Course program and reading list

Semester 1 Year 2024

School: Efi Arazi School of Computer Science M.Sc.

Advanced Data Sructures

Lecturer:

Prof. Shay Mozes smozes@runi.ac.il

Teaching Assistant:

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Course No.:	Course Type :	Weekly Hours :	Credit:
3581	Elective	3	3

Course Requirements :	Group Code :	Language:
Final Paper	241358101	Hebrew

Prerequisites

Prerequisite:

52 - Calculus I
53 - Calculus II
54 - Linear Algebra I
55 - Linear Algebra II
56 - Discrete Mathematics
59 - Data Structures
69 - Logic And Set Theory
77 - Algorithms
417 - Introduction To Computer Science

Course Description

This is a theoretical class on data structures intended for students who already took the basic data structures and algorithms classes. The class emphasizes design and analysis of data structures with good worst case behavior. Topics may include: amortized analysis, integers (predecessor search, sorting), heaps (binomial, Fibonacci), hashing (perfect, universal), self-adjusting data structures (lists, splay trees), search trees, dynamic trees (link-cut trees), dynamic graphs (connectivity), string matching (tries, suffix trees/arrays), range-minimum queries, least common ancestor.

This is a graduate level class. Mathematical maturity is assumed, and students will be required to fill in some details on their own based on principles learned in class.

Homework will include up to 6 theoretical problem sets, to be handed in individually.

Course Goals

This class will expose students in detail to data structures and techniques that are not covered in the basic data structures course. Another important goal is to enhance the analysis and formal argument skills of the students.

Grading

final quiz (online) - 40%
homework - 40%
lecture notes - 20%

Learning Outcomes

The students will be able to choose or design appropriate data structures for given problems.

The students will be able to formally analyze sophisticated data structures

Lecturer Office Hours

Thursdays 14:30-15:30 or by appointment

Reading List

The course does not follow a single book. Some of the material appears in Introduction to algorithms / Cormen, Leiserson, Rivest and Stein (3/4th edition), MIT press. For some of the topics references to the relevant papers will be supplied.