FSF3609 Operads in Algebraic Topology 7.5 credits

Operader i algebraisk topologi

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 FSF3609 valid from Spring 2019

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

The course requires knowledge of algebraic topology and homological algebra. Most of the background needed has been for example covered by SF2735, except for a basic knowledge of simplicial structures and model categories that we require.

Language of instruction

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

Intended learning outcomes

The course should provide the students with

- thorough knowledge of operads and standard constructions related to them, especially in the categories of topological spaces and chain complexes
- familiarity with the little n-cubes operad and algebraic and topological variants thereof
- a precise understanding of the relationship between iterated loop spaces and algebras over the little n-cube operad
- Understand how the singular cochain complex of a topological space is an algebra over an E-infinity operad
- Understand the main steps in the proof of Mandell's theorem

Course contents

- Operads and algebras over operads
- The little n-cubes operad, A-infinity and E-infinity operads
- Iterated loop spaces
- Approximation of free iterated loop spaces via the little n-cubes operad
- The simplicial bar construction
- The recognition principle
- The E-infinity algebra structure on singular cochains
- Mandell's theorem

Disposition

The course will consist of approximately 14 weekly lectures of 90 minutes. The first seven lectures discuss the recognition principle, the last seven lectures treat Mandell's result.

Course literature

- Michael Boardman, Rainer Vogt, "Homotopy invariant algebraic structures on topological spaces", Lecture Notes in Mathematics 347, Springer-Verlag (1973).
- Michael Mandell, "E-infinity Algebras and p-Adic Homotopy Theory", Topology 40 (2001), no. 1, 43-94.
- Michael Mandell, "Cochains and Homotopy Type", Publ. Math. IHES, 103 (2006), 213-246.
- Martin Markl, Steven Shnider, James Stasheff, "Operads in Algebra, Topology and Physics", Mathematical Surveys and Monographs 96, AMS (2002).
- Peter May, "The geometry of iterated loop spaces", Lecture Notes in Mathematics 271, Springer-Verlag (1972).

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.

Examination will consist of the students giving presentations about related topics at the end of the term.

Other requirements for final grade

Presentation of the chosen topic.

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.