

Course Outline — SPRING 2009

MATH 412

INTRODUCTION TO GRAPH THEORY

Sections X13 and X14: 12 noon MWF, 243 Altgeld Hall

Instructor: A. Kostochka, 234 Illini Hall, 265-8037, kostochk@math.uiuc.edu

Office hours: tentatively MWF 3–4

Web page: <http://www.math.uiuc.edu/~kostochk/math312>

Final Exam: 7:00 - 10:00 PM, Wednesday, May 13

TEXT: **Introduction to Graph Theory**, D. West (Prentice Hall), Second Edition, Chapters 1–7.

This is a serious introductory course about properties and applications of graphs. We study graph-theoretic concepts such as paths, Eulerian circuits, trees, distance, matchings, connectivity, network flows, colorings, planarity, and spanning cycles. A primary goal is to improve students' clarity of thought and language when writing proofs in discrete mathematics.

Famous applications include the *Minimum Connector Problem* (building roads at minimum cost), the *Assignment Problem* (filling n jobs in the best way), the *Committee Scheduling Problem* (using the fewest time slots), the *Four Color Problem* (coloring maps with four colors so that adjacent regions have different colors), and the *Traveling Salesman Problem* (visiting n cities with minimum cost).

REQUIREMENTS: Weekly problem sets (20 points) require 5 from a choice of 6 problems; graduate students registered for 1 unit do all 6 problems. The ten highest homework grades count. There are 6 short quizzes. There are three tests plus a final examination. There will be only one make-up test for all three tests.

Weighting: homework 200 points, quizzes 30 points, tests 100+100+100 points, final exam 200 points, total 730 points. The homework provides practice finding proofs and writing proofs; writing up the solutions is among the most effective ways of keeping up with the material in the course.

RESOURCES: Electronic mail is a medium for announcements and questions. Collaborative study sessions are offered to aid students in understanding the material and solving problems.

PREREQUISITES: There are no official prerequisites, but students will be best prepared if they have encountered logical reasoning, induction, and equivalence relations.