

CSC263H -- Data Structures and Analysis

Fall 2023

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Contact information and meeting times

Instructor: Sam Toueg

Office hours: Thursday 11am-1pm (by [Zoom](#))

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Email: sam@cs.toronto.edu

Teaching assistants: Navid Eslami Amirabadi, Xinyuan (Elva) Fan, Jeremy Ko, Shixuan (Nadia) Li, Xinyuan (Lily) Li, Amirmojtaba Sabour, Vedic Sharma, Robin Swason, Yibin Zhao.

Lectures:

Sections	L0101	L0201
Times	Monday-Wednesday 13:00-14:00	Monday-Wednesday 15:00-16:00
Locations	KP 108	RW 110

Tutorials:

Times	Friday 13:00-14:00	Friday 15:00-16:00
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Sections	TUT 0101	TUT 0102	TUT 0201	TUT 0202
Locations	BA 1200	MP 137	MP 137	GB 303
Teaching Assistant	Jeremy	Navid	Navid	Jeremy

Teaching assistant office hours (*we will post the locations before Sept 15*): *This schedule may change weekly*

Friday September 15	Monday September 18	Tuesday September 19
16:00-17:00	16:00-17:00	14:00-15:00
		16:00-17:00

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Course content and schedule

Course goals: Data structures are ways of organizing the data involved in computation, suitable for representation in and manipulation by computers. Algorithms are precisely stated, general problem solving methods. Data structures and algorithms are central to computer science. They are also integrally related: neither can be studied fruitfully without knowledge of the other. This course has two goals: First, to learn several important data structures and algorithms, including how to choose and/or modify a data structure to solve various problems; and second, to introduce the basic tools and techniques for the analysis of algorithms and data structures.

Prerequisites: The course prerequisites for CSC263 are listed [here](#). Given the importance of these prerequisites for success in CSC263, they are strictly enforced: if students do not have the required prerequisites, they will not be allowed to take the course and they will be removed.

Textbook: *Introduction to Algorithms*. 3rd edition. Cormen, Leiserson, Rivest, and Stein. MIT press and McGraw-Hill 2009.

Tentative weekly schedule: (*This schedule may change during the term*)

Dates	Topics	Readings (textbook and class notes)	Assignments due Wednesdays at 11:00 am

Week 1	<ul style="list-style-type: none"> - Review of time complexity of algorithms and asymptotic notation. Upper and lower bounds on algorithm complexity. - Abstract Data Types. Priority queues: Heaps. 	<p>CLRS: 1, 2, 3</p> <p>CLRS: 6</p>	A1 posted
Week 2	<ul style="list-style-type: none"> - Priority queues: Mergeable Heaps. - Priority queues: Mergeable Heaps (cont'd). Dictionaries: Binary Search Trees (quick review) 	<p>Binomial Heaps notes (CLRS 19, 2nd edition)</p> <p>CLRS: 12.1 to 12.3</p>	A1 due, A2 posted
Week 3	<ul style="list-style-type: none"> - Balanced Search Trees (AVL). - Balanced Search Trees (AVL). 	AVL Trees notes	
Week 4	<ul style="list-style-type: none"> - Augmenting data structures. - Hashing. 	<p>CLRS: 14</p> <p>CLRS: 11.1 to 11.3 (except 11.3.3)</p>	A2 due, A3 posted
Week 5	<ul style="list-style-type: none"> - Bloom Filters. - Randomized Quicksort. 	<p>Bloom filters survey paper (chapters 1 and 2.1)</p> <p>CLRS: 5 and 7</p>	
Week 6	<ul style="list-style-type: none"> - Disjoint Sets 	CLRS: 21.1 to 21.3	A3 due, A4 posted
Week 7	<ul style="list-style-type: none"> - Amortized Analysis. - Amortized Analysis: Dynamic Tables 	CLRS: 17	<p>Midterm Thursday, Oct. 26 at 8pm in the evening</p>

