

# Calculus, several variables

Programme course

6 credits

Flervariabelanalys

TATA83

Valid from: 2017 Spring semester

**Determined by**

Board of Studies for Chemistry, Biology  
and Biotechnology

**Date determined**

2017-01-25

## Main field of study

Mathematics, Applied Mathematics

## Course level

First cycle

## Advancement level

G1F

## Course offered for

- Chemical Biology, M Sc in Engineering
- Engineering Biology, M Sc in Engineering

## Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

## Prerequisites

Linear Algebra, Calculus, one variable

## Intended learning outcomes

The aim is that the student shall become familiar with the mathematical concepts, the reasoning, and the relations that constitute several variable calculus, and also to acquire computational and problem solving skills, to the extent required for further studies. After completing the course, the student should be able to

- explain basic concepts and theorems for calculus in several variables.
- identify and apply relevant methods to solve problems in calculus in several variables.

## Course content

The space  $\mathbb{R}^n$ . Fundamental notions of topology. Functions from  $\mathbb{R}^n$  to  $\mathbb{R}^p$ . Function graphs, level curves and level surfaces. Limit and continuity. Partial derivatives. Differentiability. The chain rule. Gradient, normal, tangent and tangent plane. Directional derivative. Taylor's formula. Local and global extrema. Extremal problems on compact domains (parametrizing the boundary). Implicitly defined functions and implicit differentiation. Multiple integrals; iterated integration, change of variables. Area, volume, mass. Introduction to improper multiple integrals.

## Teaching and working methods

Lectures and problem classes.

## Examination

TEN1      Written examination      6 credits      U, 3, 4, 5

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Department

Matematiska institutionen

## Director of Studies or equivalent

Jesper Thorén

## Examiner

Joakim Arnlind

## Course website and other links

<http://courses.mai.liu.se/Lists/html/index-amne-tm.html>

## Education components

Preliminary scheduled hours: 56 h

Recommended self-study hours: 104 h

## Course literature

Persson, A, Böiers, L-C: Analys i flera variabler, Studentlitteratur, Lund 1988.

Problemsamling och kompletterande material utgivet av matematiska institutionen.

## Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at [http://stydokument.liu.se/Regelsamling/Innehall/Utbildning\\_pa\\_grund-\\_och\\_avancerad\\_niva](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).