



LTH

FACULTY OF
ENGINEERING

Course syllabus

Matematisk analys Calculus

FMAA50, 13,5 credits, G1 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED F/Pi

Date of Decision: 2023-04-18

General Information

Compulsory for: IBYA1, IBYI1, IBYV1, IDA1, IEA1

Language of instruction: The course will be given in Swedish

Aim

The course aims at giving a basic treatment of one-dimensional calculus. Particular emphasis is put on the role which this plays in applications in different areas of technology, in order to give the future engineer a good foundation for further studies.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- within the framework of the course with confidence be able to handle elementary functions of one variable, including limits, derivatives and integrals
- be able to set up and solve some types of linear and separable differential equations that are important in the applications
- be able to give a general account of, and illustrate the meaning of, mathematical concepts in calculus in one variable that are used to construct and study mathematical models in the applications.

Competences and skills

For a passing grade the student must

- be able to demonstrate a good ability to carry out algebraic calculations, and be able to compute with complex numbers

- in connection with problem solving be able to demonstrate an ability to independently choose and use mathematical concepts and methods of one-dimensional analysis, and to construct and analyse simple mathematical models
- in the context of problem solving be able to integrate knowledge from different parts of the course
- be able to demonstrate an elementary ability to explain the solution of a mathematical problem within the course, in a well structured way and with clear logic.

Contents

Algebra:

Algebraic computations. Functions, equations, inequalities and modulus of a number. Complex numbers. Powers and logarithms. Trigonometry. Curve sketching: elementary functions and second degree curves.

Calculus 1:

Complex numbers and polynomials. The concept of a function. Properties of the elementary functions: graphs, formulas, limits. Limits with applications: the number e , series. Continuous functions. Derivatives: definition and properties, applications. Differentiation of the elementary functions. Properties of differentiable functions: the mean value theorem with applications. Curve sketching. Local extreme values. Optimization.

Calculus 2:

Primitive functions. Partial integration and change of variable. Partial fractions. Definition of the Riemann integral. Methods of integration. Riemann sums. Geometrical and other applications of integrals. Improper integrals. Differential equations of first order: linear and separable with applications. Linear differential equations of second order: solution of homogeneous and certain inhomogeneous equations, with applications. The Taylor and Maclaurin formulae. Power series expansions of the elementary functions, with applications.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Computer test on the subcourse Algebra, which graded only with Passed or Not passed. Written examinations on the subcourses Calculus 1 and 2. These are graded on a scale from 3.0 (passed) to 6.0 in steps of 0.1. The final grade is the integer part of the mean of these two grades (at most 5). The subcourse Algebra finishes with a short online examination in study week 5 of the first study period. The subcourse Calculus 1 begins in study week 6. A re-sit of the online examination is, besides the re-sit examination periods, offered during the ordinary exam period in October.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0117. **Name:** Algebra.

Credits: 3. **Grading scale:** UG. **Assessment:** Computer quiz, with grades Passed and Not passed.

Contents: See above, Algebra. **Further information:** The computer quiz is scheduled after study week 5 in study period 1.

Code: 0217. **Name:** Calculus 1.

Credits: 6. **Grading scale:** TH. **Assessment:** Written test. **Contents:** See above, Calculus 1. **Further information:** The subcourse starts in study week 6 of study period 1.

Code: 0317. **Name:** Calculus 2.

Credits: 4,5. **Grading scale:** TH. **Assessment:** Written test. **Contents:** See above, Calculus 2.

Admission

The number of participants is limited to: No

The course overlaps following course/s: FMA415, FMAA01, FMAA05, FMA410, FMA645, FMAB65, FMAB70, FMAB45, FMAB50, FMAB60

Reading list

- Månsson, J. och Nordbeck, P.: Endimensionell analys. Studentlitteratur, 2011, ISBN: 9789144056104.
- Övningar i endimensionell analys. Studentlitteratur, 2018, ISBN: 9789144127187.
- Dunkels, A m.fl.: Mot bättre vetande i matematik. Studentlitteratur, 2002, ISBN: 9789144019192.

Contact and other information

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Course homepage: <https://canvas.education.lu.se/courses/20441>