CSCB63: Design and Analysis of Data Structures

# Course Description

Design, analysis, implementation and comparison of efficient data structures for common abstract data types. Priority queues: heaps and mergeable heaps. Dictionaries: balanced binary search trees, B-trees, hashing. Amortization: data structures for managing dynamic tables and disjoint sets. Data structures for representing graphs. Graph searches.

Exclusion: CSC263H, CSC265H, (CSCC78H)

Prerequisite: CSCB36 or (CSCB38H) & [cGPA of 2.75 or enrollment in a CSC subject POSt]

# General Information

Instructor: Dr. Anna Bretscher

Email: anna.bretscher@utoronto.ca

Office: IC493

Office Hours: Mondays 11:00-12:30, Friday 10:40-11:30 in office (Subject to change: check calendar)

Lectures: Wednesdays 3-4 pm Thursdays 9:10-11 am

# Term Work

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| Work | Percentage |
| Assignments (4) | 20% (5% each) |
| Term Tests (3) | 45% (15% each) |
| Final Exam | 35% |

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| Week | Week of | Topics | Wednesday Pre-Lecture | Thursday Pre-Lecture |
| 1 | Jan. 11 | Introduction: Worst Case Complexity | None | CLRS 3.1 |
| 2 | Jan. 18 | Balanced Trees (AVL) | None | Refresh your understanding of Binary Search Trees and Visualization of BSTS |
| 3 | Jan. 25 | AVL Trees Height and Augment. Interval Trees | None | None |
| 4 | Feb. 1 | Finish Interval Trees, Heaps, and Graph Search Algorithms | None | Chapter 6.1 – 6.4 |
| 5 | Feb. 8 | Graph Searches and Minimum Spanning Trees | Term Test Wednesday | If you have not had your tutorial, read the graph handout on the tutorials page |
| 6 | Feb. 15 | Proof of Prim’s, Dijkstra’s Algorithm, and Strongly Connected Components | Chapter 24.3: Practice Prim’s Algorithm | Chapter 22.5 and Review DFS: Make sure you understand! |
| 7 | Feb. 22 | Amortized Analysis | Chapter 17.4 and 21 | None |
| 8 | March 1 | Disjoint Sets and Fibonacci Heaps | Chapter 20 | None |

# Textbook

Algorithm Design: Foundations, Analysis, and Internet Examples.

* Michael Goodrich and Roberto Tamassia, John Wiley & Sons (2002), ISBN:0471383651.

Introduction to Algorithms (2nd edition).

* Cormen, Leiserson, Rivest, Stein McGraw-Hill (2001), ISBN:0070131511.

Free online access for U of T students:

http://main.library.utoronto.ca/eir/resources.cfm

# Student Conduct Expectations

As we all adjust to online classes and lectures, and increasingly participate in virtual learning environments, students are reminded of the expectation that we all demonstrate respect for one another. As outlined in the Student Code of Conduct, the University of Toronto does not condone discrimination or harassment against any persons or communities especially when based on grounds CSCB63 Winter 2021. Protected under the Ontario Human Rights Code. The University of Toronto recognizes its commitment to human rights, equity and inclusion and acknowledges the disproportionate impact COVID-19 has on various parts of our community. COVID-19 is not isolated to people of any particular ethnic origin, place of origin or race. Equity, diversity and respect must remain integral as we continue to transition during these challenging times. The institution will monitor and address discriminatory comments or behaviour including on U of T’s online platforms and classrooms.

**Safe Place to Learn** **- Show Respect:** All individuals (i.e., students, professors, guests) deserve to be treated with respect and need to be respectful to others. This means allowing for different opinions, waiting for your turn to talk, and making no abusive actions or comments towards anyone in the class.

**Confidentiality (no expiry date):** If someone shares a personal experience about him or herself, or others, please do not share details of the story that will identify the people involved. Also, please only share what you feel comfortable sharing during class discussions.

**Minimize Distractions:** During classes, email/texts should be discreetly and infrequently checked, if at all. Side chatter should be kept to a minimum.

Required Materials:

To participate in online discussions and conduct remote interviews, students will need the following materials:

* Phone
* Webcam
* Laptop/desktop/tablet
* Internet access
* Headphones (optional but recommended)
* Microphone (optional but recommended)

# Student Code of Conduct

In accordance with the Ontario Human Rights Code, no person shall engage in a course of vexatious

conduct that is directed at one or more specific individuals, and that is based on the race, ancestry,

place of origin, colour, ethnic origin, citizenship, sexual orientation, gender identity, gender

expression, age marital status, family status or disability. This includes:

* Racial slurs or “jokes”: insults due to racial identity
* Online posts of cartoons or pictures, in a workplace or school that degrade persons of a particular racial group
* Name-calling due to race, colour, citizenship, place of origin, ancestry, ethnic background or creed
* Pseudonyms or handles that are inappropriate about ancestry, colour, citizenship, ethnicity, place of origin, race, or religion

The University of Toronto’s Equity Offices remain available to students to provide support on equity issues that arise as a result of COVID-19. Students are encouraged to support one another and the CSCB63 Winter 2021 University’s commitment to human rights and our values of diversity, inclusion, and respect in managing any inappropriate comments or disruptive behaviours. If you experience or witness inappropriate comments or behaviours in your classes, you If you can, take and share a screenshot of the inappropriate content with your instructor so they can follow-up with you and address the conduct.