DN1215 Numerical Methods, Basic Course 7.5 credits

Numeriska metoder, grundkurs

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

Establishment

Course syllabus for DN1215 valid from Autumn 2009

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Language of instruction

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

Intended learning outcomes

An overlying goal with the course is the realization of the necessity of numerical methods in order to simulate technological and scientific processes based on mathematical models.

After completing this course, the students should be able to

- identify various mathematical problems and reformulate these in a way suitable for numerical treatment
- select a suitable numerical method for the treatment of the given problem
- motivate the choice of a method by describing its advantages and limitations
- select an algorithm leading to efficient computation and implement this in a programming language, suitable for scientific computing, e.g. Matlab
- present the results in a relevant and illustrative way
- provide an estimate of the accuracy of the results
- utilize standard functions from e.g. Matlab's library for calculation, visualization and efficient programming.

Course contents

Basic concepts and ideas: algorithm, local linearization, iteration, extrapolation, discretization, convergence, stability, condition.

Reliability assessment: parameter sensitivity, experimental perturbations, precision.

Numerical methods for: linear and nonlinear systems of equations, interpolation, model-fitting with the method of least squares, optimization, quadrature. Methods for systems of ordinary and some partial differential equations, initial value problems, boundary value problems and methods for Fourier analysis.

The application of mathematical software in the solution of scientific and engineering problems, numerical experimentation, and the presentation of effective algorithms.

Course literature

G. Eriksson: Numeriska algoritmer med Matlab, CSC/Nada 2002.

T. Sauer: Numerical Analysis, Pearson 2006.

Examination

- PRO1 - Project, 2.5 credits, grading scale: P, F
- TEN1 - Examination, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 2.5 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.

In this course all the regulations of the code of honor at the School of Computer science and Communication apply, see: http://www.kth.se/csc/student/hederskodex/1.17237?l=en_UK.

Other requirements for final grade

Examination (TEN1; 2,5 hp) Laboratory assignments (LAB1; 2,5 hp) Project (PRO1; 2,5 hp)

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.