HF1006 Linear Algebra and Calculus in One Variable 10.0 credits

Linjär algebra och analys

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

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

Establishment

Course syllabus for HF1006 valid from Autumn 2017

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Language of instruction

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

Intended learning outcomes

After completing this course, students should demonstrate competency in the following skills:

- 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.
- 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
- Use suitable software for symbolic as well as numerical solving mathematical problems and applications mentioned above.

Course contents

LINEAR ALGEBRA

- Complex numbers: The complex plane. Modulus and argument. Polar, rectangular and exponential form.
- Euler´s and de Moivre´s theorems. Binomial equations. Algebraic equations.
- Systems of linear equations. Gauss elimination method.
- Vectors. Linear independent vectors
- Dot product, vector cross product, scalar triple product,
- Equations of lines in 3D. Equations of planes in 3D
- Determinant. Matrices, matrix operations.
- Eigenvalues, eigenvectors.

CALCULUS

- Concepts of function, limits and continuity.

- Elementary functions
- Differentiation rules.
- Application to graphing, rates, and extremum problems.
- L'Hospital's rule.
- Definite and indefinite integration. Techniques of integration.
- Applications of integration.
- 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 (ISBN13: 9789144067964)

Examination

- LAB1 - Laboratory Work, 2.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination, 4.0 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.

Passed exams:
TEN1, (4 Cr, exam, Linear algebra), grading: A/B/C/D/E/Fx/F
TEN2, (4 Cr, Calculus, written exam), grading: A/B/C/D/E/Fx/F

Passed lab work
LAB1, (2 Cr.), grading: P/F

One of the following mathematical software packages will be used: Matlab, Mathematica or Maple.

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.