



GÖTEBORG UNIVERSITY

Faculty Board of Science

MMA210 Advanced Differential Calculus

7.5 higher education credits

Second Cycle

This syllabus is the binding document.

1. Confirmation

The syllabus was confirmed by the Department of Mathematical Sciences on August 15, 2007 to be valid from September 1, 2007. The syllabus was revised on December 4, 2009 to be valid from July 1, 2010. Field of education: Science. Responsible department: Mathematical Sciences.

2. Position in the educational system

The course Advanced Differential Calculus, 7.5 higher education credits, is one of several single subject courses included in the Masters Program in Mathematical Sciences. The course is also open for eligible students outside the program. It is further one of the courses in the post-graduate program in Mathematics.

3. Entrance qualifications

The prerequisite for the course Advanced Differential Calculus is the equivalent of 90 higher education credits, including at least 7.5 higher education credits from the second cycle, in Mathematics.

4. Course content

The inverse and implicit function theorems. Sets of measure zero. Sard's theorem. Degree of mappings. Manifolds. Vector fields and differential forms. Integration of differential forms. De Rham cohomology. Stoke's theorem.

5. Learning outcomes

After completing the course, the student will

- be able to prove the inverse and implicit function theorems
- understand the various formulations of the concept of manifolds using the inverse and implicit function theorems
- be able to prove the Sard's theorem and to explain the geometric motivations of the concept of mapping degree (in particular for curves and surfaces in the three-dimensional Euclidean space \mathbb{R}^3)

- understand elementary algebraic and geometric properties of vector fields and differential forms
- know the definition of the de Rham cohomology group and compute it for simple manifolds (Euclidean spaces and spheres)
- be able to prove and apply the Stoke's theorem on manifolds.

6. Required reading

List of required reading enclosed.

7. Assessment

An examination will be given at the end of the course. A student who has failed a test twice has the right to change examiner, unless weighty arguments can be invoked. For this, the student must send a written request to the board of the department.

8. Grading scale

The grades are Fail (U), Pass (G), and Pass with Distinction (VG).

Students who are contractually entitled to ECTS grades should inform the examiner about this no later than one week after the start of the course.

Students without such entitlement will not be awarded ECTS grades. Grades will be converted into ECTS terminology according to a standard model approved by the University President.

9. Course evaluation

Oral and/or written course evaluation will be performed. The results of the evaluation will be communicated to the students and will serve as a guide for the development of the course.

10. Additional information

The language of instruction is English unless all involved are Swedish speakers.