



Course program and reading list

Semester 2 Year 2024

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

Algorithmic Game Theory

Lecturer:

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Course No.:	Course Type :	Weekly Hours :	Credit:
3987	Elective	3	3

Course Requirements :	Group Code :	Language:
Final Exam	242398701	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
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Course Description

Algorithmic game theory (AGT) is an area in the intersection of game theory and computer science, with the objective of understanding and design of algorithms in strategic environments. Unlike traditional algorithms, in which a centralized authority determines the output, in a game, the players, who are usually the users of the system, determine the output together, each acting in a selfish way, trying to optimize its own objective. The players may have varying degrees of collaboration and competition.

The course will cover the classical topics in AGT, and will focus on problems arising due to the complex interaction of many economic agents (such as network operators, service providers, designers, users, etc.). These topics include:

Mechanism Design: How to design systems with strategic participants that have good performance guarantees.

Complexity of Equilibria: How do strategic players reach an equilibrium (if at all)?

Equilibrium inefficiency: What is the cost of selfish behavior?

We will study the above problems as they arise in modern applications such as webpage advertising, online auctions, network and traffic routing, resource allocation systems, social networks, and more.



Course Goals

To familiarise students with formal methods for analyzing strategic interaction in modern systems.

Fun.



Grading

5 homework assignments: 25%

Final exam: 75%



Reading List

Recommended (non mandatory) books:

Nisan, Roughgarden, Tardos and Vazirani (eds), Algorithmic Game Theory.

Tim Roughgarden, Twenty Lectures on Algorithmic Game Theory, Cambridge University Press.