SF2742 Convex Polytypes 7.5 credits

Konvexa polytoper

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 SF2742 valid from Autumn 2012

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mathematics

Specific prerequisites

SF1631 Discrete Mathematics and SF1604 linear algebra or the equivalent knowledge.

Language of instruction

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

Intended learning outcomes

The course intends to give familiarity with basic theory and methods within the theory of convex polytopes. The aim is to give advanced knowledge which constitutes an appropriate a basis both for further studies in mathematics and for applications in related disciplines. Concretely, on completion of the course the student should

- Be familiar with the basic concepts and terms within the theory of convex polytopes.
- Be able to interpret the combinatorial properties of a polytope from its face lattice, Schlegel diagram or Gale diagram
- Be able to design examples of polytopes with certain desirable properties, such as diameter, vertex degree, face lattice structure, etc. and know something about when it is difficult to do this.
- Know and be able to use many explicit important polytopes and methods to design new ones.
- Increased ability to determine intuitively the properties of polytopes in higher dimensions and humility before the fact that intuition from 3 dimensions can easily lead incorrectly in higher dimensions.

Course contents

Basic facts about polytopes and methods to study them such as projections, face lattice, Schlegel diagrams, scaling, Gale diagrams and something about oriented matroids. We will also discuss many beautiful and important designs of special polytopes: cyclic polytopes, the Birkhoff polytope, zonotopes, Minkovski sums, 0/1-polytopes, transport polytopes, the permutahedron, the associahedron, etc.

Course literature

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

Examination

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.

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.