



DEPARTMENT OF MATHEMATICAL SCIENCES

MMG400 Linear Algebra, 7.5 credits

Linjär algebra II, 7,5 högskolepoäng

First Cycle

Confirmation

This course syllabus was confirmed by Department of Mathematical Sciences on 2017-06-26 and was last revised on 2022-06-07 to be valid from 2022-08-29, autumn semester of 2022.

Field of education: Science 100%

Department: Department of Mathematical Sciences

Position in the educational system

The course can be part of the following programmes: 1) Bachelor of Science in Physics (N1FYS), 2) Bachelor's Programme in Mathematics (N1MAT) and 3) Medical Physicist Programme (N1SJU)

Main field of studies

Mathematics

Specialization

G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Entry requirements

In addition to general entry requirements, this course requires knowledge equivalent to the courses *MMG200 Mathematics 1* (or *MMGF10* or *MMGF11*) and *MMG300 Multivariable analysis* (or *MMGF20*).

Learning outcomes

On successful completion of the course the student will be able to:

- use important concepts in linear algebra and especially handle more abstract vector spaces (e.g. be able to regard a function as a vector in a vector space),
- define important concepts and prove important theorems in the course
- analyse linear operators by means of eigenvectors and generalised eigenvectors,

- use the structure of linear operators to solve problems concerning discrete dynamic systems and linear differential equations.

Course content

Abstract vector spaces over the real or the complex numbers. Bases and dimensions. Linear transformations between vector spaces. Rank and kernel. The matrix of a linear transformation and its dependence on choice of basis. Eigenvalues and eigenvectors. Diagonalisation of linear operators. Applications to discrete dynamic systems and differential equations. The matrix exponential. Real and complex scalar product spaces. The Cauchy-Schwarz inequality. Orthogonal bases. . The Riesz representation theorem and adjunct operators. Isometries and unitary operators. The spectral theorem for self-adjoint operators. Quadratic forms and symmetric matrices. Generalised eigenvectors. Jordan's normal form and nilpotent matrices.

Form of teaching

Language of instruction: Swedish

Assessment

The examination consists of a written examination at the end of the course. During the course, there may be optional assignments that give bonus points on the exam.

Examples of such components are tests, written assignments, laboratory sessions or project work. Information for the current course instance is given via the course homepage.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

The course is evaluated with an anonymous questionnaire and/or a discussion with the student representatives. The result and any changes to the course will be communicated to the students who carried out the evaluation and to the students who are to start the course.

Additional information

For literature list, see:

<https://www.chalmers.se/sv/institutioner/math/utbildning/grundutbildning-goteborgs-universitet/kurslitteratur/Sidor/Kurslitteratur-i-matematik.aspx>

The course syllabus of MMG400 was originally established to apply from 01/07/2007, when it replaced MAM220, and was revised 20/11/2008.