# FSF3703 Topological Combinatorics 7.5 credits

**Topologisk kombinatorik**

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 FSF3703 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 in Mathematics.

A basic knowledge ofbasic topology (corresponding to the course SF2721 Topology), combinatorics and group theory.

## Language of instruction

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

# Intended learning outcomes

After the course, the student should have a sufficiently deep knowledge of topological combinatorics to be able to start working on research projects in the area.

# Course contents

- Borsuk-Ulam's Theorem and applications (e.g., Kneser-Lovász Theorem).
- Basic theory of simplicial and cellular complexes: simplicial homology, homotopy type.
- Methods for computing the homology or homotopy type of a complex: discrete Morse theory, nerves, poset maps, long exact sequences ...
- Group actions on complexes.
- The evasiveness conjecture and the prime power proof of Kahn-Saks-Sturtevant.

Further topics might be covered during the student seminars.

# Disposition

Lectures

# Course literature

- J. Matousek, Using the Borsuk-Ulam Theorem, Springer, 2003.
- A. Björner, Topological Methods, especially Part II: Tools.
- Additional material (hand-outs and lecture notes).

# 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 two parts:

- Two sets of home assignments.

- A 45-minute oral presentation (seminar) of some aspect of topological combinatorics. The presentation could be an overview of a research paper. It could also be a survey of known results in a particular area or a description of a useful tool for solving problems in topological combinatorics. Another possibility would be to discuss a topic in Matousek's book not covered during the lectures.

# Other requirements for final grade

Accepted homework problems and oral presentations.

# 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.