SF2524 Matrix Computations for Large-scale Systems 7.5 credits

Matrisberäkningar för storskaliga system

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

Establishment

Course syllabus for SF2524 valid from Autumn 2014

Grading scale

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

Education cycle

Second cycle

Main field of study

Mathematics, Technology

Specific prerequisites

Single course students: 90 university credits including 45 university credits in Mathematics or Information Technology. English B, or equivalent

Language of instruction

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

Intended learning outcomes

After having completed the course the student will understand the principles of computations with matrices. Moreover, the student will be able to select, implement, apply andanalyze the most important matrix methods suitable for the matrix problems stemming from particular applications.

- The student should be able to setup and formulate the matrix problems stemming from a applications in, for instance systems and control, acoustics, or quantum chemistry.
- The student will be able to select an appropriate matrix representation and select an algorithm based on the structure of the problem and matrix.
- The student will be able to derive and implement the most important algorithms for the main problems of the course.
- The student will be able to relate the theoretical properties of the algorithm, such as error and computation time, with the implementation, output and performance of the algorithm.
- The student will be able to derive new variants of the algorithms for related problems based on the set of matrix computation tools in the course.

Course contents

- Fundamentals of matrix computations: Floating point arithmetic, computational complexity, representation of matrices.
- Iterative and direct methods for linear systems of equations: large, structured and sparse systems.
- Iterative methods for eigenvalue problems: full matrices, large and sparse matrices, other structures, applications.
- Methods for large-scale dynamical systems: stability, model reduction, and computation of Gramian.
- Algorithms for matrix functions: direct methods, iterative methods and applications.

Course literature

Course literature will be announced at least 4 weeks before course start at course web page.

Examination

- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- LABA - Laboratory, 3.5 credits, grading scale: P, 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

- Laborations completed (LABA)
- Written Exam completed (TEN1)

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.