DN2220 Applied Numerical Methods I 6.0 credits

Tillämpade numeriska metoder I

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

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for DN2220 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Mathematics

Specific prerequisites

Language of instruction

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

Intended learning outcomes

An overall aim with this second course is to give the student knowledge about how to formulate, use, and implement computer oriented numerical methods to solve problems from different areas of application

After having taken the course the student shall be able to

- identify problem type of a practical numerical problem

- know how such a computation should be performed, choose suitable algorithm, estimate the computer resources needed and judge the quality of the result

- implement the algorithms in a computer language suitable for numerical computation, e.g. Matlab

- use computer tools for simulation and visualization in science and engineering

Course contents

Review and deepening of the basic course. Optimization in one and several variables. Geometric modeling in 2D and 3D using splines and Bezier curves.

Numerical linear and nonlinear algebra, sparse matrices, direct and iterative methods for solving linear systems of equations.eigenvalue algorithms, QR-factorization, SVD with applications. Discrete fourier transform with applications. Linear and nonlinear least-squares fitting. Boundary value problems and eigenvalue problems for ordinary differential equations. Finite difference methods and Galerkin's method. Explicit and implicit methods for initial value problems for ordinary differential equations. Stability and stiff problems.

Numerical treatment of partial differential equations, algorithms for parabolic, elliptic and hyperbolic problems.

Course literature

To be announced at course start. In previous year:

G. Eriksson, Kompendium i tillämpade numeriska metoder

C. Moler, Numerical computing with Matlab, SIAM 2004

T. Sauer, Numerical analysis, Pearson 2006

Examination

- LAB1 - Laboratory Task and Project Work, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

Other requirements for final grade

Written exam (TENl; 3 university credits).
Computer assignments (LAB1; 3 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.