

MATH 714 FALL 2009

MARGARET READDY

COMBINATORICS OF COXETER GROUPS

Coxeter groups arise in nature, whether as symmetry groups of regular polytopes, tessellations of the plane, juggling patterns, or more generally, as reflections. We will look at Coxeter groups from a combinatorial, geometric and algebraic approach.

This course serves both as an introduction to Coxeter groups and a glimpse into the current research trends, including combinatorial descriptions of finite and affine Weyl groups, the complete **cd**-index and Kazhdan-Lusztig polynomials.

We will be following Björner and Brenti's recent book on Coxeter groups. We will also be reading some recent papers in the field. Please refer to our website www.math.uky.edu/~readdy/714/ for further information.

No previous knowledge of combinatorics or algebra is assumed.

COURSE OUTLINE

- I. Introduction
- II. Bruhat order
- III. Weak order and reduced words
- IV. Root systems, games and automata
- V. Combinatorial descriptions
- VI. Enumeration
- VII. Kazhdan-Lusztig and R -polynomials
- VIII. Other material, as time permits

TEXTBOOK

Anders Björner and Francesco Brenti, *Combinatorics of Coxeter Groups*, Springer, 2005. Available on amazon.com for \$59.95.

HOMEWORK AND GRADING

Approximately every two weeks we will hold a homework session during classtime in which we discuss the homework problems.

As this is a topics course, you are expected to demonstrate to me that you are making an effort to learn the course material. Ways you can do this include: attending lecture regularly, asking or answering questions in class, presenting solutions during the homework sessions, giving a talk on a paper in the Discrete CATS seminar. If you wish to give a Masters talk, please let me know early enough so that we can select a paper.