Week 8	<ul style="list-style-type: none"> - Graphs: basic definitions and data structures. - Graphs: breadth-first search and applications. 	CLRS: 22.1 - 22.2	A4 due, A5 posted
Reading Week	Reading Week	Reading Week	Reading Week
Week 9	<ul style="list-style-type: none"> - Graphs: depth-first search and applications. 	CLRS: 22-3 - 22.4	A5 due, A6 posted
Week 10	<ul style="list-style-type: none"> - Graphs: Minimum spanning trees and applications. 	CLRS: 23	
Week 11	<ul style="list-style-type: none"> - NP-Hard problems and approximation algorithms: approximate solution to the Euclidian TSP. - Problem Complexity Lower bounds: <ul style="list-style-type: none"> • Decision Trees: lower bound for the sorting problem. 	CLRS: 35.2 CLRS: 8.1	A6 due
Week 12	<ul style="list-style-type: none"> - Problem Complexity Lower bounds: <ul style="list-style-type: none"> • Adversary arguments: lower bound for the MIN-MAX problem. - Course wrap-up 	CLRS: 9.1	

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Calendar of important course-related events:

Speak, then, and tell everything. For, it comforts those in pain
To know before hand all the agony they still must bear.

--Aeschylus, *Prometheus Bound*

<i>Date</i>	<i>Event</i>
Wednesday, September 13	Assignment 1 handed out
Wednesday, September 20	Assignment 1 due and Assignment 2 handed out
Wednesday, October 4	Assignment 2 due and Assignment 3 handed out
Wednesday, October 18	Assignment 3 due and Assignment 4 handed out
Thursday evening, October 26	<u>Midterm test</u>
Wednesday, November 1	Assignment 4 due and Assignment 5 handed out
Wednesday, November 15	Assignment 5 due and Assignment 6 handed out
Wednesday, November 29	Assignment 6 due

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Midterm exam

Material covered: All the material that we covered in class, in the tutorials, in the reading and homework assignments, up to and including the last week of class before the exam.

Aids Allowed: None.

Time: Thursday, October 26, evening at 20:00 (sharp!) - 21:30.

Please try to come at least 5-10 minutes before 8pm,
so that we can pre-distribute the exam and then start it at 8pm sharp.

Location: EX200 (Examination Facility, 255 McCaul Street).

Students who have an irresolvable course conflict with the timing above can take the midterm test from 21:00 to 22:30 instead, on the same day (i.e., Thursday, October 26) in EX200.

If you want to take the delayed exam session from 21:00 to 22:30, *you must register for it by Monday, September 25 at the latest.* To register, e-mailing a

note to csc263-2023-09@cs.toronto.edu with your name, student number, and the name and time of the conflicting course.

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Final exam

Material covered: All the material that we covered in class, in the tutorials, in the reading and homework assignments, up to and including the last week of class.

Aids Allowed: None.

Time and Location: TBA [here](#).

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Course policies

Course evaluation: There will be 6 homework assignments, one midterm test and a final assessment test. The relative weights of these components towards the final mark are:

Homework	42%
Midterm test	18%
Final test	40%

Important note: A mark of at least 40% on the final test is necessary to pass the course.

Academic integrity: Academic integrity is essential to the University of Toronto and the University treats cases of cheating and plagiarism *very seriously*. Academic offenses relevant to this course include using someone else's ideas or words without appropriate attribution; obtaining or providing unauthorized assistance on any assignment, test, or exam; misrepresenting your identity; falsifying or altering documentation; and violating the homework collaboration policy stated below.

Homework collaboration and help policy: In each homework assignment you may collaborate with at most two other students currently taking one of the sections of CSC263 taught this term. If you collaborate with other students on an assignment, you and your partner(s) must submit only one of your solution, with all your names, as a single group. The solution will be graded in the usual way and all partners in a group will receive the same mark. *Collaboration involving more than three students, or between different groups, is not allowed. For help with your homework you may consult only the course instructors, teaching assistants, your homework partners (if you have any), your textbooks, the material that we post, and your class notes. You may not consult any other source.*

Homework submission: You must submit your assignments online through Crowdmark as *typed* PDF files, as described in detail on the first page of our homework

assignments. The PDF files that you submit must be clearly legible. To this end, we encourage you to learn and use the LaTeX typesetting system, which is designed to produce high-quality documents that contain mathematical notation. You can use other typesetting systems if you prefer, but *handwritten documents are not accepted*.

