

ÇANKAYA UNIVERSITY
Department of Industrial Engineering
Fall, 2024
IE 454
An Introduction to Combinatorial Analysis
(3+0+3 credits, 5 ECTS)

Catalogue Description. Introduction to combinatorial analysis; review of some basic counting rules; recurrence relations; generating functions; introduction to graph theory; search types; dynamic programming, Eulerian and Hamiltonian paths and circuits; Chinese postman and street sweeping problems; traveling salesperson problem; Steiner trees; assembly line balancing.

Course Objectives. This course aims to provide students with a fundamental understanding of combinatorial analysis, with a focus on counting, arranging, and analyzing discrete objects and structures. By the end of the course, students will be able to acquire a solid grasp of combinatorial analysis, enabling them to tackle a wide range of mathematical and computational challenges in various disciplines.

Course Outline: The following topics will be covered

Weeks	Title
1	Introduction to combinatorial analysis
2	Basic counting rules: The sum and product rules
3	Basic counting rules: pigeonhole principle, permutation, combination
4	Basic counting rules: occupancy problems
5	Recurrence relations
6	Generating functions
7	Introduction to graph theory
8	Types of search algorithms/procedures
9	Optimization methods: dynamic programming
10	Eulerian and Hamiltonian paths and circuits
11	Chinese postman and street sweeping problems
12	Traveling salesman problem
13	Steiner trees
14	Assembly line balancing

Instructor	
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Office Hours:	TBA
Mode of Education:	TBA

Grading

HomeWorks	20 % (2 HWs)
Attendance	10%
Midterm	30 %
Final	40 %
Total:	100 %

Note that the instructor reserves the right to modify these percentages in case he finds it necessary.

Textbook:

- K.H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill, 2019.

Reference Books:

- Miklos Bona (2006), A Walk Through Combinatorics An Introduction to Enumeration and Graph Theory, 2nd edition, World Scientific Publishing.
- Douglas. B. West (2001), Introduction to Graph Theory,

Policy on Home works and Exams:

Cheating on homework and exams will have serious consequences. Therefore, all work submitted should reflect your honest effort. In this course, homework assignments and project will play a crucial role in ensuring students from understanding of the material that they have learned in lectures. In doing homework, it is suggested that the students should work in **teams**. The limit for the number of members in a team will be announced later.

All examinations will be based on lectures, tutorials, and labs. To pass these exams students will need to have studied the material well in advance in order to understand the concepts, procedures, and techniques. To discourage last-minute cramming, the instructor and the assistants will not answer any questions from students on the day of an examination.

The instructor has the right to make changes to this syllabus.