Syllabus for the course

Applied Algorithms

Prof. Tami Tamir

The goal of this course is to help you become better prepared to tackle algorithm design for "real-world" problems. This includes (1) being familiar with fundamental resource-allocation problems and solutions, (2) understanding algorithmic techniques and the tradeoffs involved in designing correct, efficient, and implementable algorithms, (3) understanding challenges in algorithm design for selfish users, and (4) knowing how to model and abstract messy real-world problems into clean problems that can be attacked using known paradigms or specific algorithms.

Hopefully, you will gain a greater appreciation of the beauty and elegance of algorithms as well as where they are used in the real world. Specifically, we will study problems arising in production planning, operating systems, media-on-demand systems, networks, and more.

Pre-requests: undergrad course in algorithms, data structures.

Course Grading Method: 3 homework assignments: 30%, final exam: 70%

Tentative list of topics :

- Introduction and Review: Graphs, Complexity classes.
- Stable matching.
- Scheduling Theory.
- Facility Location.
- Packing Problems.
- Algorithmic Game Theory.

Books: There is no single text book that covers the whole material.
Recommended books are:

- *Introduction to Algorithms*, by T. Cormen, C. Leiserson, R. Rivest and C. Stein. MIT Press. (All editions are fine, as well as the Hebrew translation by the Open University).
- *Algorithm Design* by Jon Kleinberg and Éva Tardos.
- *Combinatorial Optimization. Algorithms and Complexity*, by C. H. Papadimitriou and K. Steiglitz.
- *Scheduling: Theory, Algorithms, and Systems*, by Michael Pinedo.
- *Scheduling Algorithms* by Peter Brucker.
- *Algorithmic Game Theory* by N. Nisan, T. Roughgarden, E. Tardos, and V. Vazirani