湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Data Structures and Algorithms
Course Code	CMPT 2141
Semester	Winter 2027
Course Length	4 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	CMPT 1011 Introduction to Computer Science

Course Description:

This course provides a rigorous introduction to the design, implementation, and analysis of data structures. Students will explore how to organize and manage data efficiently in computer memory to optimize algorithmic performance. Key concepts include the study of abstract data types (ADTs), their concrete implementations in a high-level programming language, and the mathematical evaluation of their efficiency using Big-O notation.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical thinking skills** – Students will engage in creative and/or innovative thinking, and/or inquiry, analysis, evaluation, synthesis of information, organizing concepts, and constructing solutions.
- **Communication skills** – Students will demonstrate effective written, oral, and visual communication.
- **Teamwork** – Students will demonstrate the ability to work effectively with others to support a shared purpose or goal and consider different points of view.
- **Social responsibility** – Students will demonstrate intercultural competency and civic knowledge by engaging effectively in local, regional, national, and global communities.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Identify and apply the most suitable data structures for specific computational problems;

- Architect and code complex data structures from the ground up, including linked lists, binary search trees, and hash tables;
- Quantify algorithm performance through time and space complexity analysis;
- Master the application of recursion and iterative methods in problem-solving.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:
Data Structures and Algorithms in Java, 6th Edition, by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser. Wiley.

Course Requirements:

Lab Exercises
Students are given a specific micro-problem related to the week's lecture. The goal is to ensure students can translate theoretical logic into bug-free code immediately after learning the concept.

Programming Assignments
These five major projects are the core of the practical curriculum. Unlike labs, these are large-scale and open-ended. Students must design a complete system (e.g., a file system simulator or a navigation router) choosing the appropriate data structures themselves. Evaluation focuses on code efficiency, memory management, and adherence to OOP principles.

Conceptual Quizzes
Students will take five short, unannounced quizzes throughout the semester. These quizzes focus on tracing algorithms, calculating Big-O complexity for specific code snippets, and comparing the theoretical efficiency of different data structures.

Midterm Examination
A two-part assessment conducted halfway through the semester:
The Written Part tests theoretical understanding of Big-O, recursion tracing, and data structure properties.
The Coding Part is a time-constrained programming test where students solve algorithmic problems in a controlled environment.

Final Examination
A cumulative written exam focusing on advanced topics such as balanced search trees, graph algorithms, and sorting lower bounds. It ensures that the student has retained the theoretical framework necessary for higher-level courses.

Assessments: Activity	**Percent Contribution**
Lab Exercises	15%
Programming Assignments	25%
Conceptual Quizzes	15%
Midterm Examination	20%
Final Examination	25%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	Percentage of available points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

CMPT 2141 Schedule

Lecture	Topic	Readings
L1	Course Overview & Java Review (Generics, Interfaces)	Ch. 1, 2
L2	Object-Oriented Design & Memory Management	Ch. 2
	Lab 1: Java OOP (Inheritance & Exceptions)	
L3	Algorithm Analysis & Big-O Notation	Ch. 4
L4	Linear Structures I: Arrays & Singly Linked Lists	Ch. 3
L5	Linear Structures II: Doubly Linked Lists & Circular Lists	Ch. 3
L6	Recursion Fundamentals & Analysis	Ch. 5
	Lab 2: Linked List Implementation	
L7	Stacks: ADT and Implementations	Ch. 6
L8	Queues & Deques: ADT and Applications	Ch. 6
L9	List ADT and Iterators	Ch. 7
L10	Trees I: General Trees & Binary Trees	Ch. 8
L11	Trees II: Tree Traversal Algorithms	Ch. 8
	Lab 3: Binary Tree Traversals	
L12	Priority Queues & Heaps	Ch. 9
L13	**Midterm Examination**	Lectures 1-12
L14	Maps, Dictionaries, and Hash Tables	Ch. 10
L15	Hash Functions & Collision Resolution	Ch. 10
L16	Binary Search Trees (BST)	Ch. 11
L17	Balanced Trees: AVL Trees	Ch. 11
L18	Sorting I: Bubble, Selection, Insertion Sort	Ch. 12
L19	Sorting II: Merge Sort & Quick Sort	Ch. 12
L20	Sorting III: Lower Bounds & Linear Time Sorts	Ch. 12
	Lab 4: Sorting & Algorithmic Efficiency	
L21	Graph I: Definitions & Representations (Adjacency Matrix/List)	Ch. 14
L22	Graph II: Traversals (BFS & DFS)	Ch. 14
L23	Graph III: Shortest Paths (Dijkstra's)	Ch. 14
L24	Advanced Topics: Dynamic Programming Intro	Handouts
L25	Final Review & Course Wrap-up	Review
	Final Examination	Cumulative

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for

requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.