Course syllabus

Flerdimensionell analys
Calculus in Several Variables

FMAB30, 6 credits, G1 (First Cycle)

Valid for: 2020/21
Decided by: PLED F/Pi
Date of Decision: 2020-04-01

General Information

Main field: Technology.
Compulsory for: B2, B12, BME2, C2, D2, E1, I1, K2, L2, M1, MD1, N2, V2, W2
Elective for: IBYA3, IBYI3, IBYV3, IDA3, IEA3
Language of instruction: The course will be given in Swedish

Aim

The course aims at giving a basic treatment of calculus in several variables. Particular emphasis is given to the role this plays in applications in different subjects of technology, in order to give the future engineer a good foundation for further studies in mathematics as well as other subjects. The aim is furthermore to develop the student’s ability to solve problems and to assimilate mathematical text.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

• be able to compute with and handle elementary functions of several variables within the framework of the course with confidence, together with their derivatives and integrals.
• be familiar with different representations of curves, surfaces and volumes in two and three dimensions, and be able to use them in computations.
• be able to carry out (specified) changes of variables in partial differential equations, and by this means to solve such equations.
• be familiar with the basic theory of optimization, local as well as global, and be able to find the solution in simple cases.
• be able to demonstrate an ability to independently choose methods to evaluate double and triple integrals, and be able to carry out the solution essentially correctly.
be able to demonstrate an ability to independently choose method to evaluate a curve integral, and be able to carry out the solution essentially correctly.

be able to demonstrate a good ability to carry out algebraic calculations within the context of the course.

be able to give a general account of and to illustrate the meaning of such mathematical concepts in calculus in several variables that are used to construct and study mathematical models in the applications.

be able to account for the contents of some central definitions, theorems and proofs.

**Competences and skills**

For a passing grade the student must

- in the context of problem solving be able to demonstrate an ability to independently choose and use mathematical concepts and methods within calculus in several variables.
- in the context of problem solving be able to integrate concepts from different parts of the course.
- be able to demonstrate an ability to construct and analyse some simple mathematical models in calculus in several variables.
- be able to show capability to explain mathematical arguments in a structured and logically clear way.
- have a basic ability to use Maple for visualisation and formula manipulation, and be able to identify some of its possibilities and limitations.

**Contents**

- Generalities on functions of several variables: level curves, function surfaces, level surfaces, surfaces in parameter form, curvilinear coordinates.


- Optimization on compact and non-compact domains. Optimization with constraints.


- Curve integrals in the plane. Green’s formula with applications. Potentials and exact differentials.

- Computer work. Visualisation and formula manipulation using Maple.

**Examination details**

**Grading scale**: TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment**: Written test comprising theory and problem solving. Computer work.

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.
Parts
Code: 0117. Name: Calculus in Several Variables.
Credits: 6. Grading scale: TH.
Credits: 0. Grading scale: UG.

Admission
Assumed prior knowledge: Single variable calculus, e.g. one of the courses (FMAB45, FMAB50 and FMAB60), (FMAB65 and FMAB70) or FMAA50, and linear algebra, e.g. one of the courses FMAB20, FMAA55 or FMAA20.
The number of participants is limited to: No
The course overlaps following course/s: FMA025, FMA435, FMA430, FMAB35

Reading list

Contact and other information
Course coordinator: Studierektor Anders Holst, Studierektor@math.lth.se
Course administrator: Studerandeexpeditionen, expedition@math.lth.se
Course homepage: http://www.maths.lth.se/course/flerdimnykod/