MATH 454 – Graph Theory

Course Description from Bulletin: Graph Theory is the study of mathematical structures underlying the ubiquitous network models occurring in computer science, machine learning and optimization, electrical and computer engineering, physics, chemistry, and social networks. This course lays a rigorous foundation in graph theory through existential and algorithmic problems, structural and extremal results, and applications to science and engineering. Topics include trees, matchings, connectivity, planarity, and coloring. Credit will not be granted for both MATH 553 and MATH 454. (3-0-3)

Enrollment: Students majoring in Applied Mathematics, Computer Science, Data Science, Electrical Engineering, and other majors.

Textbook(s): West, *Introduction to Graph Theory,* 2nd ed., Prentice Hall.

Prerequisites: MATH 230 and (MATH 251 or MATH 252).

Objectives:
1. Students will achieve command of the fundamental definitions and concepts of graph theory.
2. Students will understand and apply the core theorems and algorithms, generating examples as needed, and asking the next natural question.
3. Students will achieve proficiency in writing proofs, including those using basic graph theory proof techniques such as bijections, minimal counterexamples, and loaded induction.
4. Students will work on clearly expressing mathematical arguments, in discussions and in their writing.
5. Students will become familiar with the major viewpoints and goals of graph theory: classification, extremality, optimization and sharpness, algorithms, and duality.

Lecture schedule: Three 50 minute (or two 75 minute) lectures per week

Course Outline:

	Hours
1. Fundamentals	6
2. Trees	6
3. Matchings	6
4. Connectivity and Network Flow	6
5. Coloring	6
6. Planarity	6

Assessment:

Homework	10-50%
Quizzes/Exams	20-50%
Final Exam	30-50%

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