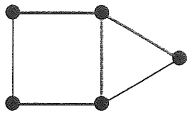
MA 514 - Combinatorial Structures and Techniques Fall 2017
MWF 12:00pm – 12:50pm in CB 335

Instructor: Martha Yip
Email: martha.yip [at sign] uky.edu
Office: POT 775
Office hours: by appointment



Course website:

http://ms.uky.edu/~myip/teaching/ma514.html

Email policy: My preferred method for contact is by email. To ensure that your emails get answered promptly (within 24 hours) and not get caught in spam filters, please

- have the Course Number (MA 514) in the subject line,
- have your Name in the body of the email, and
- use your UK email account.

Textbook: van Lint and Wilson, *A Course in Combinatorics*, 2nd ed., Cambridge University Press, 2001.

Course Goals: This course is an introduction to fundamental structures and techniques in combinatorics. Topics include:

- Chapter 1 Graphs
- Chapter 2 Trees
- Chapter 3 Colouring graphs
- Chapter 4 Extremal graph theory
- Chapter 6 Partially ordered sets
- Chapter 5 Systems of distinct representatives
- Chapter 7 Network flow theory
- Chapter 10 Möbius Inversion

Time permitting, advanced topics in graph theory and enumerative combinatorics will be introduced. Other learning outcomes in this course include:

- developing facility at combinatorial reasoning, and
- sharpening proof-writing skills.

Assignments: Problem sets are accessible through the course calendar. They will be collected at the end of class on each due date. *Late assigments will not be accepted.*

In order to be successful in this course, it is important that you make every effort to complete the assignments. Help is available during my office hours, but *it is recommended that you attempt the homework on your own before seeking help.* In addition, you are encouraged to discuss course material with your fellow classmates, but *your submitted written work must be in your own words.* If you decide to use other sources (eg. textbooks, papers, the internet) as reference, *make sure that you reference every source properly.*

Examinations: There are three tests:

- Test 1: Friday October 2, in class
- Test 2: Friday November 6, in class
- Test 3: Wednesday December 13, 10:30-12:30am

Electronic devices are not allowed during any tests or exams.

Grading Scheme: Your cumulative average is computed as follows:

55% Homework, 15% Test 1, 15% Test 2, 15% Test 3.

Your course grade will be determined by your cumulative average at the end of the semester and will be based on the following scale:

A	B	C	D	E
≥ 90	≥ 80	≥ 70	≥ 60	< 60

Canvas will be used as a grade server so that you can easily keep track of your grades.

Academic Accommodations: If you have a documented disability that requires academic accommodations, please see me as soon as possible. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (DRC, Multidisciplinary Science Building, Suite 407, 257-2754, drc@uky.edu) for coordination of campus disability services available to students with disabilities.

Academic Integrity. Academic honesty is fundamental to our community. Violations of academic integrity may result in suspension from the university. For details see `http://www.uky.edu/studentconduct/code-student-conduct`.

For information on the Office of Academic Ombud Services' definition of plagiarism, and UK's academic offense policy, see `http://www.uky.edu/ombud/plagiarism-what-it`.

MA 714 - KOSTKA POLYNOMIALS AND THEIR GENERALIZATIONS FALL 2016

Instructor: Martha Yip
Time: MWF 12:00pm – 12:50pm

Course Description: The Kostka numbers, $K_{\lambda\mu}$, are connection coefficients which appear in the change of basis formula $h_\mu = \sum_\lambda K_{\lambda\mu} s_\lambda$ between the homogeneous basis and the Schur basis for the space of symmetric functions. In the first part of the course, we will examine the role of Kostka numbers in combinatorics and in the representation theory of the symmetric group. Topics include basic symmetric function theory, tableau combinatorics, and the decomposition of permutation modules into irreducible $\mathfrak{S}_n$-modules.

In the second part of the course, we will study various one- and two-parameter generalizations of the Kostka numbers, sometimes known as Kostka-Foulkes polynomials and Macdonald-Kostka polynomials. Topics include the charge formula of Lascoux and Schützenberger, the Kostant partition function, Hall-Littlewood polynomials, Macdonald polynomials, and Catalan numbers.

Prerequisites: MA 614. Basic knowledge of symmetric function theory is nice to have, but not required. We will review material on symmetric functions as necessary.

Course work: Students will be required to read a section of a textbook or a paper, and present a 50 minute talk.

Some References:

(a) W. Fulton, *Young tableaux,* Cambridge University Press, 1997.
(b) A.N. Kirillov, *Ubiquity of Kostka polynomials,* arXiv:math/9912094v4.
(c) I.G. Macdonald, *Symmetric functions and Hall polynomials,* Oxford University Press, 1995.
(d) K. Nelsen and A. Ram, *Kostka-Foulkes polynomials and Macdonald spherical functions,* Surveys in Combinatorics, London Math. Soc. Lecture Note Ser. **307** (2003), 325–370.