



DN2253 Numerical Algebra, Methods for Large Matrices 7.5 credits

Numerisk algebra för stora matriser

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

Establishment

Course syllabus for DN2253 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

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 should realize how linear algebra is depending on computer resources and accuracy when performing a scientific computation. The student should also be able to utilize modern computing routines from linear algebra in a practical problem.

After the course the student should be able to

- identify linear algebra computations in a practical problem
- perform such a computation, estimate computer resources and judge the quality of the results
- implement special algorithms adapted to the properties of the problem
- design the algorithm so that the machine architecture of the computers can be utilized.

Course contents

Linear systems of equations: direct algorithms, perturbation theory and condition, rounding errors. Sparse matrices.

Iterative methods: stationary iterations, Krylov space methods and preconditioning.

Eigenvalue problems: theory, transformation methods and iterative methods.

Singular value decomposition and its applications in data analysis and information retrieval.

Model reduction for linear and nonlinear dynamical systems.

For each algorithm it is studied how it works, how many resources that are used as well as how good accuracy that can be expected in the results.

Course literature

James W. Demmel: Applied Numerical Linear Algebra, SIAM 1997.

Material on current problems and methods distributed at course.

Examination

- TENB - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- LABB - Laboratory Work, 3.0 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

Computer assignments (LAB1; 3 university credits).

Oral final exam (TEN1; 4,5 university credits).

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.