

MATH 413: Introduction to Combinatorics

Fall 2005 — Course Outline — University of Illinois

Sections F13/F14: 2:00pm–2:50pm MWF, 141 Altgeld Hall

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Office hours: MW 3:00pm–4:00pm or by appointment.

Web page: <http://www.math.uiuc.edu/~hartke/teaching/math413>

Tests: Fri Sep 23, Fri Oct 21, Fri Nov 18 in class

Final Exam: 1:30pm–4:30pm Fri, Dec 16

TEXT: *Introductory Combinatorics* by Richard A. Brualdi, Pearson Prentice Hall, fourth edition, 2004.

OVERVIEW: The aim of this course is to give an introduction to combinatorial mathematics. The emphasis will be on enumeration and symmetric structures. We will learn how to count combinatorial objects and how to construct and study useful symmetric configurations. We will pay very little attention to graphs (covered by Math 412) and linear programming and combinatorial optimization (covered by Math 482). This course will be helpful to those who plan to study combinatorial courses of higher level. We pay attention to both computational techniques and proofs of theorems. The main topics are: Examples of combinatorial problems, the Pigeonhole Principle, permutations and combinations, the binomial coefficients, partially ordered sets, the Inclusion-Exclusion Principle, recurrence relations, generating functions, and combinatorial designs.

Essentially, we will cover Chapters 1–3, 5–8, 10 of the book *Introductory Combinatorics* by Richard A. Brualdi, plus some supplementary material from the instructor.

REQUIREMENTS: Weekly problem sets (20 points each, only the twelve highest count), weekly quizzes (8 points each, only the nine highest count), three tests (100 points each), and one cumulative final exam (200 points). The tests and final exam are written and closed-book. The total number of points is $240+72+300+200=812$.

The homework provides practice employing techniques learned in class and finding and writing proofs; writing up the solutions is among the most effective ways of keeping up with the material in the course. Students are encouraged to discuss the problems with each other, but 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: Email and web pages will be used for announcements and questions.

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