# THOMPSON RIVERS UNIVERSITY

**Department of Computing Science**
**Faculty of Science**

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**COURSE OUTLINE**
**COMP 2230-02**
**Data Structure, Algorithm Analysis, and Program Design (3,1,0)**
**Winter 2026**

**Instructor**: Shivani Tyagi
**Class Venue:** OM 1350
**Office hours:** By appointment **Office:** 406B Clock Tower

**Class Schedule**

1. 3 Lectures per week (50 minutes each) : Mondays, Wednesdays & Thursdays (6:00 PM - 6: 50 PM)
2. 1 Seminar per week (50 minutes) : Wednesday (7:00 PM - 7:50 PM)

**Recognized Holidays (No Classes)**

1. Feb 16 (Mon) – Family Day
2. Apr 3 (Fri) – Good Friday
3. Apr 6 (Mon) – Easter Monday

**Midterm Break:** Feb 17 – Feb 20
**Final Exam Window:** Apr 16 – Apr 29

**Course Description**

This course introduces students to fundamental methods of representing and organizing data in Computing Science. Students study, implement, and analyze core data structures such as lists, stacks, queues, trees, and graphs. Students learn about the design and implementation of algorithms using these data structures, along with evaluating their efficiency through time and space complexity analysis. Students also explore trade-offs among different data structures and algorithmic approaches to support effective program design and problem-solving.

**Educational Objectives/Outcomes**

Upon successful completion of the course, the student will demonstrate the ability to:

1. Identify problems that can be solved using common data structures.
2. Understand the basic operations of these data structures and how to implement them in Java.
3. Learn and understand sorting algorithms such as Bubble, Selection, Insertion, Merge, and Quick sort.
4. Understand searching methods including Linear search, Binary search, and Hash-based search.

5. Learn how to analyze the efficiency of searching and sorting algorithms using mathematical techniques.
6. Understand the programming techniques appropriate to developing middle-sized programs.

**Prerequisites:** A grade of C or better in COMP 1230 or COMP 1231 and MATH 1700 or MATH 1701

**Overview of Course Topics and Tentative Schedule**

| Week | Tentative Dates | Topics |
|---|---|---|
| 1 | Jan 12 – Jan 18 | Course Introduction, Algorithm Analysis (Big-O, Time & Space Complexity) |
| 2 | Jan 19 – Jan 25 | Introduction to Collections, Generics, Stacks |
| 3 | Jan 26 – Feb 1 | Linked Structures: Stacks (Implementation using Linked List) |
| 4 | Feb 2 – Feb 8 | Queues (Circular Queue, Applications) |
| **5** | **Feb 9 – Feb 15** | **Lists, ArrayList vs LinkedList, Iterators**<br>**Midterm 1 Week (No Assignment) – Review & Midterm 1 (Closed-book, Moodle)** |
| **6** | **Feb 16 – Feb 22** | **Mid Term Break** |
| 7 | Feb 23 – Mar 1 | Searching (Linear, Binary) and Sorting (Intro) |
| 8 | Mar 2 – Mar 8 | Sorting Algorithms (Bubble, Selection, Insertion, Merge, Quick), Efficiency Analysis |
| 9 | Mar 9 – Mar 15 | Trees, Binary Trees, Binary Search Trees (BST) |
| 10 | Mar 16 – Mar 22 | Heaps and Priority Queues, Applications |
| **11** | **Mar 23 – Mar 29** | **Midterm 2 Week (No Assignment) – Review & Midterm 2 (Closed-book, Moodle)**<br>**Industry UseCase Study : Around Data Structures & Usage** |

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|---|---|---|
| 12 | Mar 30 – Apr 5 | Hashing Applications (Hash Tables, Collision Handling) |
| 13 | Apr 6 – Apr 12 | Sets and Maps, Graphs (Intro, Representation, Traversal) |
| 14 | Apr 13 | Course Review and Final Exam Preparation |

**Lab Syllabus**

The lab sessions are designed to complement the lecture topics. In the labs, you will implement and practice the concepts and algorithms discussed during lectures. Each week, you will work on programming exercises that reinforce your understanding of data structures, algorithm analysis, and problem-solving techniques. The lab provides a hands-on environment to apply theory, experiment with different approaches, and gain practical programming experience.