Late homework policy: Late assignment submissions are *not* accepted.

Missed homework policy: If you miss an assignment deadline because of a medical or serious personal emergency, you must fill out this [form](#) and e-mail it to csc263-2023-09@cs.toronto.edu as soon as possible. You should also complete an Absence Declaration on **ACORN** (as described [here](#)) when appropriate. Note that a student may submit at most one Absence Declaration per academic term (see all the details [here](#)). If you have already submitted this form once this term, then you must send us a [Verification of Illness or Injury form](#), a letter from your College Registrar, or other documentation as appropriate.

If we judge your reason for missing an assignment deadline to be valid, *and you miss at most two assignments during the term*, then we will use the average mark that you achieved in your other assignments as your mark for the missed one. For students who miss three or more assignments for a valid reason, requests will be considered on a case-by-case basis.

Homework marking: For each homework assignment, we may mark only a selected (but not preannounced) subset of the questions. In that event, the homework assignment will be marked out of the total weight of the selected questions.

Remarking policy: Before making a remarking request, you must read and understand the provided solutions and think carefully about your own solution. If, after doing so, you wish to submit a remarking request, you must fill this [form](#) and email it to csc263-2023-09@cs.toronto.edu no later than one week from the date the marked assignment or test was made available to the class. *Remarking requests made after this deadline will not be accepted.* Please note that:

1. Remarking requests of the type "yes, my solution is not quite correct, but you took off too many marks for this mistake" are not accepted: the marking scheme was decided and applied as uniformly as possible to all students.
2. A remarking request of an assignment or a test may cause the rechecking of all the assignment or test, and the overall mark may stay the same, increase, or decrease.
3. To discourage frivolous remarking requests we will apply the following rule: A remarking request that does not result in a mark increase causes a "demerit" to each of the student(s) who submitted the assignment/test in question. We will not consider remarking requests for an assignment/test submitted by a student who has accumulated three such demerits.

Missed midterm test policy: If you miss a midterm test due to a medical or other serious personal emergency, get in touch with your instructor immediately, fill out this [form](#) and e-mail it to csc263-2023-09@cs.toronto.edu as soon as possible. You should also complete an Absence Declaration on **ACORN** (as described [here](#)) when appropriate. Note that a student may submit at most one Absence Declaration per academic term (see all the details [here](#)). If you have already submitted this form once this term, then you must send us a [Verification of Illness or Injury form](#), a letter from your College Registrar, or other documentation as appropriate.

There will be no make-up midterm tests, but if we judge your reason for missing the test to be valid, we will use your final exam test mark to compute your mark for the missed midterm test.

Attendance in tutorials: Attendance in tutorials is as mandatory as attendance in lectures. In neither case is formal attendance actually taken. However, there will be new material that is presented only in tutorials and not discussed in the lectures for which you are responsible and in which you may be tested in assignments or tests.

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Course Forum

We will use [Piazza](#) as the platform for class announcements and discussions. This service is free to use, but requires registration.

To register, follow the link below and provide the access code provided in the initial email to students. Use your @mail.utoronto.ca or @utoronto.ca address as your Piazza email contact for this course. If you have privacy concerns about this, please see your course instructor to discuss alternatives. The bottom line is that we must be able to identify any individual on the forum as a student registered in the course; individuals for whom this is not the case can be removed from the class forum without warning.

The CSC263 Piazza page is: <https://piazza.com/utoronto.ca/fall2023/csc263>

The Piazza access code is provided in the initial email sent to CSC263 students via Quercus; it is also given in the "Course Links" handout posted in the "Course Handouts" module of Quercus.

Guidelines for posting on Piazza:

- Take the time to formulate your postings clearly.
- Be courteous in your communications.
- Your postings must abide by the [academic integrity policy](#) and the [homework collaboration policy](#). Postings asking for hints or offering hints on solutions to homework assignments violate these policies. So asking a question such as "I am using this method to solve this problem, am I on the right track?" violates the homework collaboration policy.
- Your postings can be made anonymously to other students (at your discretion), but not to the instructor.

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