Faculty of Science

MATM33, Mathematics: Differential Geometry, 7.5 credits

Matematik: Differentialgeometri, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2019-12-09 to be valid from 2019-12-09, autumn semester 2020.

General Information

The course is an elective course for second-cycle studies for a Master of Science degree in mathematics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Mathematics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall goal of the course is to provide a classic introduction to differential geometry, important for further studies in the subject and in relevant areas of physics. The purpose is further to develop the students' ability to solve problems and communicate mathematical reasoning.

Knowledge and understanding

After completing the course the student should be able to:

- give an account of the concepts and methods within classic differential geometry that are treated in the course,
- identify the most important results in the course and give an account of their proofs,
- give a detailed account of the theory behind the methods used in differential geometry within the framework of the course.

Competence and skills
After completing the course the student should be able to:

- integrate knowledge from the different parts of the course in connection with problem solving,
- describe the solution to a mathematical problem within the course framework in speech and writing, logically coherent and with adequate terminology,
- plan and carry out relevant assignments for the course using appropriate methods within a given time-frame.

Judgement and approach
After completing the course the student should be able to:

- argue for the importance of differential geometry as a tool in other areas, e.g. physics.

Course content

The course covers:

- The geometry of curves in Euclidean space, their curvature and torsion and how these determine the curves.
- The geometry of surfaces in Euclidean space, their first and second fundamental forms, the Gauss map, principal curvatures, Gaussian curvature and mean curvature.
- Theorema Egregium and a deep analysis of geodesics and their behaviour both locally and globally.
- Gauss-Bonnet's Theorem: two different local versions and the famous global version.

Course design

The teaching consists of lectures and seminars. A compulsory assignment is included in the course. The assignment should be solved in smaller groups and the solutions should be presented orally to the entire student group.

Assessment

The examination consists of a written examination and an oral examination at the end of the course, as well as an oral presentation of group assignment during the course. The oral examination may only be taken by those students who pass on the written examination.
Students who fail the regular written respectively oral examination are offered a re-examination shortly thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass the course it is required to pass the written examination, the oral examination and the oral presentation of group assignment. In addition, the grade Pass with distinction requires that the total number of points obtained in the written and the oral examination is at least 75% of the maximum total number of points. The maximum number of points that can be obtained in the written and the oral examination are weighted five to two.

Entry requirements

For admission to the course, English B as well as at least 90 credits, with at least 60 credits in pure mathematics are required, including knowledge corresponding to the courses MATB22 Linear Algebra 2, 7.5 credits, and MATB23 Analysis in Several Variables 2, 7.5 credits.

Further information

The course may not be included in a degree together with MATM13 Differential Geometry, 7.5 credits.

Subcourses in MATM33, Mathematics: Differential Geometry

Applies from H20

2001 Written examination, 5,0 hp
Grading scale: Fail, Pass
2002 Oral examination, 2,0 hp
Grading scale: Fail, Pass
2003 Oral presentation, 0,5 hp
Grading scale: Fail, Pass