

Fall 2019-20, Math 5380 – Combinatorics

<u>Instr/Tutor</u>	<u>Office</u>	<u>Lecture/Tutorial Hour</u>	<u>Venue</u>
Beifang Chen	Rm 3480	TueThur, 3:00-4:50pm	G002 CYT Bldg

Textbook: *Enumerative Combinatorics I*, by R. Stanley, 1997
or any book with the topics: inclusion-exclusion principle, generating function, Mobius inversion, and Polya theory

Combinatorics is a relatively new subject in mathematics. Though its origin dates back to ancient Chinese He Luo Tu, its true development lies in the need of modern information and technology, especially computer science. The course of combinatorics or discrete mathematics, as for providing necessary mathematical background for mathematicians, scientists and engineers, becomes more and more important and popular in higher education.

This course is for beginning PG and senior UG students. No specific prerequisite is required. Mature on mathematical argument is sufficient. We will cover the following topics: bijective counting, sieve method, generating functions, Polya theory, and Mobius inversion. After finishing these basic subjects (of standard enumerative combinatorics), we will select topics from (not restricted) combinatorial optimization such as network flows, colorings, matchings, scheduling; or topics from geometric combinatorics such as polytopes and polyhedra, counting lattice points; or topics from partially ordered sets and matroids, etc.

Style: Lectures + homework + open problems or projects.

Grading: No exams. Final grades will be based on homework or projects.

Intended Learning Outcomes

The School of Science Intended Learning Outcomes and the Math Department Intended Learning Outcomes are distributed separately along with this syllabus. Upon the end of the course, students should have opportunities to and be able to

1. ILO A. Develop an understanding of the core ideas and concepts of advanced combinatorics. (cf ILO 1)
2. ILO B. Recognize the power of abstraction and generalization, and apply logical reasoning to investigate mathematical work with independent judgement (cf ILO 2)
3. ILO C. Apply rigorous, analytic, highly quantitative approach to analyze and solve problems using combinatorial techniques (cf ILO 3)