

MATH 412: Introduction to Graph Theory

Fall 2004 — Course Outline — University of Illinois

Sections X1U and X1G: 12 noon MWF, 443 Altgeld Hall

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

office hours: MWF 3–4

Final Exam: 7–10pm Wednesday, December 15

Sections G1U and G1G: 3 pm MWF, 345 Altgeld Hall

S. Hartke, 227 Illini Hall, 265-5036, hartke@math.uiuc.edu

office hours: To be announced.

Web page: <http://www.math.uiuc.edu/~hartke/teaching/math412>

Final Exam: 1:30–4:30pm Friday, December 17

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, all of which are written and closed-book.

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. Students may discuss the problems with each other as long as all help is properly cited in the solution. However, all students are expected to *individually* write their own solutions.

All students are expected to be aware of and abide by the University's policies on student conduct and academic integrity and honesty.

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.

Students should discuss with the instructor any class conflicts or other problems as soon as possible. Late homework and makeups for missed tests and the final exam will only be allowed in extreme situations.

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.