FSF3674 Differential Geometry 7.5 credits

Differentialgeometri

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 FSF3674 valid from Autumn 2011

Grading scale

Education cycle

Third cycle

Specific prerequisites

Prerequisite for the course is knowledge of differential geometry (differential manifolds, tensors, differential forms) corresponding for example to the advanced level course SF2722 "Differential geometry". Further, the participants should have read advanced level courses on algebra, analysis, and topology

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 wide and deep knowledge of differential geometry to be able to start reading research level texts in the area and be able to connect and apply methods and results of differential geometry to other areas of mathematics.

Course contents

Introduction:

- Manifolds, semi-Riemannian metrics, curvature, submanifolds, hyperquadrics, geodesics, comparison theorems for positive/negative curvature.

Followed by a selection from the subjects:

- Curvature in general, holonomy, characteristic classes
- Lorentzian geometry, Hawking-Penrose singularity theorems
- Lie groups, homogeneous spaces, symmetric spaces
- Morse theory, De Rham cohomology
- Elliptic operators, spectral geometry, index theory
- Vector fields, distributions, foliations, differential systems,
- Frobenius theorem
- General relativity

Disposition

The course is given as a series of lectures (approximately 16 x 2h), possibly with presentations given by the participants.

Course literature

For the introduction:

- Barrett O'Neill, "Semi-Riemannian Geometry"
- Christian Bär, lecture notes

For the other subjects:

- Hand outs of appropriate literature.

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.

Completed homework assignments and oral test or presentation.

Other requirements for final grade

Homework assignments and oral test or 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.