

Introduction to Computer Science 2

Syllabus 2023 Spring

1. (February 27.) Fundamental notions of graph theory: graph, simple graph, degree, subgraph, complement, isomorphism, directed graph.
2. (March 6.) Fundamental notions of graph theory, cont'd: walk, trail, path, connected graph, (connected) component, tree, spanning tree.
3. (March 13.) Euler trails and circuits, necessary and sufficient condition for their existence. Hamilton paths and cycles, necessary and (separate) sufficient conditions for their existence.
4. (March 20.) Bipartite graphs, their characterisation. Vertex coloring, lower and upper bounds on the chromatic number, greedy coloring.
5. (March 27.) Zykov's construction. Interval graphs, their coloring. BFS algorithm.
6. (April 3.) Matchings, independent vertices, vertex- and edge cover, their relations. Gallai's theorems.
No class on April 10.
7. (April 17.) Matchings (cont'd), algorithm in bipartite graphs. Theorems of König, Hall and Frobenius.
8. (April 24.) Edge-chromatic number, theorems of Vizing, König and Shannon. Minimum weight spanning trees, Kruskal's algorithm.
No class on May 1, but:
9. (**May 5.**, 8), May 8. Flows in networks, *st*-cut, augmenting path algorithm. Max flow-mincut theorem. Edmonds-Karp theorem. Generalisations.
10. (May 15.) Menger's theorems. Higher connectivity of graphs.
11. (May 22.) Shortest paths, the Bellman-Ford algorithm.
No class on May 29.