Linear Algebra

Single subject and programme course

7.5 credits

Linjär algebra

764G01

Valid from:

Determined by
The Quality Board at the Faculty of Arts and Sciences

Date determined
2007-10-15

Revision date
2012-08-30

Offered for the last time
Spring semester 2023

Replaced by
764G08

Main field of study
Mathematics

Course level
First cycle

Advancement level
G1X

Course offered for
- Bachelor´s Programme in Statistics and Data Analysis

Intended learning outcomes
The student will learn basic mathematical concepts and methods in linear algebra that are used by statisticians. The course objective is for the student to be able to read and understand linear algebra in scientific statistical texts, and to be able to conduct logical reasoning and linear algebra calculations.

This includes that the student will
- be able to solve systems of linear equations.
- know the concept of a vector in arbitrary dimenstion.
- be able to calculate scalar products and projections of vectors.
- know the concepts of a matrix and be able to perform matrix calculations.
- be able to calculate determinants and know what the determinant say about linear dependencies.
- know examples of linear maps and how to represent these by matrices.
- know the concepts of basis and coordinates, and be able to use orthogonal matrices for change of bases.
- be able to determine eigenvalues and eigenvectors.
- be able to diagonalize symmetric matrices and use this on quadratic forms.
- be able to use the method of least squares and know about the geometrical interpretation.

Course content

The following be treated in the course.
- Linear systems of equations: succesive elimination and substitution, possible solutions, geometrical interpretation.
- Matrices: multiplication, transpose, rank, trace, inverse, easy equations.
- Vectors: geometrical vectors, scalar product, projections, coordinates, linear combinations, linear independencies/dependencies.
- Bases: orthonormal bases, change of bases, orthogonal matrices, Gram-Schmidt process.
- Determinants: definition, calculation of orders 2 and 3, relation to linear dependencies and systems of equations.
- Linear maps: geometrical examples, matrix representation.
- Diagonalization: eigenvalues, eigenvectors, spectral decomposition, calculations for matrices of order 2 and 3.
- Quadratic forms: matrix representation, diagonalization.
- Method of least squares: overdetermined systems of equations, geometrical interpretation, curve-fitting.

Teaching and working methods

The teaching will be lectures, where concepts and methods will be presented, and lessons with the possibility for individual help in the students own work with exercises. Self-studies is necessary as a complement to the scheduled teaching.

Examination

A control exam that is not obligatory.
A written exam.

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it. If the coordinator has instead recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner assesses that it is possible, based on consideration of the course objectives.

Students failing an exam covering either the entire course or part of the course twice are entitled to have a new examiner appointed for the reexamination.

Students who have passed an examination may not retake it in order to improve their grades.

Grades

Three-grade scale, U, G, VG

Other information

Planning and implementation of a course must take its starting point in the wording of the syllabus. The course evaluation included in each course must therefore take up the question how well the course agrees with the syllabus. The course is carried out in such a way that both men´s and women´s experience and knowledge is made visible and developed.

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Department

Matematiska institutionen