

Course Outline — FALL 2002

MATH 312

INTRODUCTION TO GRAPH THEORY

12 noon MWF (section X1), 243 Altgeld Hall: J. Skokan, 227 Illini Hall, 265-5036, e-mail: jozef@math.uiuc.edu

3PM MWF (section G1), 149 Henry Bldg: A. Kostochka, 234 Illini Hall, 265-8037, e-mail: kostochk@math.uiuc.edu

The web page of the course: <http://www.math.uiuc.edu/~jozef/math312/>

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 three tests plus a final examination.

Weighting: homework 200 points, tests 100+100+100 points, final exam 200 points, total 700 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. These are discussed in Math 247 (Fundamental Mathematics) and in other courses. Appendix A of the text discusses such mathematical background.