DN2225 Numerical Solutions of Differential Equations 6.0 credits

Numerisk behandling av differentialekvationer

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 DN2225 valid from Spring 2009

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 overlying goal with the course is to give the student knowledge about how to formulate, utilise, analyze and implement advanced computer oriented numerical methods for solving those differential equation problems that are of importance in applications.

After completing this course the student should be able to

- for a given problem, identify problem type within the area of differential equations, ordinary and partial, and suggest an algorithm for the numerical solution
- utilise and analyze the most important algorithms for the kind of problems presented in this course
- utilise those algorithms from other areas of numerical analysis which are necessary for solving differential equations, e.g. large sparse linear systems of equations, Fourier analysis, etc
- set up and explain some fundamental mathematical models in science which are based on differential equations
- implement the algorithms i a programming language suitable for numerical computation, e.g. Matlab
- utilise computer tools for simulation and visualization of differential equation models in science and engineering.

Course contents

Numerical treatment of initial value problems, boundary value problems, and eigen-value problems for ordinary and partial differential equations. Discretization by finite differences, finite elements, and finite volumes. Convergence, stability and error analysis. Application oriented computer labs and a project.

Course literature

L. Edsberg "Introduction to Computation and Modeling for Differential Equations", Wiley 2008.

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

Examination (TEN1; 3 university credits).
Computer assignments and project work (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.