



## COURSE SYLLABUS

# Multivariable Calculus, 7.5 credits

*Flervariabelanalys, 7,5 högskolepoäng*

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<b>Course Code:</b> TFVK17	<b>Education Cycle:</b> First-cycle level
<b>Confirmed by:</b> Dean Feb 1, 2017	<b>Disciplinary domain:</b> Natural sciences
<b>Revised by:</b> Director of Education Nov 24, 2022	<b>Subject group:</b> MA1
<b>Valid From:</b> Jan 2, 2023	<b>Specialised in:</b> GIF
<b>Version:</b> 7	

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### Intended Learning Outcomes (ILO)

Upon completion of the course, the student should

Knowledge and understanding

- Demonstrate an understanding of the basic concepts and theorems in the differential and integral calculus in several variables

Skills and abilities

- Demonstrate the ability to sketch regions given by inequalities and to parametrize some standard curves and surfaces
- Demonstrate the ability to compute partial derivatives, linearize a function or a parametrization, find directional derivatives and identify the directions of fastest increase and decrease of a differentiable function
- Demonstrate the ability to identify and classify local critical points of a function; find local and global extremes with or without constraints
- Demonstrate the ability to set up and solve double and triple integrals
- Demonstrate the ability to identify conservative vector fields and determine their potentials
- Demonstrate the ability to compute line and surface integrals over scalar and vector fields either via parametrization, or, when possible, using Green's, Gauss' or Stokes formulas.

### Contents

The course presents the basics of the Calculus in several variables.

The course focuses on the following topics:

- Curves and surfaces in implicit form and parameter form (in particular the quadrics)
- Basic set-theoretical concepts. Polar, cylindrical and spherical coordinates
- Functions of several variables, level curves and surfaces
- Limits and continuity, partial derivatives
- Gradient, differentiability, directional derivatives and linearization
- The chain rule, change of variables, the nabla differential operator, curl and divergence. Higher order partial derivatives, the Laplace and wave PDEs

- Second-order Taylor polynomial, classification of critical points and identification of local extremes
- Optimization on compact domains, optimization subject to constraints, Lagrange multipliers
- Double and triple integrals, Fubini evaluation, change of variables
- Basic calculus of vector-valued functions, line and surface integrals, conservative fields, potentials
- The Green's, Gauss' divergence and Stokes formulas.

### Type of instruction

Lectures and seminars.

The teaching is conducted in English.

### Prerequisites

General entry requirements and completed course Single Variable Calculus, 6 credits and Linear Algebra, 6 credits or Basic Calculus, 6 credits and Linear Algebra and Optimization, 7.5 credits (or the equivalent)

### Examination and grades

The course is graded 5,4,3 or Fail.

Registration of examination:

Name of the Test	Value	Grading
Examination	7.5 credits	5/4/3/U

### Course literature

Literature

The literature list for the course will be provided 8 weeks before the course starts.

Title: Multivariable calculus

Author: Briggs/Cochran

ISBN: 9780321664150