Course program and reading list
Semester 1 Year 2023

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

Algorithms for Planar Graphs

Lecturer:
Prof. Shay Mozes  smozes@runi.ac.il

Teaching Assistant:
Prof. Shay Mozes  smozes@runi.ac.il

<table>
<thead>
<tr>
<th>Course No.:</th>
<th>Course Type :</th>
<th>Weekly Hours :</th>
<th>Credit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3558</td>
<td>Elective</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Course Requirements:
Final Exam

Group Code : 232355800
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

A graph is planar if it can be drawn on a piece of paper such that edges do not cross. Planar graphs occur in diverse fields such as route planning (think Google maps or Waze), computer vision and computer chip design (VLSI), to name just a few. In this advanced theory-oriented class we will investigate structural properties of planar graphs such as planar duality, non-crossing and Monge properties, and the existence of small separators. We will exploit these properties to design efficient algorithms for various optimization problems including shortest paths, maximum flow, vertex cover, and the traveling salesman problem. The course is intended for MSc students and advanced BSc students who are interested in the design and analysis of algorithms and data structures. Parts of the material covered are classical, while others represent the state-of-the-art in current research on the topic.

Course Goals

The course is intended to bring students to master the topic of algorithms for planar graphs at a level that will allow them to read current literature and get involved in research in the field.

Another goal of the class is to introduce, by way of example, the use of structural mathematical properties for the design of efficient algorithms.

Grading

25% problem sets (5-6 theoretical problem sets throughout the semester)

70% final exam

5% class participation

Lecturer Office Hours

Thursdays after class, or by appointment.

Reading List

The course is accompanied by a draft of a text book Optimization Algorithms for Planar Graphs by Klein and Mozes, freely available at www.planarity.org

Videos of past offerings of this class are available at https://cs.runi.ac.il/~smozes/teaching.html