**Summary**

Study groups generated by reflections.

**Content**
- Orthogonal transformations in a real Euclidean space.
- Groups generated by reflections. Coxeter groups, root systems. Crystallographic groups. Fundamental regions for Coxeter groups.
- Affine Coxeter groups. Classification.
- Applications and connections with other fields.

**Keywords**
Orthogonal transformations, reflection, regular polytop, root system, simple root, positive root, Coxeter group, Coxeter graph, crystallographic group, Weyl group, fundamental region, simply laced root system, the longest element of a Coxeter group, Coxeter element, Coxeter plane, Coxeter number, root lattice, affine Weyl group, the highest root, finite and affine Dynkin diagrams.

**Learning Prerequisites**

**Required courses**
Linear algebra I-II, Group theory

**Recommended courses**
Linear algebra I-II, Geometry I-II, Group theory, Lie algebras, Linear representations of finite groups

**Learning Outcomes**
By the end of the course, the student must be able to:
- Apply concepts and ideas of the course
- Reason rigorously using the notions of the course
- Choose an appropriate method to solve problems
- Identify the concepts relevant to each problem
- Apply known methods to solve problems similar to the examples shown in the course and in the problem sets
- Solve new problems using the ideas of the course
- Implement appropriate methods to identify and study the groups generated by reflections
Teaching methods
Lectures and exercise sessions

Assessment methods
Written exam
Dans le cas de l’art. 3 al. 5 du Règlement de section, l’enseignant décide de la forme de l’examen qu’il communique aux étudiants concernés.

Supervision
Office hours  No
Assistants  Yes
Forum  No

Resources
Bibliography

Ressources en bibliothèque
• (electronic version)
• Reflection Groups and Coxeter Groups / Humphreys
• Finite Reflection Groups / Benson & Grove
• Combinatorics of coxeter groups / Björner & Brenti

Moodle Link
• https://moodle.epfl.ch/course/view.php?id=15824