



Faculty of Health, Science and Technology
Mathematics

Syllabus

Calculus in several variables

Course Code:	MAGA54
Course Title:	Calculus in several variables <i>Flervariabelanalys</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MAA (Mathematics)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2017-08-30, and is valid from the Spring semester 2018 at Karlstad University.

Prerequisites

Foundation course in Mathematics 7.5 ECTS cr., Calculus and Geometry, 7.5 ECTS cr, and Linear Algebra 7.5 ECTS cr each, or equivalent.

Learning Outcomes

Upon completion of the course, students should be able to:

- give an account of the concepts of limits, continuity, partial derivatives, gradients and differentiability for functions of several variables and use these in solving problems,
- calculate partial derivatives, use the general chain rule and use coordinate transformations to solve simple partial differential equations,
- use partial derivatives to determine local and global extreme values, also with constraints,
- give an account of the definition of the multiple integral and use multiple integrals to calculate e.g. areas of curved surfaces and volumes,
- determine potentials for conservative vector fields,
- evaluate line integrals of scalar and vector valued functions,
- evaluate curve, surface and flux integrals directly as well as by using Green's, Stokes' or Gauss' theorems,
- perform control of results to verify that they are correct or reasonable, and
- show understanding of the subject by combining new concepts, theorems and examples and discover analogies and make generalizations.

Content

Main course components:

- Basic topological concepts: open, closed and compact sets.

- Functions of several variables with limits and continuity, partial derivatives, the chain rule, directional derivatives and gradients, tangent planes, Jacobian matrices and Jacobian determinants.
- Coordinate transformations, simple partial differential equations.
- Taylor polynomials in several variables.
- Extreme values: classifying critical points, local and global extreme values, the method of Lagrange multipliers.
- Double and triple integrals: iterated integration, change of variables with polar, cylindrical and spherical coordinates, generalized integrals
- Geometrical and physical applications: area of curved surface, volume, mass and centre of mass
- Vector fields, conservative vector fields, potentials
- Divergence and rotation operators, nabla operator
- Line integrals, surface integrals, flux integrals
- Green's formula, Gauss' divergence theorem, Stokes' theorem.

Reading List

See separate document.

Examination

Assessment is based on a written exam.

The number of assessment opportunities is limited to three per academic year.

Grades

One of the grades U (Fail), 3 (Pass), 4 (Pass not without distinction), or 5 (Pass with distinction) alternatively U (Fail), G (Pass) or VG (Distinction) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.