**Grade Evaluation & Important Timelines**

You are responsible for the following deliverables, which will determine your course grade:

| Assessment Type | Note | Weight |
|---|---|---|
| Attendance | Class Attendance | 5% |
| Weekly worksheet x 10 | Open-book. Release on Mondays | 20% |
| Midterm 1 | Closed-book, Moodle timed-quiz, 40 minutes | 20% |
| Midterm 2 | Closed-book, Moodle timed-quiz, 40 minutes | 20% |
| Exam | Closed-book, 120 minutes | 35% |

The timelines for assignment & exams are as follows:

| Assessment | Date | Notes |
|---|---|---|
| Worksheet 1 | Jan 19 (Mon) – Jan 25 (Sun) | Covers Week 1 topics |
| Worksheet 2 | Jan 26 (Mon) – Feb 1 (Sun) | Covers Week 2 topics |
| Worksheet 3 | Feb 2 (Mon) – Feb 8 (Sun) | Covers Week 3 topics |
| **Midterm 1** | **Feb 12 (Thu)** | **Covers Weeks 1–4, Closed-book, Moodle timed quiz (40 min)** |

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|---|---|---|
| Worksheet 4 | Feb 23 (Mon) – Mar 1 (Sun) | Covers Week 5 topics |
| Worksheet 5 | Mar 2 (Mon) – Mar 8 (Sun) | Covers Week 7 topics |
| Worksheet 6 | Mar 9 (Mon) – Mar 15 (Sun) | Covers Week 8 topics |
| Worksheet 7 | Mar 16 (Mon) – Mar 22 (Sun) | Covers Week 9 topics |
| **Midterm 2** | **Mar 26 (Thu)** | **Covers Weeks 5–10, Closed-book, Moodle timed quiz (40 min)** |
| Worksheet 8 | Mar 30 (Mon) – Apr 5 (Sun) | Covers Week 10 topics |
| Worksheet 9 | Apr 6 (Mon) – Apr 12 (Sun) | Covers Week 12 topics |
| Worksheet 10 | Apr 13 (Mon) – Apr 19 (Sun) | Covers Week 13 topics |
| **Final Exam** | **Apr 16 – Apr 29 (1 day TBD)** | **Closed-book (120 min)** |

**Weekly assignments**

Every week, you will have a worksheet that is worth 2%. These low-stakes assignments consist of multiple choice questions and small exercises that help you consolidate your understanding of the materials and serve as a formative assessment.

The worksheet will be distributed via Moodle every Monday (except for midterms' weeks & the first week of the semester) and the deadline for each worksheet is the same Sunday of that week at 11:59 PM.

**Note: During the last class of each week (Thursday), the final 10 minutes will be dedicated to addressing any questions or doubts regarding the worksheet.**

**Use of Technology :** Java Interpreter via Github Codespaces & Moodle

**Communication**

1. For any course-related questions, such as lectures, assignments, exams, course logistics, please ask them under the discussion forum in Moodle.
2. For any individual-related questions, such as academic concession, deadline extension, personal circumstances, etc., please email me.
3. Response time: I will try our best to reply to your inquiries as soon as possible during the normal working hours (9AM-5PM Mon-Fri). If you send me a message outside of regular working hours, please expect a response on the next working day.

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## Attendance, late assignments, academic concessions, academic accomodation

### Attendance

A registered student who does not attend the first two events (e.g., lectures/labs/ etc.) of their course(s) and who has not made prior arrangements acceptable to the instructor(s) may, at the discretion of the instructor(s), be considered to have withdrawn from the course(s) and have their course registration(s) deleted.

Please refer to TRU's attendance policy. In addition, we will take attendance during class via Moodle.In the CS department, you need to get at least 75% attendance for passing any course.

### Academic concessions

If you encounter situations that may impede your ability to meet course requirements—such as illness, family emergencies, or other significant life events—please notify the instructor at least 24 hours before the deadline. Academic concessions, including extensions or alternative assessments, will be considered on a case-by-case basis. You may be required to provide documentation to support your request. Concession requests after the deadline has passed will likely be refused.

### Late Assignments

Assignments are expected to be submitted on time. Late submissions will incur a penalty of 25% per day, up to a maximum of 75%. After 3 days, late assignments will no longer be accepted and will receive a grade of zero. Extensions may be granted in exceptional circumstances, provided that you contact the instructor before the deadline.

### Accessibility

Students registered with the Accessibility Services who require accommodations must provide their Letter of Accommodation to the instructor as soon as possible. This letter will outline the necessary accommodations to ensure an equitable learning environment. Please ensure that this is done early in the term to facilitate timely arrangements.

### Policy on the use of generative AI

Please refer to TRU's guideline on the use of generative AI tools such as chatGPT or Copilot in this course. https://libguides.tru.ca/artificialintelligence