CSC 265: Enriched Data Structures and Analysis
Fall 2024

Instructor: Adrian She

Teaching Assistants: Shi Hao Liu

Lectures: MW 3-4pm in MY 330, F 3-4pm in ES B149

Office Hours: Thurs 3-4pm in BA 2272

Email: `csc265-2024-09@cs.toronto.edu`

Email Policy: Please use your university email address, and include CSC 265 in the subject line of the email. I will aim to respond to emails within 2 business days.

Please ensure that you have checked the course syllabus, Quercus, and Piazza for the answer to your question before emailing me. Questions about the course content can be addressed in office hours or over Piazza. Remember to please use respectful language in all email communications.

Course Contents and Objectives: CSC 265 is an "enriched" version of CSC 263, Data Structures and Analysis. While we will cover roughly the same topics, we will go at a faster pace, in greater depth and with more rigour, and have more challenging assignments. Certain topics briefly mentioned in CSC 263 may be covered in more detail, and some additional topics may also be covered. Greater emphasis will be placed on proofs, theoretical analysis, and creative problem-solving.

By the end of this course, students should be able to:

- Analyze the worst case running time of algorithms, and the worst case expected running time of randomized algorithms.
- Implement and use data structures for abstract data types (ADTs), including priority queues, dictionaries, and disjoint sets. In particular, you should be able to use binary heaps, a mergeable heap data structure, balanced binary search trees, hash tables, and data structures for disjoint sets.
- Perform amortized analysis of sequence of operations on a data structure. You should be familiar with the basic tools of amortized analysis, in particular the potential function method.
- Know how to use data structures for storing graphs, with basic graph algorithms such as graph search (breadth-first and depth-first search) and minimum spanning trees.
- Prove simple lower bounds on the worst case running time of algorithms in the decision tree model, using the information theoretic and adversarial methods.

Prerequisites: You must have completed an introduction to theoretical computer science course (CSC 236/240) that covers runtime analysis and proofs of program correctness. You must have taken, or be currently taking an introductory course in probability (MAT 377, STA 237, STA 247, STA 255, STA 257).

Course Materials: The recommended course textbook is **Cormen, Leiserson, Rivest, Stein (CLRS), "Introduction to Algorithms"**. The 3rd edition is available for free to students through the University of Toronto libraries website. Course readings will be posted for each week on the course Quercus page.

Supplementary notes for some topics, problem sets, tutorial sheets, and class announcements will also posted on the class Quercus page.

Piazza: A course Piazza will also be made available for discussions about course material. Please use Piazza rather than email for help related to understanding the course material. Other students may also benefit from your questions. When posting, abide by the academic integrity policy. Do not post solutions to homework problems on the Piazza page.

When using Piazza, be respectful to your instructors and fellow students. Offensive language and threatening behaviour will not be tolerated. Keep in mind that when posting "anonymously", you are only anonymous to other students, and not to the instructors.

Marking Scheme: Your course grade will be calculated based on the following scheme:

- Quizzes: 5%
- Assignments: 30%, 5 assignments worth 6% each.
- Midterm Exam: 25%, Oct 23 in class
- Final Exam: 40%, **in-person**, date to be scheduled by Faculty of Arts and Sciences

To pass the course, you must score at least 40% on the final exam.

There will be a short weekly quiz, to be completed online on Quercus on your own time. Each quiz will be available for at least a week. Quizzes are intended to assess a basic level understanding of the course material, including the course readings from CLRS and any material covered in lecture. The best 7 out of 8 quizzes will count towards the final grade.

Assignments will involve longer problems that may include creative problem-solving. You will also have at least two weeks to work on each assignment.

Assignment	Date Out	Date Due
1	Sept 6	Sept 20
2	Sept 20	Oct 4
3	Oct 4	Oct 18
4	Oct 18	Nov 8
5	Nov 8	Nov 22

Quiz	Date Out	Date Due
1	Sept 9	Sept 16
2	Sept 16	Sept 23
3	Sept 23	Sept 30
4	Sept 30	Oct 7
5	Oct 7	Oct 16
6	Oct 16	Nov 6
7	Nov 6	Nov 18
8	Nov 18	Nov 25

Homework Policy: Assignments are due by midnight on the listed due date. Each assignment can be done by a group of at most two students. You are strongly encouraged to work with a partner. Assignments should be **typed. Handwritten assignments will not be accepted.** Resources for learning how to use LaTeXwill be made available on the course website.

If you work with a partner, one student is responsible for writing the solution and the other student is responsible for proof-reading and revising the solutions. The first page of your submission must list the name, student ID, and UTOR email of each group member, and indicate for each problem, who wrote the solution and who revised it. The purpose of these rules is to ensure that each student fully understands the solution for each problem.

You are encouraged to find partners for assignments through Piazza, or by speaking with your classmates during lectures and tutorials.

Academic Integrity: Every student must abide by the University of Toronto academic integrity policy and the Code of Student Conduct. In particular, the following rules apply when submitting graded work for the course.

When working on group assignments, you may discuss the problems with your partner and come up with solutions together, but you may **not** discuss them with other students. You should not discuss solutions with anyone other than the professor, the TA, and your partner (if working on a group assignment). You should only use the official course materials and your own lecture notes as aids when writing up solutions. You should not consult other books, solutions manuals, or solutions to similar problems on the Internet. **Failure to comply with these guidelines is a serious academic offense.**

However, there are still many other ways you can work with other students in the course. You can read and review lecture notes together, and work on additional problems from the textbook and tutorial that will not be graded. For more information about academic integrity, please consult Prof. Francois Pitt's website at `https://www.cs.toronto.edu/~fpitt/documents/plagiarism.html`.

The use of generative AI tools, including ChatGPT, Github Copilot, or any open-source tools you may have trained or deployed yourself, is strictly prohibited when completing all course assessments.

Lateness Policy: Every student has one grace credit, which allows them to be late on one assignment for up to 24 hours. After the credit is used, no other late submission from the same student will be accepted. If you are working in a group, the credit will be taken from both members of the group.

Policy on Missed Term Work: Please contact the instructor as soon as possible in case you are unable to complete an course assessment. If your request is approved, you may receive an accomodation in the form of an oral exam, a written make-up test, or a reweighting of your assessments.

Accomodations: Students with diverse learning styles and needs are welcome in this course. In particular, if you have considerations that may require accommodations, please feel free to approach the instructor by email and/or Accessibility Services at (416) 978 8060; `studentlife.utoronto.ca/as`.

Regrading Policy: Remarking requests will be accepted up to one week after the date a homework assignment is returned. A remarking request can be used to alert us to possible mistakes in the grading of an assignment, but not to question the marking scheme of the assignment. Please ensure that you review solutions and TA feedback before you submit a regrade request. I will aim to respond to remark requests within two weeks.

Regrade requests do not guarantee that your grade will increase. Your grade may stay the same, decrease, or increase.

Course Tutorials: The Friday lecture will often be used for a course tutorial lead by the teaching assistants. The course tutorial will generally include practice with solving problems related to the course material. You are encouraged participate actively in course tutorials to support your learning in the course.

Copyright Notice: Students may not create audio or video recordings of classes, with the exception of those students requiring an accomodation for disability, who should speak to the instructor prior to beginning to record lectures. Course materials may not be reproduced or posted or shared anywhere other than the official course Quercus and Piazza pages, and should only be used by students currently registered in the course. Students who share materials on external websites may be subject to disciplinary actions under the Code of Student Conduct.

(Updated August 28, 2024)