King Fahd University of Petroleum & Minerals

Department of Mathematics

Math 467: Graph Theory

Semester 222

Prof. Jawad Abuihlail

Description: Graphs and digraphs. Degree sequences, paths, cycles, cut-vertices, and blocks. Eulerian graphs and digraphs. Trees, incidence matrix, cut-matrix, circuit matrix and adjacency matrix. Orthogonality relation. Decomposition, Euler formula, planar and nonplanar graphs. Menger's theorem. Hamiltonian graphs.

Prerequisite: MATH 208 *or* MATH 225 *or* MATH 302

Textbook: G. Chartrand, L. Lesniak and P. Zhang, Graphs & Digraphs, Chapman and Hall/CRC; 5th edition (2011).

Further Reading: Douglas West, Introduction to Graph Theory, Pearson; 2nd edition (2002).

Grading Policy: We will follow the **Inquiry-Based Learning** (project-based):

Midterm Exam	Projects	Quizzes	Homework	Final Exam
25%	25%	10%	5%	35%
Week 9	Week 15			TBA

Objectives:

1. To introduce students to basic topics in graph theory
2. To use graph theory in solving real world problems; such as problems in network and scheduling.

Learning Outcomes:

Upon completion of this course, students should be able to

1. Define and describe basic concepts and graph theory terminology: induced subgraphs, cliques, matchings, covers in graphs, graph coloring.
2. Recognize different families of graphs and their properties such as Hamiltonian, Eulerian and planar Graphs.
3. Describe automorphism groups and different types of graph matrices and their use.
4. Solve problems involving vertex and edge connectivity, planarity and crossing numbers.
5. Construct spanning trees, matching, and different matrices.
6. Apply different proof techniques in theorems and exercises.
7. Apply Graph theory to model and solve real world problems and networks

Syllabus

Week(s)	Chapter	Topic
1, 2 & 3	1	Introduction to Grpahs
4 & 5	2	Trees and connectivity
6 & 7	3	Eulerian and Hamiltonian graphs
Sunday, MARCH 12th, 2023: Midterm Exam		
8 & 9	4	Diagraphs
10 & 11	5	Graphs: History and Symmetry
12 & 13	6	Planar Graphs
14 & 15	10	Matching, Factorization and Domination
		Presentations/Defence of Projects

Cheating in Exams: Cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will be reported to the higher university administration.

Cheating in exams includes (but is not limited to):

➢ looking at the papers of other students

➢ talking to other students

➢ using mobiles or any other electronic devices.

Exam Issues:

- No student will be allowed to take the exam if not having his/her KFUPM ID or National/Iqama ID .
- Students are not allowed to carry mobiles, smart watches, or electronic devices to the exam halls/rooms
- Missing an Exam: In case a student misses an exam (midterm or the Final Exam) for a legitimate reason (such as medical emergencies), he/she must bring an official excuse from Students Affairs. Otherwise, he/she will get zero in the missed exam.

Attendance: Students are expected to attend all lecture classes.

➢ If a student misses a class, he/she is responsible for any announcement made in that class.

➢ A DN grade will be awarded to any student who accumulates more than 20% (09) unexcused absences or 33% (15) excused and unexcused absences.

Note: The student will be warned twice by his instructor before he/she is assigned a DN grade

The Usage of Mobiles in Class: Students are not allowed to use mobiles for any purpose during class time. Students who want to use electronic devices to take notes must take permission from their instructor. Violations of these rules will result in a penalty decided by the instructor.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin.