Calculus in One Variable 1

Programme course

6 credits

Envariabelanalys 1

TATA41

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Mathematics, Applied Mathematics

Course level
First cycle

Advancement level
G1X

Course offered for
- Industrial Engineering and Management - International, M Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Biomedical Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Physics and Nanoscience, Bachelor's Programme
- Mathematics, Bachelor's Programme
- Computer Science and Software Engineering, M Sc in Engineering
- Computer Science and Engineering, M Sc in Engineering
- Design and Product Development, M Sc in Engineering
- Energy-Environment-Management M Sc in Engineering
- Information Technology, M Sc in Engineering
- Chemical Biology, M Sc in Engineering
- Mechanical Engineering, 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
Foundation Course in Mathematics

Intended learning outcomes

To give basic proficiency in mathematical concepts, reasoning and relations contained in single-variable calculus. To provide the skills in calculus and problem solving required for subsequent studies. After a completed course, the student should be able to

- read and interpret mathematical text
- qoute and explain definitions of concepts like local extremum, limit, continuity, derivative, antiderivative and integral
- qoute, explain and use central theorems such as the first and second fundamental theorem of calculus, the mean value theorems, the intermediate value theorem, the extreme value theorem
- use rules for limits, derivatives, antiderivatives and integrals
- carry out examinations of functions, e.g., using derivatives, limits and the properties of the elementary functions, and by that means draw conclusions concerning the properties of functions
- use standard techniques in order to determine antiderivatives and definite integrals
- make comparisons between sums and integrals
- perform routine calculations with confidence
- carry out inspections of results and partial results, in order to verify that these are correct or reasonable.

Course content

Functions of a real variable. Limits and continuity. Derivatives. Rules of differentiation. Derivatives of the elementary funtions. Properties of differentiable functions. Derivative and monotonicity. Graph sketching, tangents and normals, asymptotes. Local and global extrema. Derivatives of higher order. How to find antiderivatives. Partial integration, the method of substitution. Antiderivatives to rational functions, functions containing certain radicals and trigonometric functions. The Riemann integral: definition and properties.
Integration of continous functions. Connection between the definite integral and antiderivatives. Methods of integration. Definition and calculation of generalised integrals. Estimation of sums.

Teaching and working methods

Lectures and problem classes. The IT programme has a different organization, due to the study programme syllabus.

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
Axel Hultman (Y, Yi, MED, Mat, FyN, FRIST), Magnus Herberthson (I, Ii), Hans Lundmark (D, IT,U,KB,TB) och Mikael Langer (M,DPU, EMM)

Course website and other links

Education components
Preliminary scheduled hours: 66 h
Recommended self-study hours: 94 h

Course literature

Additional literature

Books

Forsling, G. och Neymark, N., *Matematisk analys, en variabel* Liber

Other

Problemsamling utgiven 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://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.