CS0445 Data Structures (Fall 2025)

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Section 1: Tuesday, 13:50 – 16:25, S109

Office Hours:

Tuesday 9:00 – 12:00, N524.

Wednesday 9:00 - 12:00, N524.

Please send an email to schedule a meeting.

Course Description:

This course focuses on basic abstract data types (ADTs) in Computer Science. Participants will gain proficiency in using the Java programming language to implement these ADTs and associated algorithms. The focus extends to problem-solving techniques for tasks like data searching and sorting. Besides, participants will comprehend the complexity of basic algorithms without direct implementation, for selecting appropriate algorithms or ADTs to efficiently address computational tasks.

Course Objectives:

- Mastering ADTs: Develop a comprehensive understanding of essential ADTs and their role in solving computational problems.
- Java Programming Proficiency: Acquire proficiency in using the Java programming language to implement ADTs and associated algorithms.
- Problem-Solving Skills: Train problem-solving skills by solving tasks related to data searching, sorting, and other computational challenges.
- Algorithmic Complexity Awareness: Gain insight into the theoretical complexities of basic algorithms, enabling informed algorithm selection for optimal computational efficiency.

Prerequisites:

CMPINF0401 Intermediate Programming.

Textbook:

Goodrich, Michael T., Roberto Tamassia, and Michael H. Goldwasser. *Data structures and algorithms in Java (6th Edition)*. Wiley, 2014.

In general, we suggest focusing on lecture slides as they are refined materials.

Assessment:

Attendance	10%
Assignments	50%
Final exam	40%

List of Topics:
- Java Basics; References, Pointers and Memory; Java OOP.
- Asymptotic Analysis.
- Arrays; Lists; Sets; Linked Lists.
- Recursion.
- Stacks; Queues.
- Insertion Sort; Selection Sort; Merge Sort; Quick Sort; Bucket Sort; Radix Sort.
- Priority Queues; Heaps.
- Maps; Hash Tables.
- Trees Basics; Binary Search Tree; AVL Tree; Skip Lists.
- Graph Basics; Graph Traversal.

Mitigating Circumstances:

If you have a medical situation or any personal circumstances that substantially affect your study or exam. You are encouraged to contact the department or the instructor as soon as possible. With valid proof, mitigation may be applied when assessing your assignments or exam sheets.

Course Policies:
- Please regularly check the announcements or the emails from Blackboard.
- We can not assure instant respond to emails, we suggest bring urgent questions to face-to-face sessions.
- Google skill is one of the most important skills in Computer Science study, try Google your questions first.
- Treat ChatGPT as an auxiliary tool only. Use your brain first because it is much more powerful.
- Zero-tolerance to both two persons in plagiarism. This year more checks will be done to detect plagiarism.
- Late submissions cause penalties, unless due to approved mitigating circumstances, prior to the deadline.
- Students with documented emergencies, after careful evaluation, may jump directly to the make-up exam.
- All course materials or any recordings are for your personal use and for educational purposes only.

Learning Outcomes:
- Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- Apply computer science theory and software development fundamentals to produce computing-based solutions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.