CS3000 - Algorithms & Data
Summer 2024
Northeastern University

Prof. Laney Strange (she/her)

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Course web page	http://course.ccs.neu.edu/cs3000
Piazza	https://piazza.com/northeastern/summer2024/cs3000
Gradescope	https://www.gradescope.com/courses/765281
Lecture Schedule	MTWR 11:40am-1:20pm RI 236
Recitation Schedule (CS3001)	Sec 1. TR1:30-2:35pm CG 094 Sec 2 & 3 TR 3:20-4:25pm KN 010

About this Course

This is an introductory undergraduate course in algorithms. Every computer program can be viewed as an implementation of an algorithm for solving a particular computational problem. The focus of this course is on learning algorithm design techniques for solving the underlying computational problems. We will also look at how algorithms translate to programs, but our emphasis will be on the algorithm design and analysis. In this class, we will:

- Work on a range of computational problems that arise in diverse applications
- Learn how to formulate problems precisely from somewhat informal descriptions
- Learn algorithmic design techniques used to solve the problems
- Learn proof techniques critical for reasoning about algorithms
- Learn analysis techniques critical to determine the efficiency of algorithms

Specific topics covered in the course include:

- Basics tools for analysis of algorithms: proof by induction, asymptotic notation
- Divide-and-conquer algorithms
- Dynamic programming
- Basic graph algorithms: BFS, DFS, topological sorting, strongly connected components
- Graph optimization: shortest paths, minimum spanning trees
- Amortized analysis, randomized algorithms
- Greedy algorithms
- Network flow algorithms and applications
- NP-completeness

Recommended Textbook

There is no required textbook. However, the material is mostly going to be from the following book:

- Introduction to Algorithms by Cormen, Leiserson, Rivest, and Stein
- (The 4th edition has just come out, but it's fine to buy an older/used edition!)

Relevant chapters will be listed alongside lecture topics on the course website. You do not need to read the textbooks ahead of lecture; they are most useful as reference materials or for looking up new examples. Keep them handy when working on the homework or reviewing your lecture notes.

Evaluation

Factor	**Number**	**Weight**
Homeworks	6	45%
Algorithm Practice Problems (APPs) 3 dropped	8	15%
Exam #1	1	20%
Exam #2	1	20%
	TOTAL	**100%**

Your final grade for CS3000 will use the following breakpoints to convert from letter to number grades. We use natural rounding to get these whole numbers, e.g., 96.5 becomes a 97 but 96.4 becomes 96.

Letter	**Range**
A	94-100
A-	90-93
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72

D	60-69
F	< 60

Office Hours

Office hours are a great place to get clarification on concepts and have conversations with TAs and professors. Instructor and TA office hours are listed on the course website.

It'll be important that you come to office hours having already made an attempt on the homework. We will be happy to help guide you on concepts and provide clarification. We do not provide you with answers to problems, and we do not confirm that your solution is correct.

Homework

Homeworks are assigned once per week. Homeworks are due at 9pm eastern on the due date, unless otherwise noted. You may submit homeworks up to 48 hours late with no penalty, but ***your submission will not be graded right away if it is submitted late.*** The summer semester goes by quickly, and to ensure we grade homeworks in a timely manner, we will prioritize those submitted by the deadline.

There is also **one second-chance deadline** this semester, which you can use to resubmit ONE previous homework (1-5).

- Deadline: **June 20th, 2024 at 9pm**. You can use this second-chance homework to resubmit one of homeworks 1-5 for a new grade.

HW6 cannot be resubmitted. Homework solutions will not be released because of this policy, but we will go over all relevant homeworks at the recitation meetings preceding the exams.

All homework solutions must be typed (preferably in LaTeX). We will provide the source files for the HW assignments to help you get started. Our first recitation will include a tutorial on LaTeX, and we'll link some resources on the course website.

It is encouraged that you work with your classmates on the homework problems. If you do collaborate, you must write all solutions by yourself, in your own words; you are also strictly forbidden from sharing any written solutions. You must list all of your collaborators on your submission.

Recitations

The recitation for this class, CS3001, has two meetings per week, but **we will use only the Tuesday meeting for an official recitation section.**

You will have a practice problem set to complete during the Tuesday recitation, and we'll go over the solutions, but it won't be graded..

Thursday recitations will be fun algo-practice sessions, led by our TAs! We'll announce on Piazza each week what the theme will be and who your TA lead will be. These Thursday times will be excellent preparation for your co-op and job interviews.

Please check the schedule on the course website; recitation schedules vary week to week and we'll post reminders/announcements on Piazza and in class.

Algorithm Practice Problems (APPs)

APPs will be assigned towards the end of roughly two lectures each week. You'll put together a solution to a short problem that we'll all use in the following lecture. We'll have time set aside to do these in class, or you can submit on your own.

APPs will be graded on completeness. They must be submitted by 11:30am (just before lecture) on the due date. They will not be accepted late, but we drop 3 of them (out of 8 total).

Exams

There are two exams during the semester, and they will be administered in-person, during class. Exam dates are:

- Thursday, May 23rd
- Thursday, June 13th

For each exam, you may bring one 8.5x11-inch paper as a cheat sheet, with anything written or typed on it (one side only). You will submit this cheat sheet along with your exam, and you are not permitted to use any other materials or notes during the exams.

Additionally, we will use the last day of class to offer a short, one-problem exam for anyone who wants to take it. Your score on this problem can be used to replace your score on ONE problem from Exam 1 OR Exam 2. No cheat sheets are permitted for this make-up exam problem.

If you have a DRC accommodation for extra time on exams, it is your responsibility to arrange to take the exams in the DRC office. Make sure you set this time up at least a week ahead of the scheduled exams to guarantee the time and space you need.

Revise/Resubmit Policy

You'll have a few opportunities to re-submit your work this semester. You can review and consider the feedback you receive from us as part of your graded work, and use that to revise and build a better solution.

Because of these resubmission policies, ***we don't make any exceptions to published deadlines***. We also don't publish solutions to homeworks, but we will go over the solutions to all relevant homeworks during the exam-prep recitations.

Resubmissions - Homework

- You can submit any/all homeworks up to 48 hours late with no penalty. However, we can't guarantee it will be graded and returned with the other submissions; we'll prioritize solutions that were submitted on time.
- You also have an opportunity to resubmit one homework a new grade.
- HW6 is the exception; it cannot be resubmitted.

Resubmission Deadline - Homework

- **June 20th at 9pm eastern** (You may resubmit ONE of homeworks 1-5)

Make-Up Exam Question

- We'll have an optional make-up exam question, which is optional and you can choose to do it during the last recitation (6/18) or the last day of class (6/20). You'll be able to pick a topic from exam #1 OR exam #2, and then take a mini-exam with a new problem on that topic.
- Your score on the make-up question will replace your score on one problem from one exam.
- No cheat sheets are allowed for the make-up exam question.

Make-up Exam Question Dats

- **Tuesday June 18th** during recitation OR
- **Thursday June 20th**, during lecture

Late/Attendance Policy

CS3000 is an in-person class, and attendance is expected. However, we don't take attendance and we don't want or expect anyone to come to class when they're sick. We'll post the lecture notes from each day that you can use to catch up on any missed material. If you miss class for any reason, we recommend reading the notes for that day, working through any problems on your own step-by-step, and stopping by Laney's office hours to get caught up.

You must be present in-person for scheduled exams. Make sure you familiarize yourself with the schedule so that you don't miss the exams.