KH1111 Mathematics 15.0 credits

Matematik

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

Establishment

Course syllabus for KH1111 valid from Autumn 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completion of upper-secondary school before 1 July 2011 and adult education at upper-secondary level before 1 July 2012

Specific entry requirements: Mathematics D, Physics B and Chemistry A. The grade Passed or 3 in each of the subjects is required.

Completion of upper-secondary school from 1 July 2011 and adult education at upper-secondary level from 1 July 2012 (Gy2011)

Specific entry requirements: Physics 2, Chemistry 1 and Mathematics 3c. A pass in each of the subjects is the lowest acceptable grade.

Language of instruction

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

Intended learning outcomes

After passing the course, the students should be able to:

- use basic theorems and important concepts to formulate, analyze, communicate and solve mathematical problems in
  - Arithmetic and algebra
  - Vector geometry and matrix algebra
  - Basic mathematical analysis
- evaluate and critically examine results from mathematical models and calculations
- use calculation and analysis programs to solve mathematical problems

Course contents

PART A

- Structure of the number system
- Algebraic simplifications
- Square and cubic roots, absolute values, powers, logarithms and trigonometric relationships
- Elementary functions with inverse functions and their graphs
- Quadratic curves
- Inequalities
- Equations with absolute values, polynomial, exponential, power, logarithmic and trigonometric equations
- Trigonometric identities
- Complex number sets, Argand diagram and complex planes
- Conjugate to a complex number
- Complex numbers in Cartesian, Polar and Exponential form
- Loci and regions of the complex plane
- De Moivre's theorem
- Equations with non-real roots and equations with complex coefficients

PART B

- Vector space
- Addition and subtraction of vectors, multiplication between vectors, the length of a vector
- Distance in the plane and in the space
- Dot product and Cross product of vectors
- Line equation in the plane and in the space
- Distance, angle and possibly intersections between lines in the plane and space
- Equation for a plane in space
- Distance, angle and possibly intersection between lines and plane or plane and plane in the space
- Area for triangle and parallelogram in the plane and in the space, the volume of a parallelepiped.
- Addition, subtraction and multiplication of matrices
- Matrix equations
- Unit matrix and invert matrices of order 2 and 3
- Linear equation systems with Gauss' elimination method and Jacobi's method
- Least square method for curve fitting
- Matlab as a mathematical analysis tool

PART C

- Arithmetic and geometric sequences and their economic and scientific applications
- Functional concepts, real, compound, monotonic, inverse and arcus functions
- Limit values
- Sequence of numbers as n goes towards infinity
- L´Hospital's rule for evaluating limits
- Conditions for continuous functions
- The derivative's definition and derivation of the derivative to the elementary functions
- Linear approximation
- Chain, product and quota rule when deriving
- Logarithmic derivation, implicit derivation
- Numerical equation solution with Newton's method
- Application of the derivative in curve construction, in calculating rates and in optimization problems
- Primitive functions to elementary functions, integration by parts, substitution, integrals of rational functions
- Numeric integration with Trapezoidal and Simpson's method
- Definite and improper integrals
- Application of integrals in area calculation, volume calculation and calculation of arc length
- Curves in polar form

- Volume calculation with double integral
- Numerical solution of differential equations with Euler's method with Excel
- Separate differential equations, use of integrative factor to solve first-order equations
- First- and second order linear homogeneous differential equations
- Maclaurin series for elementary functions.
- Application of Maclaurin series in integral calculation and limit value calculations

Examination

- TENC - Written examination C, 6.0 credits, grading scale: P, F
- TENB - Written examination B, 4.0 credits, grading scale: P, F
- TENA - Written exam A, 3.0 credits, grading scale: P, F
- LABB - Computer Lab Works 2, 1.0 credits, grading scale: P, F
- LABA - Computer Lab Works 1, 1.0 credits, grading scale: P, 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.