

Math 724: Graduate Combinatorics Spring 2012

Instructor: Prof. Patricia Hersh
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Office: 3122 SAS Hall
Office Hours: by appointment

Class Meeting Time and Location: TuTh 1:30-2:45pm, SAS Hall 1218.

Text: Lectures on Polytopes, by Günter Ziegler

Prerequisites: None

Course Topics: Geometric and Topological Combinatorics. Topics will include many of the following: polytopes, polyhedra and cones, examples of associahedra and permutohedra, Farkas Lemma, simple and simplicial polytopes, polytope duality, face numbers and face lattices, graphs of polytopes, connections to linear and integer programming, Hirsch Conjecture and d -step Conjecture, Steinitz Theorem for 3-polytopes, Schlegel diagrams, matroids and oriented matroids, geometric lattices and hyperplane arrangements, shellability (line shelling and shellability of geometric lattices), Zaslavsky's region counting formulas, neighborliness of cyclic polytopes, Stanley-Reisner rings and h -numbers as Hilbert series, constraints on face numbers including the Upper Bound Theorem and g -theorem, discrete Morse theory.

Homework: There will be recommended problems, some of which will be collected.

Grading: Course grades will be determined by homework, one take-home midterm exam, and one final exam. Each will count for $1/3$ of your grade. The class will be very interactive, with class participation very important in this course; strong class participation will raise your grade by up to $1/3$ of a letter grade.

Class Participation: Please do not hesitate to ask questions in class. It helps everyone!

I hope you enjoy this course and learn a lot!