SF1605 Complementary Course in Linear Algebra 1.5 credits

Kompletteringskurs i linjär algebra

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

Establishment

Course syllabus for SF1605 valid from Autumn 2014

Grading scale

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

Education cycle

First cycle

Main field of study

Mathematics, Technology

Specific prerequisites

SF1624 Algebra and Geometry, or equivalent.

Language of instruction

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

Intended learning outcomes

The general objective of the course is to be a complement for students that have taken a smaller course in Linear algebra, especially SF1624, so that the student will achieve the same knowledge as is expected in the course Linear algebra, SF1604. More precisely after a course is expected that the students should be able to

- understand the concept linear vector space and concepts like subspace, linear span, linear independence, bases, dimension and coordinates.
- be able to decide whether a set of vectors is linearly independent and be able to find bases for vector spaces and the dimension of subspaces.
- know how to calculate the rank of a matrix and understand the connection between the rank and the dimension of the null space of a matrix.
- know the definition of an inner product space and be able to decide if a product is an inner product.
- use the Gram Schmidt method to find an orthogonal base in a subspace of an inner product space, and to be able to characterize orthogonal matrices.
- master the use of the least square method to find optimal solutions of inconsistent linear equations.
- master the use of transformation matrices for changing the base in a vector space.
- be able to decide whether or not a map between vector spaces is a linear map and determine the matrix of a linear map.
- use mathematical induction in simple cases.

Course contents

Complex numbers, polynomials, proof by induction. Systems of linear equations, real and complex matrices and determinants; Cramer's rule. Adjoint and inverse matrix. Cross product, dot product and geometry in R^2 and R^3 as well as generalisations to higher dimensions. The Gram-Schmidt orthogonalization process and projections in R^n. General vector spaces and inner product spaces. Linear maps between vector spaces, eigenvalues and eigenvectors, quadratic forms. Change of basis and matrix representation of linear maps and quadratic forms in different bases. Diagonalization of matrices. The Spectral theorem for symmetric matrices.

Course literature

Anton/Rorres: Elementary Linear Algebra with Applications. 9:th ed.

Tomas Ekholm: Kompletteringskompendium.

Examination

- TEN1 - Examination, 1.5 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.

Other requirements for final grade

Written or oral exam (TEN1; 1,5 university credits).

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.