

Spring 2007 MATH 584 / CS 575 METHODS OF COMBINATORICS
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Time: MWF 1

Place: Room 147, Altgeld Hall

Instructor: PROF. ZOLTAN FUREDI
Telephone: (217) 333 3355
E-mail: z-furedi@math.uiuc.edu
web: www.math.uiuc.edu/~z-furedi

Prerequisites: Math 580 or consent of instructor.

Familiarity with basic terms of Graph Theory (Math 412) and Combinatorics (Math 413) are essential. The knowledge of the materials covered by the following courses is very helpful: Math 242 (Calculus of several variables), Math 403 (Euclidean geometry), Math 415 (Linear algebra), Math 417 (Abstract algebra), Math 447 (Real analysis).

Text: Professor West's manuscript for Math 580 or Volume IV: Arrangements and Methods, available through a copy service (probably TIS Bookstore, 707 S Sixth Street), about 35\$ (cheap!)

L. Babai and P. Frankl: *Linear Algebra Methods in Combinatorics*. Another manuscript, copies can be ordered from Dept. Comp. Sci, Chicago University (about \$25)

Van Lint and R. Wilson: *A Course in Combinatorics* (excellent intro to designs).

Exams and grading: Homework assigned randomly. There will be no exams, but to receive credit one must read and summarize some research papers.

Outline: The aim of this course is twofold. First, a solid introduction to the basic methods of combinatorics and computation by reviewing important notions, results and problems. Second, to supply a series of research problems to interested students on or close to thesis level.

Syllabus: (tentative) We concentrate on Codes, Designs, Geometric problems, and additive number theory problems using Algebraic Methods (like Olson's theorem). Among others:
Codes and designs, distances in finite metric spaces
Discrete geometry, geometric discrepancy
Graph representations, Lovasz' theta, Körner's Sperner capacity, Prague dimension
Forbidden subgraphs, finite projective geometries.