MATH 510 – 16501
Discrete Math

Fall 2003

Mon, Wed, Fri, LS112, 3:30–4:20

Instructor: Prof. Chris Pinner
Course Home-Page: http://www.math.ksu.edu/~pinner/math510/
Office: Cardwell 113.
Phone: 532-0587
email: pinner@math.ksu.edu
Probable Office Hours: MWF 12:30–1:30, or by appt.

Text: *Introductory Combinatorics,* Richard A. Brualdi, third edition, Prentice Hall.

Course Description. Combinatorics & graph theory. Topics selected from counting principles, permutations & combinations, the inclusion-exclusion principle, recurrence relations, trees, graph coloring, Eulerian & Hamiltonian circuits, block designs, and Ramsey Theory.

Grading Scheme.

Homework = 150 points.
Midterm 1 = 100 points
Midterm 2 = 100 points
Final Exam = 200 points
Exam 1 (tentative): Wed Sep. 24.
Exam 2 (tentative): Wed Nov. 5.
Final Exam: Wed Dec 17, 4:10-6:00, LS112.

Assignments. Weekly homework will be assigned in class and will be due in the homework box 5pm on Friday of the following week. Show all your work. Make sure you include your name and Math 510 on the front. The lowest homework score will be dropped. There will be no late homework or make-up exams. If you have to miss a test for a valid reason then your course grade will be determined from your remaining work (notify me as soon as possible).

General Information. If you have any condition such as a physical or learning disability, which will make it difficult to carry out the work as I have outlined it or which will require academic accommodations, please notify me in the first two weeks of class.

Rough Course Outline

Ch 1. What is Combinatorics? (2 lectures)

Ch 2. Pigeon Hole Principle (3 lectures)
2.1 Pigeonhole principle: simple form
2.2 Pigeonhole principle: strong form
2.3 A theorem of Ramsey

Ch 3. Permutations & Combinations (5 lectures)
3.1 Two basic counting principles
3.2 Permutations of sets
3.3 Combinations of sets
3.4 Permutations of multisets
3.5 Combinations of multisets

Ch 5. The Binomial Coefficients (5 lectures)
5.1 Pascal's formula
5.2 The binomial theorem
5.3 Identities
5.5 The multinomial theorem
5.6 Newton's binomial theorem

Ch 6. The Inclusion-Exclusion Principle (5 lectures)
6.1 The inclusion-exclusion principle
6.2 Combinations with repetitions
6.3 Derangements
6.4 Permutations with forbidden positions
6.5 Another forbidden position problem

Ch 7. Recurrence Relations & Generating Functions (4 lectures)
7.1 Some number sequences
7.2 Linear homogeneous recurrence relations
7.4 Generating functions
7.5 Recurrences & generating functions

Ch 9. Matchings in Bipartite Graphs (5 lectures)
9.1 General problem formulation
9.2 Matchings
9.3 Systems of distinct representatives 9.4 Stable marriages

Ch 11. Introduction to Graph Theory (5 lectures)
11.1 Basic properties
11.2 Eulerian trails
11.3 Hamilton chains & cycles
11.5 Trees

Ch 12. Digraphs & Networks (3 lectures)
12.1 Digraphs
12.2 Networks

Ch 13. More on Graph Theory (3 lectures)
13.2 Plane & planar graphs
13.4 Independence number & clique number