CS 200: Algorithm Analysis

Syllabus – Fall 2020

Instructor: Nathan Sommer
Email: nsommer@wooster.edu
Office Location: Taylor 313
Office Hours: See course web site

Meeting Time: Tuesday and Thursday, 9:45 AM to 11:05 AM in Taylor 205 or on Microsoft Teams

Course Web Site: http://csweb.wooster.edu/nsommer/cs200

Course Description

This course covers algorithms commonly encountered in computer science. Sorting, recursion, greedy strategies, and dynamic programming techniques are examined, as well as algorithms which utilize graphs and trees. Time and space complexity analysis is also covered, including the limitation of algorithms in the context of NP-completeness.

Course Goals

Upon completion of this course, a successful student will be able to:

- Analyze the time and space complexity of algorithms.
- Use common algorithmic techniques such as recursion, dynamic programming, and graph algorithms to solve problems.
- Carry out a research project involving a software prototype and a paper written in a manner consistent with computer science academic writing.

Textbook

Introduction to Algorithms, 3rd Edition, Cormen et. al.

Learning Amidst COVID-19

The current pandemic obviously has a dramatic effect on how we will conduct classes this semester. I will do my best to create a conducive environment for learning in the face of this challenge, and some adjustments to the course may be made as we go along. Let us all practice patience and kindness towards one another as we figure things out together.

Course Format

Classes are to be held remotely via Microsoft Teams at the beginning of this semester, and in-person classes will start later (unless policy changes, this will be February 1). Once the College begins allowing in-person classes, students will have the option to attend this course in-person or to continue attending remotely via Teams. It may be the case that there are more students who wish to attend in-person than there are seats in our classroom. If that is the case, a rotation will be devised.

Recording of Classes

Given the pandemic, circumstances are more likely to arise that make it difficult or impossible for some students to attend class at some point during the semester. Additionally, some remote students are in drastically different time zones and may find it difficult to attend class during our alotted time. Because of this, I plan to record our class sessions within Teams so that students can review the content at a later time, and students who have to miss class for exceptional circumstances can catch up more easily. These recordings will only be accessible by class participants, and they may not be distributed beyond this class in any form without the permission of all participants.

Additional College Policies

See here for additional College-level information:

https://www.wooster.edu/info/2020-2021-guide/

Outline of Topics

- Foundations of algorithm analysis
  - Asymptotic notation
  - Recurrences
- Sorting
- Data Structures
  - Review elementary data structures
  - Binary search trees
  - Red-black trees
- Dynamic programming
- Greedy algorithms
- Graphs
  - Searching

  - Minimum spanning trees
  - Shortest paths
- P vs. NP and NP-completeness

Assignments and Exams

Your grade will be calculated based on the following items:

- **Homework** – Homework assignments will consist mainly of problem sets, and will be submitted through Moodle.
- **Labs** – Labs will involve programming projects, and assignments that involve written analysis. These assignments will be collected via git-keeper.
- **Research Project** – A major component of this course is a semester-long research project. There will be a number of deliverables for this project throughout the semester, culminating in a final paper, a piece of software, and a presentation.
- **Midterm Exams** – There will be two midterm exams during the semester.

Grading

Grades will be weighted as follows:

25%	Homework
25%	Labs
30%	Research Project
20%	Midterm exams (10% each)

I will use the standard 90, 80, 70, 60 grading scale with pluses and minuses. I may relax these standards as necessary but I will not raise them.

Communication

Feel free to talk to me about any issues that may arise. The preferred means of communication about course material is via direct message on Microsoft Teams. If you have questions about programming assignments, it is often most effective to talk via a video call so that you can share your screen with me.

You may book a time to meet with me during my office hours using the booking link on the course web site. If there are no spots free or you cannot make my normal office hours, let me know and we can figure out another time to meet.

Course Policies

- **Late Policy** – I will do my best to grade and return assignments to you as soon as I can. Late submissions make timely grading much more difficult. As such, any submissions I receive after I have started grading an assignment will be subject to a 25% penalty for each day that it is late, starting as soon as I start grading the assignment.

  If an assignment's due date has passed and I want to start grading submissions but *nobody* has submitted, the 25% penalty starts at that point regardless of the fact that there is nothing to grade.

