SF1541 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 SF1541 valid from Autumn 2013

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

For non-program students: basic university qualification and 15 credits in mathematics and 6 credits computer science or programming techniques.

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 are needed to make reliable and efficient simulations of technical and scientific processes based on mathematical models.

On completion of the course, the student should be able to

- identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment
- choose appropriate numerical method for treatment of the given problem
- explain choice of method by accounting for advantages and limitations
- choose an algorithm that implies efficient calculations and implement it in a programming language, suited for calculations, e.g. Matlab
- present the results in a relevant and illustrative way
- estimate the reliability of the results
- use functions from the programming language library for efficient calculations and visualisation

Course contents

Basic ideas and concepts: algorithm, local linearisation, iteration, extrapolation, discretisation, convergence, stability, condition.

Estimation of reliability: parameter sensitivity, experimental perturbation calculation, precision.

Numerical methods for: linear systems of equations, nonlinear equations and systems of equations, interpolation, model adaptation with the least squares method, optimisation, integrals and differential equations.

Using mathematical software to solve engineering mathematical problem, make numerical experiments and present efficient algorithms.

Course literature

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

T. Sauer: Numerical Analysis, Pearson 2006.

Examination

- LABB - Laboratory Work, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LABA - Laboratory Work, 1.5 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.

· LABA - Laboratory sessions, 1.5 credits, grading scale: P, F

· LABB - Laboratory sessions, 3.0 credits, grading scale: P, F

· TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F

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

Other requirements for final grade

A written examination (TEN1; 3 credits).
Laboratory assignments (LABA; 1.5 credits).
Laboratory assignments with oral and written presentation (LABB; 3 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.