FSF3709 Characteristic Classes 7.5 credits

Karakteristiska klasser

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 FSF3709 valid from Autumn 2015

Grading scale

Education cycle

Third cycle

Specific prerequisites

Familiarity with basic algebraic structures such as groups, rings, fields, modules. Familiarity with basic topological notions: topo-logical space, compactness.

Language of instruction

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

Intended learning outcomes

The course goal is to understand and be able to apply the concept of characteristic classes in a range of mathematical disciplines. At the end of the course, the student will be able to follow current research literature and, if desired, pursue own research projects in this area.

Course contents

- Introduction to vector bundles. Bundles as parametrized vector spaces, as sheaves, and as cocycles. Operations on bundles. Algebraic bundles. Tangent and normal bundles. Bundles with additional structure
- Lie groups, Grassmannians, universal bundles, and classifying spaces. Sim-plicial spaces and paracompactness.
- Čech cohmology, the cup product, de Rham cohomology
- The definition and computation of characteristic classes: Stiefel-Whitney classes, Chern classes, and Pontryagin classes
- Introduction to differential geometry: connections, curvature
- Chern-Weil theory and generalized Gauss-Bonnet theorems
- Characteristic classes in algebraic geometry, Chow groups, Segre classes
- An advanced topic such as cobordism, characteristic numbers, genera, the Hirzebruch signature theorem, or the Hirzebruch-Riemann-Roch theorem.

Disposition

Lectures, homework and presentation.

Course literature

Lecture notes will be provided for the students. They will contain a bibliography but no textbook will be used for the course.

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.

Homework and presentation.

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.