Linear Algebra

Programme course

6 credits

Linjär algebra

TAIU05

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Mathematics, Applied Mathematics

Course level
First cycle

Advancement level
G1X

Course offered for
- Computer Engineering, B Sc in Engineering
- Chemistry
- Engineering Electronics, B Sc in Engineering
- Chemical Analysis Engineering, B Sc in Engineering
- Mechanical Engineering, B Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Intended learning outcomes

The aim of this course is to acquaint the students with mathematical concepts and methods from linear algebra that are foundational in the natural sciences. Moreover, they should develop an ability to follow and conduct logical reasoning and gain computational and problem solving skills that are essential to further studies in technology and science. After passing the course, one should also be able to understand linear algebraic concepts that frequently occur in technical reports. In order to achieve this, it is necessary to be able to

- solve linear systems of equations using elimination, and to know that such systems have either zero, one or infinitely many solutions.
- carry out matrix computations and solve simple matrix equations.
- define and use the concepts of bases, ON bases and coordinates.
- compute and apply equations for lines and planes.
- compute intersections between lines, between planes and between lines and planes.
- compute distances from points to lines and from points to planes.
- define scalar products and compute scalar products in ON bases.
- use the projection formula.
- define cross products and triple products and compute these in ON bases.
- use the method of least squares.
- compute 2x2 and 3x3 determinants.
- explain the connection between determinants and invertibility of matrices and use determinants for area and volume computations.
- define the concept of linear transformations and find and carry out computations with the corresponding matrices.
- define and compute eigenvalues and eigenvectors of matrices and linear transformations and interpret these notions geometrically.
- use the coordinate identity for basis change and transforming matrices between different bases.
- diagonalise matrices and use this in certain applications.
- solve certain systems of differential equations using diagonalisation methods.

Course content

Systems of linear equations. Matrices and inverses. Geometrical vectors. Scalar product. Vector product and orientation. Determinants. Lines and planes. Method of least squares. Change of basis. Linear mappings and their matrices. Eigenvalues and eigenvectors. The spectral theorem. Systems of differential equations.

Teaching and working methods

Lectures and tutorials.

Examination

TEN1	Written examination	6 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Matematiska institutionen

Director of Studies or equivalent

Jesper Thore'n

Examiner

Magnus Herberthson

Course website and other links

http://www.mai.liu.se/und/kurser/index-amne-tm.html

Education components

Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.