# HF1905 Mathematical Analysis 5.0 credits

**Matematisk analys**

This is a translation of the Swedish, legally binding, course syllabus.

## Establishment

Course syllabus for HF1905 valid from Autumn 2019

## Grading scale

A, B, C, D, E, FX, F

## Education cycle

First cycle

## Main field of study

Technology

## Specific prerequisites

Basic and specific requirements for bachelor's program in engineering.

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

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# Intended learning outcomes

After completing the course students should for a passing grade be able to:

- Define and interpret the fundamental concepts of linear algebra and calculus : vector, dot product, cross product, triple product, line, plane, matrix, determinant, limit, continuity, derivative, integral.
- Do calculations with complex numbers in polar, rectangular and exponential form.
- Solve and geometrically interpret systems of linear equations.
- Use vector algebra to evaluate projections, distance, areas and volumes.
- Sketch the graph of a function using asymptotes, critical points, the derivative test for increasing/decreasing functions, and concavity.
- Apply differentiation to solve applied max/min problems for functions of one variable.
- Use L'Hospital's rule to evaluate certain indefinite forms.
- Evaluate integrals using techniques of integration, such as substitution, and integration by parts.
- Use the methods of integration to evaluate areas and volumes.
- Solve first order differential equation.
- Solve second order linear differential equation with constant coefficient.
- Apply differential equations to different technical fields. Understand and apply the procedures for integrating rational functions.
- Calculate partial derivatives.
- Apply partial derivatives for finding extreme values for functions of two variables.
- Calculate and apply double integrals for computing areas, volumes and moments of inertia.
- Use suitable software for symbolic as well as numerical solving mathematical problems and applications mentioned above. For higher grades, the student in addition should be able to:
- Derive important relations in mathematical analysis.
- Generalize and adapt the methods to use in somewhat new contexts.
- Solve problems that require synthesis of material and ideas from all over the course.
- Solve more advanced problems in, for example, integrals and applications.

# Course contents

- Concepts of function, limits and continuity.
- Elementary functions.
- Differentiation rules.
- Taylor's formula
- Application to curve sketching, rates, and extremum problems.
- L'Hospital's rule.

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- Definite and indefinite integration. Techniques of integration.

- Basic integration techniques and applications.

- Functions of several variables. Partial derivatives. Maxima and minima.

- Double integrals in Cartesian and polar coordinates and applications: area, volume and moments of inertia.

- Differential equations: First order ordinary differential equations. Separable differential equations. Linear first-order differential equations.

- Linear higher-order differential equations. Linear differential equations with constant coefficients. Applications.

# Course literature

MATEMATIK FÖR INGENJÖRER, Staffan Rodhe, Håkan Sollervall, Studentlitteratur. Upplaga 6 (eller nyare), ISBN13: 9789144067964.

# Examination

- TEN1 - Examination, 5.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

# Ethical approach

- All members of a group are responsible for the group's work.

- In any assessment, every student shall honestly disclose any help received and sources used.

- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.