically because it is a widely used, object-oriented programming language that is likely unfamiliar to students who were introduced to programming with Python or Java. In learning a new language, you will better understand the differences between specific languages and the fundamental commonalities between languages that are the fundamental concepts of programming. Although this course will heavily emphasize object-oriented programming skills, there will also be a variety of computing theory and practical systems topics discussed, such as pointers, memory management, compilers, and asymptotic complexity analysis. Overall, in this course you will become a much better programmer, and see the beginnings of some core areas of computer science: particularly systems, algorithm analysis, and software design.

Course Learning Objectives

By the conclusion of the course, you will be able to:

- Write object-oriented code in C++, using concepts such as inheritance, polymorphism, and encapsulation
- Use a compiler, linker, and build manager, and understand their roles in developing large software projects
- Write programs using abstract data types such as lists, stacks, fifo queues, priority queues, sets, and maps
- Implement core data structures such as vectors, linked lists, trees, and hash tables
- Analyze the efficiency of data structures and choose appropriate data structures for a given purpose
- Use a unit testing framework and test-driven development practices for building modules and libraries

Credit

4.0 Credits

LEARNING ACTIVITIES AND GRADING

Expected Time Commitment

Outside of lectures, you may expect to average eight to ten hours per week on reading, assignments, and projects.

Class Time and Attendance

Class meetings will involve a mix of discussions, demonstrations, individual and collaborative exercises, and lecture. You are expected to attend and actively participate in class, and it is my responsibility and yours to make class a valuable use of your time. Participating in class involves being physically and mentally present in class, coming prepared and on time, asking questions, making positive contributions to class discussion by volunteering and when called upon, and working effectively and respectfully with other students.

You are expected to attend class, because you and other students benefit from your participation. Small classes and collaborative in-class work mean that other people in the class are affected when you are absent. There is no specific penalty for absences, but consistent attendance may influence me favorably when considering any adjustments to the letter grade scale if your score is close to a cutoff. Please let me know ahead of time by email if you are going to miss a class period for any reason. It is up to you to contact me to arrange for keeping up with missed classes and assignments.

Homework and Programming Assignments

There will be a homework assignment due approximately each week. The homework assignments will primarily be programming exercises applying course concepts to give you practice building and using common data structures in C++. Each homework is important practice, and all together, will count for nearly half of the grade in the course.

In addition to the feedback I will provide feedback on each assignment regarding correctness and completeness, you are expected to come meet with me at least twice times during the semester to discuss the software design and code style of one of your assignment

submissions. This could be during office hours or by appointment. You will not receive a grade on your software design, but will get credit for attending and participating in reviews.

Readbacks

Most class days will have a short pre-class “Readback” form for you to fill out to help you and me prepare for class. Readbacks are not graded on correctness – you will always get full credit for a thoughtful, honest, and timely submission. Readbacks must be completed an hour before the assigned class period, so that I can review common questions and comments before class.

Deadlines

Late submissions for assignments will not be accepted without prior arrangement. Legitimate reasons for granting extensions could include planned absences taking you away from campus, unplanned illness or hardship, or foreseeable conflicts with other class activities. In any circumstance that will interfere with your completion of assignments, *you must contact me as soon as possible to be considered for an extension.*

Because I am concerned about your health and well-being, I will also accept late homework according to my "health and well-being" policy. To be eligible, you must:

- start the assignment at least three days in advance of the due date
- expend a reasonable amount of effort to complete the assignment by the time it is due (at least 4 hours in total);
- send me an email attesting to facts (1) and (2), including whatever work you've done so far, at the time the assignment is due;
- go to sleep reasonably soon after sending me that email; and
- schedule a meeting with me as soon as possible to talk about your difficulty with the assignment and negotiate an extension

Examinations

There will be three midterm exams and a cumulative final exam. For an exam, in addition to writing utensils, you will be allowed to bring one sheet of notes for reference.

Exam 1: In Class Monday, February 12th

Exam 2: In Class Thursday, March 8th

Exam 3: In Class Thursday, April 19th

Final Exam: Friday, May 11th, 2-4pm

Course Grading

Homework / Programming Assignments
Homework Code Reviews
Midterm Exams (each)
Readbacks
Final exam

Course Points

40%
5%
10%
5%
20%

Your letter grade will be assigned based on the “standard” 90% ‘A’s, 80% ‘B’s, 70% ‘C’s, 60% ‘D’s cutoffs. I would be happy to give you all ‘A’s if deserved. I do not grade on a curve or make numerical adjustments to individual assignment scores based on class averages. However,

if the numerical grading results in grades I believe are too low, I reserve the right to lower these cutoffs for the whole class (raising your grades) to grant the grades that are deserved.

COURSE MANAGEMENT AND COURSE POLICIES

Accommodations

If you are a student with a disability who will need accommodations in this course, please meet with Rebecca Frost, Director of Student Success and Disability Support Services (Memorial 325, 509.527.5213, frostr@whitman.edu) for assistance in developing a plan to address your academic needs. All information about disabilities is considered private; if I receive notification from Ms. Frost that you are eligible to receive an accommodation, I will provide it in as discreet a manner as possible.

Electronic Devices

During class sessions, using electronic devices for nonacademic purposes is unprofessional and disrespectful to your instructor and to other students. Please silence and put away cell phones and smart phones. During class sessions, we will be using the classroom's ability to share screen content from the installed workstations. Therefore, all programming work in class must be completed on the classroom workstations. Supplemental electronic devices, if desired, should be used only for note-taking purposes.

Collaboration and Academic Integrity

You are expected to conduct your academic work in accordance with the highest ethical standards, and with a primary goal of helping every student in the class learn. This course may include a mixture of individual, pair, and team assignments. It will be explicitly communicated for each assignment whether students much do individual or group work on that assignment. Please refer to the Whitman College Academic Honesty Policy, as well as the [Computer Science Academic Integrity](#) statement for some guidelines on applying that policy to this class specifically.

Thanks to Janet Davis, Andy Exley and Michael Louis for their contributions.



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