TED University

Department of Mathematics

2022-2023 Spring Semester

MATH 401 – Graph Theory

Syllabus

Credit Hours: **(3+0+0) 3 TEDU Credits, 6 ECTS Credits**

Pre-requisites: **MATH 401**

Course Description

The types of graphs and basic definitions, Path and loops. Enumeration. Connectivity. Traversability. Planar graphs. Euler Formula, dual graph. Coloring. Matrices of graphs. Graphs and groups

Instructor

Niyazi Anıl GEZER

Primary Contact: niyazi.gezer@tedu.edu.tr

Office: B355

Supplementary Books

- *Graph Theory: A Problem Oriented Approach, by D.A. Marcus*
- *A First Course in Graph Theory, by G. Chartrand and P. Zhang*

Grading

Every student will get an overall score out of a total of 100 points according to the grading scheme given below.

Midterm Exam 1: 20% (April 28, 2023; during the Lecture Hours)
Midterm Exam 2: 20% (May 19, 2023; during the Lecture Hours)
Final Exam: 35%
Homework Assignment: 15%
Active Learning Exercises: 2% x 5 = 10%

Learning Outcomes

Upon successful completion of this course, students will be able to:
1. Define the basic concepts of graphs, directed graphs, and weighted graphs.

2. Define the properties of bipartite graphs, trees, and spanning trees.

3. Apply Dijkstra's algorithm and express other related algorithms

4. Explain 4-colour problem, colorings, planar graphs, and related theories

5. Understand Eulerian and Hamiltonian graphs

6. Apply matrix methods to graphs

7. Determine Cayley and Schreier graphs

8. Uses group theoretical notions to obtain graphs

Student Workload (200 hours)

Activities	Number	Duration (hour)	Total Work Load
Lectures	14	3	42
Course Readings	14	2	28
Active Learning Exercises (Study duration)	5	5	25
Homework (Study duration)	1	11	11
Midterm Exams (Study duration)	2	12	24
Final Exam (Study duration)	1	20	20

Midterm and Final Exams

Throughout the semester there will be two midterm exams and one final exam.

Homework

Throughout the semester there will be one homework assignment. No make-up will be given for the homework assignment.

Active Learning Exercises

Throughout the semester you will have 5 active learning exercises. These exercises will help you learn the course material actively and collaboratively.

Course Outline

The course outline is given below. This outline is tentative and will be adapted to the pace of the class in agreement with the students. Any changes will be announced either in the classroom or via e-mail.

Week 1	Basic Concepts of Graphs	
Week 2	Directed, Undirected, and Simple Graphs; Multigraphs	
Week 3	Bipartite Graphs; Trees and Forests	
Week 4	Spanning Tree Algorithms, Dijkstra's Algorithm	ALE1
Week 5	Euler Paths	
Week 6	Hamilton Paths and Cycles	ALE 2
Week 7	Vertex and Edge Coloring	
Week 8	Matrix Theory	ALE 3
Week 9	Eigenvalues of Graphs	
Week 10	Basic Concepts of Groups	

Week 11	Group Actions; Cayley and Schreier graphs	ALE 4
Week 12	Simplicial complexes, Clique Complex of a Graph, Simplicial Actions of Groups	Homework
Week 13	Graph Homomorphisms	
Week 14	Doubly Infinite Path Spaces of Graphs	ALE 5

Calculator Policy

Students are not allowed to use calculators in the exams.

Make-up Policy

Students having formal health report and permission/duty for a university's activity may take makeup for exams. No make-up will be given for homework assignments. There will not be make-up for a make-up exam.

Principles of Academic Integrity
(Can be found on the webpage https://student.tedu.edu.tr/en/student/principles-of-academic-integrity)

TED University upholds open-mindedness and diversity of ideas as essential to the foundation and development of an academic community. In this regard, students are encouraged to discuss their courses, research, and assignments with their instructors and classmates. These discussions and exchanges of ideas are the core elements of academic life. Endeavored by this freedom they had, members of the academic community trust each other and work in collaboration. To maintain the ongoing viability of this academic environment and to safeguard the proper use of resources, ideas, and knowledge, TED University has adopted the academic integrity policies as given below.

Any type of academic dishonesty (during exams or on assignments, projects, etc.) is not tolerated and is strongly condemned by TED University. Academic frauds include, but are not limited to, the following

- **Cheating** (deliberately using or attempting to use course materials or auxiliary equipment not allowed during an exam, etc.)
- **Fabrication** (deliberate falsification of data, information, or citations.)
- **Aiding and abetting** (helping someone in an act or attempt of deliberate academic dishonesty)
- **Plagiarism** (using an author's words or ideas as one's own)

Cheating

Cheating has a very broad description which can be summarized as "acting dishonestly". Some of the things that can be considered cheating are the following: copying answers on exams, homework, and lab work, using prohibited material on exams, lying to gain any advantage in class, and providing false, modified, or forged data in a report, plagiarizing, modifying graded material to be re-graded, causing harm to colleagues by distributing false information about an exam, homework or lab. Cheating is a serious offense and will be penalized by the university disciplinary committee.

Plagiarism

All the following are considered plagiarism:
- Turning in someone else's work as your own
- Copying words or ideas from someone else without giving credit
- Failing to put a quotation in quotation marks
- Giving incorrect information about the source of a quotation
- Changing words but copying the sentence structure of a source without giving credit
- Copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not

Plagiarism is a serious offense and will be penalized by the university disciplinary committee. The best way to avoid accidentally plagiarizing is to work on your own before you ask for the help of other resources.

STUDENT SERVICES INFO:

o **Student Development and Psychological Counseling Center:**
The Center is a service mandated for providing crisis intervention and supportive listening services to the campus community. A major part of fulfilling that mandate is raising awareness of our service so students know they are never alone in dealing with problems. You may contact the SDPCC at: ogrencidanismamerkezi@tedu.edu.tr, 0312 585 0316, Office A122, or visit their website at http://csc.tedu.edu.tr/

o **TEDU COPeS - Psycho-Social Support**
TED University Psychosocial Support Team was initially established in order to facilitate coping with the psychological, social, familial, academic, and professional difficulties that may arise due to adverse conditions associated with the COVID-19 pandemic for TEDU students and employees.
In time we have expanded our services to provide psychosocial support in diverse disasters. In this line, TEDU COPeS offers psychosocial support for TED University students and employees in the aftermath of Kahramanmaraş earthquakes.
For further information and/or questions, visit their website at https://copes.tedu.edu.tr/

o **Specialized Support and Students with Disabilities**
Students who may require specialized support due to a disability affecting mobility, vision, hearing, learning, mental or physical health should consult with Specialized Support and Disability Coordinator, Asst. Prof. Emrah Keser E-mail: emrah.keser@tedu.edu.tr, or visit the website at https://www.tedu.edu.tr/tr/main/engelsiz-tedu