Calculus

Programme course

12 credits

Analys i en variabel

TAIU10

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
- Computer Engineering, B Sc in Engineering
- Engineering Electronics, B Sc in Engineering
- Chemical Analysis Engineering, B Sc in Engineering
- Mechanical Engineering, B 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.

Intended learning outcomes

That you as a student will learn to feel confident with the mathematical expressions, reasoning and relations from Single Variable Calculus and that it will teach you calculating and problem solving skills needed for your further studies. After a completed course you should be able to:

- Read and interpret mathematical texts
- Explain definitions and expressions like local extremes, limits, continuity, derivatives, primitive functions and integrals
- Explain and use central theorems like The Fundamental Theorem of Calculus, Mean-Value Theorems, The Intermediate-Value Theorem and The Max-Min Theorem.
- Use mathematical laws for limits of functions, derivatives, antiderivatives and integrals.
- Perform investigations of functions using derivatives, limits and the properties of basic functions and from this draw conclusions regarding the properties of the functions
- Use standard techniques to calculate antiderivatives and definite integrals.
- Express and calculate geometrical quantities like areas of plane regions, arc length, volumes of solids of revolution and areas of solids of revolution.
- Handle differential equations (first-order separable and first-order linear equations and constant-coefficient equations of higher order.) and integralequations.
- Explain Taylor's formula
- Use Taylorexpansions to approximate functions and investigate limits.
- Perform checks of results and calculations to verify that they are correct and reasonable

Course content

- Preparatory course: Equations and systems of equations. Geometric and arithmetic sums. Inequalities. Binomial theorem. Exponential functions and logarithms. Polynomials. Trigonometry and trigonometric functions.
- Calculus: Real and complex numbers. Induction. Functions of a real variable. Elementary functions. Sequences, limits. Derivatives and continuity. Rules for differentiation. Properties of continuous functions. Study of functions. Primitive functions. Integration and geometrical applications, including area, curve length, areas of rotation and volumes of rotation. Improper integrals. Taylor's formula. Maclaurin expansions of elementary functions with applications to the calculation of limits. Linear ordinary differential equations of first and second order, separable equations.

Teaching and working methods

The course is taken during the first semester of the first year. Teaching is done in lectures and problem classes. The examination consists of two written tests.
The course runs over the entire autumn semester.

Examination

KTR3	Examination	0 credits	U, 3, 4, 5
KTR2	Examination	0 credits	U, 3, 4, 5
KTR1	Examination	0 credits	U, 3, 4, 5
TEN2	Written examination	6 credits	U, 3, 4, 5
TEN1	Written examination	6 credits	U, 3, 4, 5

Passed written test 1 and written test 2 gives a bonus on the first written examination (TEN1). Approved written test 3 gives a bonus to the second written examination (TEN2). The right to count the bonuses from the tests is 12 months from the date of writing.

Grades

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

Other information

Supplementary courses: Transform Methods, Discrete Mathematics, Numerical Algorithms

Department

Matematiska institutionen

Director of Studies or equivalent

Jesper Thorén

Examiner

Magnus Berggren

Course website and other links

http://www.mai.liu.se/kurser/TAIU10-ing.html

Education components

Preliminary scheduled hours: 202 h
Recommended self-study hours: 118 h

Course literature

Additional literature

Books

Forsling, Göran och Neymark Mats, (2011) *Matematisk analys, en variabel* Liber

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.