CS 530: Advanced Algorithms

Syllabus

Fall 2025

1 General Information

Instructor: Nathan Klein (nklei1@bu.edu)

Webpage: https://nathan-klein.github.io/advanced-algs.html

Lectures: Tuesday and Thursday, 9:30am - 10:45 in MCS B37

Teaching Fellow: Pooria Farahani

Discussion Sections: Wednesday 10:10am - 11:00 and 11:15am - 12:05 in CDS 801

Office Hours: Monday 2:00 - 3:00, Tuesday 11:00 - 12:30, Thursday 11:00 - 12:30, and by appointment in CDS 1026

Course Description: This course surveys a collection of beautiful ideas in algorithms. From the curse of dimensionality to spectral graph theory to the price of anarchy, we will focus on understanding the important conceptual contributions of the field of algorithms over the last 50 years.

Prerequisites: Strong undergraduate-level knowledge of algorithms, linear algebra, and probability. Motivated, mathematically mature undergraduate students who have excelled in CS 237 and CS 330 are also welcome.

2 Coursework

Grade Calculation: Homework (35% with lowest score dropped), midterm (20%), participation and (basic informational) quizzes (20%), and a final exam or final project (25%).

Homework: Group work is encouraged. However, when working with a group, you may not write down solutions and consult them later. All homework write-ups must be completed alone and without the aid of notes from group work. Submit your homework to Gradescope.

Late Homework: You have four late days to use as you'd like over all assignments for turning in late homework. A late day is considered used if you end up turning in the homework: remember, I will drop the lowest homework score. After these days are used up, I will not accept late homework unless there are extenuating circumstances.

Participation and Quizzes: As long as you come to class engaged, you should receive essentially full points. You can also receive participation points from posting on Piazza (see below). The

quizzes will be based on a flash-card deck that I post online and will contain basic definitions from the course. They will involve briefly explaining concepts from the flashcard deck. This is designed to help students follow lectures. In some ways learning math is like learning a language, and it is important to know the basic building blocks by heart.

Final or Final Project: Students are given a choice to do a final project or take the final exam. You can also opt to do both, and tell me which you would like to be graded.

Final Project: The final project (if you elect to do it) will involve either undertaking an original research project, reading and understanding a paper related to algorithms, or surveying work in an area or related to an open problem.[1] Projects will have both a written component and a presentation at the end of the course. They may be done alone or in small groups. Students will need to discuss and clear their final project topic with me, and send a proposal by October 24th.

3 Additional Information

Piazza: We will be using Piazza for discussions, homework questions, and logistics. A code to join will be emailed to all students.

Anki: I will post Anki flashcards on the course website of definitions to know for the quizzes and, more importantly, to know so that it is easier to follow lectures.

Health: Please let me know if you are struggling at all with health issues and I am more than happy to help make the course more manageable for you. For mental health, consider Student Health Services as a resource: they provide free assessments and can help connect you to a therapist covered by your healthcare. They also run meditation sessions and support groups, with one explicitly aimed at graduate students.

[1] Surveys about open problems are often good projects and are encouraged. You do not need to solve the problem, just to understand why it's interesting and what has been tried.