



FSF3705 Polytope Theory 7.5 credits

Polytopteori

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for FSF3705 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

A Master degree including at least 30 university credits (hp) in Mathematics (including SF1631 Discrete mathematics and SF1624 Linear algebra or similar knowledge).

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The course will give a basic knowledge of theory and methods in the theory of convex polytopes. The goal is to give a good and deep knowledge as a firm ground both for further studies in mathematics and for applications in other disciplines. More specifically the student should after the course:

- know basic concepts and terminology in the theory for convex polytopes.
- be able to interpret the combinatorial properties of a polytope from its face lattice, Schlegel diagram or Gale diagram
- be able to construct examples of polytopes with certain properties and know some things about when this is difficult to do
- know and be able to use important special polytopes and methods to construct new ones.
- Have increased ability to intuition about properties of polytopes in higher dimensions and have realised how easy it is to guess incorrectly about properties in dimensions higher than 3.

Course contents

Basic facts about polytopes and methods to study them, e.g.

- Projections
- Face lattice
- Schlegel diagram
- Shelling
- Gale diagram
- Some things about oriented matroids.

The course concerns also many beautiful and important constructions of special polytopes, e.g.:

- Cyclic polytope
- Birkhoff polytope
- Zonotope
- Minkowski sum
- 0/1-polytope
- Transportation polytope
- Permutahedron
- Associahedron

Disposition

Lectures, homework, and presentation

Course literature

Ziegler, Günter M: "Lectures on Polytopes"; Springer Graduate Texts in Mathematics.

Examination

- INL1 - Assignment, 7.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Homework, and a presentation/oral exam.

Other requirements for final grade

Homework, and a presentation/oral exam

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.