  Exceptions to this policy will be granted in special circumstances. You must let me know *before* the due date if you feel you have a valid reason why you cannot turn an assignment in on time.

- **Extensions** – I will extend an assignment's due date for the entire class if it is clear that the original time frame was unreasonable. If you are going to bring up the possibility of a due date extension for a programming assignment, be prepared to demonstrate that you have already made substantial progress on the assignment.

  Please contact me if you find yourself in a situation where you need an extension for personal reasons.

- **Academic Honesty** – It is expected that you will complete labs and your research project individually. Any uncited work that you turn in must be your own.

  Software similarity is a tricky thing as some similarities between code submissions are inevitable. I draw the line at submissions that contain a significant amount of code that is either identical to someone else's code or submissions where the only differences are purely cosmetic (i.e. variable and function names have been changed to hide code copying). Contact me if you have any doubts about what is permissible.

  Dishonesty in any of your academic work is a serious breach of the Code of Academic Integrity and is grounds for an F for the entire course. Such violations include turning in another person's work as your own, copying from any source without proper citation, crossing the boundary of what is allowed in a group project, submitting an assignment produced for a course to a second course without the authorization of all the instructors, and lying in connection with your academic work. You will be held responsible for your actions.

  You are expected to know and abide by the rules of the institution as described in *The Scot's Key* and the *Handbook of Selected College Policies.* These policies are available here:

  https://www.wooster.edu/academics/affairs/policies/

- **Conflicts with Academic Responsibilities** – The College of Wooster is an academic institution and its fundamental purpose is to stimulate its students to reach the highest standard of intellectual achievement. As an academic institution with this purpose, the College expects students to give the highest priority to their academic responsibilities. When conflicts arise between academic commitments and complementary programs (including athletic, cultural, educational, and volunteer activities), students, faculty, staff, and administrators all share the responsibility of minimizing and resolving them.

As a student you have the responsibility to inform the faculty member of potential conflicts as soon as you are aware of them, and to discuss and work with the faculty member to identify alternative ways to fulfill your academic commitments without sacrificing the academic integrity and rigor of the course.

- **Recording Classroom Activities** – No student may record or tape or photograph any classroom activity without the express written consent of the course instructor.

The Learning Center: Academic Support and Disabilities

The Learning Center, which is in APEX (Gault library) offers a variety of academic support services, programs and 1:1 meetings available to all students. Popular areas of support include time management techniques, class preparation tips and test taking strategies. In addition, the Learning Center coordinates peer-tutoring for several academic departments. Students are encouraged to schedule an appointment at the APEX front desk or visit the Learning Center Website for additional options.

An additional support that the Learning Center offers is English Language Learning. Students can receive instruction or support with English grammar, sentence structure, writing, reading comprehension, reading speed, vocabulary, listening comprehension, speaking fluency, pronunciation, and American culture through 1:1 meetings with the Learning Center staff, ELL Peer Tutoring, ELL Writing Studio courses, and other programming offered throughout the year. Students seeking ELL support are encouraged to visit the APEX front desk.

The Learning Center also coordinates accommodations for students with diagnosed disabilities. At the beginning of the semester, students should contact the Learning Center (ext. 2595) to make arrangements for securing appropriate accommodations. Although the Learning Center will notify professors of students with documented disabilities and the approved accommodations, students are encouraged to speak with professors during the first week of each semester. If a student does not request accommodations or does not provide documentation to the Learning Center, faculty are under no obligation to provide accommodations.

Title IX Reporting Policy

The College of Wooster is committed to fostering a campus community based on respect and nonviolence. In accordance with Title IX, Wooster is legally obligated to investigate incidents of sexual harassment and sexual assault that occur on our campus. Faculty who become aware of any incident of sexual violence, including harassment, rape, sexual assault, relationship violence, or stalking, are required by law to notify Wooster's Title IX Coordinator. For more information about your rights and reporting options at Wooster, including confidential and anonymous reporting options, please visit http://www.wooster.edu/offices/title-ix/.

The details of this syllabus are subject to change based on our progress through the material and the ever evolving COVID-19 situation.