

Course program and reading list
Semester 2 Year 2022

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

Automata and Games

Lecturer:
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Course No.: 3589  Course Type: Elective  Weekly Hours: 3  Credit: 3

Course Requirements: Group Code: 222358900  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
417 - Introduction To Computer Science
643 - Automata And Formal Languages
Course Description

The course will provide general background on automata and games and will focus on automata and games that run indefinitely.

It will include the following topics.

Automata:
We will study on the different aspects of automata over infinite objects: automata over words and over trees, deterministic, nondeterministic, and alternating automata, the various acceptance conditions (such as parity and Rabin), and more.
We shall analyze the pros and cons of each type, study algorithms for performing operations on automata, such as union and complementation, and study algorithms for translating between the different types.
We shall also look into the connection between automata and logic, as well as the connection between automata and games.

Games:
We shall overview the different aspects of game theory: zero-sum games vs. win-win games, two-player vs. multiple-player games, finite and infinite games, stochastic games, winning conditions, strategies, winning strategies, determinacy, strategy memory, perfect and imperfect information, and more.
We shall concentrate on zero-sum two-player infinite games, on which we will study on various winning conditions, such as reachability and parity, determinacy, and algorithms for finding winning strategies.

Course Goals

Acquire understanding of automata and games, and how to use them in various fields of computer science, mathematics, and other areas disciplines.

Grading

Grade

80% the exam and 20% the exercises.

For passing the course, one should have at least 60 in the exam and at least 60 in the final grade.

Exercises

There will be 6 exercises, some of which to be submitted in pairs.
The exercises' grade will be the average of the best 5 exercises.
For attending the exam, the student should submit at least 3 exercises.
Lecturer Office Hours

TBD

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Reading List

Automata, Logics, and Infinite Games: A Guide to Current Research
by Erich Grädel, Wolfgang Thomas, and Thomas Wilke