

Coxeter groups (Gruppi di Coxeter)

2023/2024

(first semester)

Teachers: Michele D'Adderio and Mario Salvetti

Introduction

In 1934 the great geometer H. S. M. Coxeter introduced the groups that now go under his name as an abstraction of groups generated by reflections through hyperplanes.

A prototypical example of these groups is given by the symmetric groups. In fact a lot of the related mathematical activity can be described as an attempt to generalize known results for symmetric groups to a larger family of Coxeter groups. Other classical examples are the groups of symmetries of regular polyhedra and of regular tassellations of Euclidean spaces of dimension ≤ 3 .

The theory of Coxeter groups sits naturally at the intersection of geometry, algebra, combinatorics and topology. In this course we will introduce these objects and start their study from all these four points of view.

Highlights

We will prove the paradigmatic classification of finite Coxeter groups. In fact, it turns out that these are precisely the finite groups generated by reflection.

Furthermore, we will study the topology of the so called Coxeter complex associated to a Coxeter groups, providing an important application of the notion of shellability.

Practical information

The course will last 42 hours, and it will take place in the first semester. There will be an oral examination, consisting of a short seminar followed by questions about the content of the course.

The prerequisites for this course are basic linear algebra, basic theory of finite groups, genuine curiosity and open-mindedness.

Whoever is interested in knowing more about this course can contact us via e-mail: michele.dadderio@unipi.it, mario.salvetti@unipi.it