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

Advanced Algorithms

Lecturer:
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Teaching Assistant:
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Course No.: 3501  Course Type: Lecture  Weekly Hours: 3  Credit: 4

Course Requirements: Final Exam  Group Code: 221350101  Language: 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

An advanced course intended mainly for M.Sc. students. The course will cover a range of topics relating to algorithm design and analysis. The focus is more on breadth rather than on depth. As such we will cover many subjects that will give the students a taste of advanced algorithmic techniques and approaches to solving problems algorithmically. Subjects covered include reviewing basic techniques such as greedy algorithms, divide and conquer, and dynamic programming; approximation algorithms for NP-hard problems, parameterized complexity, linear programming, randomized algorithms, online algorithms, algorithmic game theory, and more. Most techniques will be demonstrated on real-world applications, such as scheduling, network routing and utilization, and facility location.

Course Goals

The goal of this course is to introduce the students to various algorithmic techniques for solving problems, and to strengthen the students' ability to design, analyze and argue formally about algorithms.

Grading

The grade is composed of 25% homework assignments (5 problem sets) and 75% final written exam.

All the HW assignments are considered when calculating the HW grade.

To pass the course, a student must receive passing grade (60 and above) in the exam and in at least 3 problem sets.

Lecturer Office Hours

Mondays 17:00-18:00

Additional Notes

Homework collaboration policy:

You should first try to solve the problem set on your own.

Collaboration in groups of 2-3 students is encouraged, but limited to oral discussions. You may use other material such as books and online resources. Do not use solutions from past years or from the web.
After consulting with your friends / other resources, write down your solution on your own, without using any written/dictated/recorded material.

If you really understand the problem, you should be able to write the solution on your own.

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**Reading List**

Most of the course stuff will be available in the Moodle page.

**Books:** There is no single book that covers the whole material.

Recommended books are:

- *Introduction to Algorithms*, by T. Cormen, C. Leiserson and R. Rivest. MIT Press, 1990 (There exists a new edition, by the same authors + C. Stein.). Both editions are suitable for the course. The translation of this book by the Open University is also good.
- *Algorithm Design* by Jon Kleinberg and Éva Tardos.
- *Scheduling Algorithms* by Peter Brucker.
- *Linear Programming* by Vasek Chvatal
- *Algorithmic Game Theory* by N. Nisan, T. Roughgarden, E. Tardos, and V. Vazirani