SF1523 Analytical and Numerical Methods for Differential Equations 7.5 credits

Analytiska och numeriska metoder för 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 SF1523 valid from Autumn 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Active participation in SF1625 Calculus in one variable and SF1522 Numerical Computations.

Language of instruction

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

Intended learning outcomes

A general aim with the course is to give the student the understanding that numerical methods and programming techniques are needed to make reliable and efficient simulations of technical and scientific processes based on mathematical models.

After the course the student should be able to

- Use concepts, theorems and methods to solve problems within analytical and numerical aspects of differential equations included in the course main content.
- Use analytical and numerical methods to solve differential equations included in the course main content, and show insight about possibilities and limitations for different methods.
- Read and assimilate mathematical text.

Course contents

- Equations: first and higher order scalar differential equations, systems of differential equations of first order, partial differential equations for heat conduction and waves,
- Concepts: discretization, approximation, convergence, condition numbers, linearization, stability,
- Methods: integrating factor, diagonalization, Fourier series, separation of variables, Fourier transform,
- Numerical method for integrals and differential equations: Eulers method, Runge-Kutta methods, the backward Euler method, boundary value problems, finite difference methods for heat conduction and waves,
- Numerical methods for optimization: Newton's method, Lagranges method.

Course literature

The course literature will be announced on the course homepage at least four weeks before the start of the course.

Examination

- LABA - Laboratory Works, 2.5 credits, grading scale: P, F
- TEN1 - Examination, 5.0 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.

In this course, the code of honour of the school is applied,
see: http://www.sci.kth.se/institutioner/math/avd/na/utbildning/hederskodex-for-studenter-och-larare-vid-kurser-pa-avdelningen-for-numerisk-analys-1.357185

The examiner decides, in consultation with KTHs Coordinator of students with disabilities (Funka), about any customized examination for students with documented, lasting disability.

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.