



# 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 2022

## 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.
- know and be able to use important special polytopes and methods to construct new ones.
- be able to interpret combinatorial properties of a polytope from its face lattice
- know the basic problems and ideas in Ehrhart theory, and learn some techniques to compute related invariants of lattice polytopes.
- have increased 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, shelling, f-vector, triangulations, Ehrhart polynomial, lattice polytopes,  $h^*$ -polynomial, secondary polytope

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

## 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.

The examination consists of: Hand-in problems, a written exam, and a presentation of a scientific text

## 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.

