



LUND
UNIVERSITY

Faculty of Science

MATC70, Mathematics: Matrix Theory, 7.5 credits

Matematik: Matristeori, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2018-04-26 to be valid from 2018-04-26, autumn semester 2018.

General Information

The course is an optional course for first-cycle studies for a Bachelor of Science or a Master of Science degree in mathematics.

Language of instruction: English

Main field of studies

Mathematics

Depth of study relative to the degree requirements

G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The main aim of the course is to convey knowledge about concepts and methods from matrix theory and linear algebra which are important in applications within many subjects in science, technology and economy, and familiarity with their use.

Knowledge and understanding

On completion of the course, the student should be able to:

- independently characterize and use different types of matrix factorizations.
- independently explain the theory of matrix functions, in particular polynomials, and its connection to the Jordan normal form.
- describe different types of vector and matrix norms, and to compute or estimate them as well with as without computer support.
- describe the common classes of normal matrices and their properties.

Competence and skills

On completion of the course, the student should be able to:

- integrate methods and approaches from the different parts of the course in order to solve problems and answer questions within the framework of the course.
- write computer programs for the solution of mathematical problems within the framework of the course.
- orally and in writing, with clear logic and with proper terminology be able to explain the solution to a mathematical problem within the framework of the course.

Course content

Matrices and determinants. Linear spaces. Spectral theory. The Jordan normal form. Matrix factorizations. Matrix polynomials and matrix functions. Norms. Scalar products. Singular values. Normal matrices. Quadratic and Hermitian forms. The Least Squares method and pseudo inverses. Non-negative matrices.

Course design

The teaching consists of lectures and exercise classes. Two smaller programming assignments shall be completed during the course.

Assessment

The examination consists of a written home examination, an appurtenant oral examination and two programming assignments. The oral examination is only given to those students who have passed the written home examination.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

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Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

To achieve the grade Pass, it is required to pass the programming assignments, the written home examination and the oral examination. Whether the grade Pass with distinction should be given is decided by combining the results of the included examination parts.

Entry requirements

To be eligible for the course, at least 67.5 higher education credits in mathematics and numerical analysis are required, including the courses MATB22 Linear Algebra 2, 7.5 credits, NUMA01 Computational Programming with Python, 7.5 credits and one of the courses MATB13 Discrete Mathematics 7.5 credits and MATB24 Linear Analysis 7.5 hp, or equivalent.

Further information

The course is given jointly with the course FMAN70 Matrix theory, 6 credits, at the Faculty of Engineering and can not be included in a degree together with this course.

Subcourses in MATC70, Mathematics: Matrix Theory

Applies from H18

- 1801 Written take-home examination, 6,0 hp
Grading scale: Fail, Pass, Pass with distinction
- 1802 Oral examination, 1,5 hp
Grading scale: Fail, Pass, Pass with distinction
- 1803 Computer assignments, 0,0 hp
Grading scale: Fail, Pass