ÇANKAYA UNIVERSITY

Department of Industrial Engineering

Fall, 2024

IE 508 - Graph Theory with Applications

(3 0 3 credits – 7.5 ECTS)

Course Definition:

Basics of graph theory. Directed and undirected graphs, and subgraphs. Shortest paths and spanning trees. Solution techniques for maximum flow and minimal cost flow problems. Multi-commodity networks and graph representations. Network simplex algorithm. Applications in scheduling and sequencing.

	Instructor
	Dr. Ahmet KABARCIK
E-mail:	a.kabarcik@cankaya.edu.tr
Office:	Main Campus, L – 323
Office hours:	TBA

Classroom for the lectures:	Balgat Campus, A – 304
Lecture hours:	Thursday, 18:00 – 20:50

Course Outline:

Week	Topic(s)
1	Introduction of graph theory
2	Minimum spanning tree; Prim Algorithm, Kruskal Algorithm, Sollin Algorithm
3	Shortest path problems; Bellman Algorithm, Moore-Dijkstra Algorithm, Floyd Algorithm. Maximum path problem.
4	Maximum flow problem
5	Transportation problems; *i)* initial solution; North-West Method, Minimum Cost Method, VAM method. *ii)* Optimality test
6	Transportation problem; Minimum Cost Method, Buffer Stock Method.
7	Assignment problems; Generalized Assignment Method, Hungarian Method
8	Minimum Cost Network Flow
9	Network Simplex Method, Capacitated Network Simplex Method.
10	Multi-commodity networks and graph representation
11	Project networks; CPM, PERT.
12	Matching and covering. Euler Graph; *i)* Euler Tour and Fleury Algorithm, *ii)* Directed and Undirected Postman Problems *iii)* Mixed Postman Problem
13	Travelling Salesman Problems
14	Vehicle Routing Problems

Textbooks

- Ravindra K Ahuja, Thomas L Magnanti, James B Orlin, "Network Flows: Theory, Algorithms, and Applications", Prentice Hall, 1993, 978-0136175490
- James R. Evans, Edward Mineka, "Optimization Algorithms for Networks and Graphs", Marcel Dekker, 1992, 978-0824786021

Grading:

Homeworks:	30% (3 hws)
Midterm:	30%
Final:	40%
Total:	**100%**

Policy on Homework and Exams:

Cheating in homeworks and exams has serious consequences. Therefore, all work submitted should reflect your honest effort.

- All the announcements will be posted on webonline.cankaya.edu.tr

- **Not attending both the Final Exam and Midterm Exam without a valid excuse might lead to an "NA" grade.**

- **NOTE THAT EVERYTHING ON THIS SYLLABUS IS SUBJECT TO CHANGE. STUDENTS WILL BENOTED ABOUT SIGNIFICANT CHANGES.**