DD2363 Methods in Scientific Computing 7.5 credits

Vetenskapliga beräkningsmetoder

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 DD2363 valid from Autumn 2016

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

90 credits, of which 45 credits should be in mathematics and/or informatics.

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

â€¢ design and implement explicit time-step methods for particle models

â€¢ design and implement implicit time-step methods for general systems of ordinary differential equations (ODE)

â€¢ design and implement algorithms for systems of non-linear equations

â€¢ formulate finite element methods (FIVE) for partial differential equations (PDE) and adapt FEM software to a given problem

â€¢ Suggest appropriate parallelisation strategy for a given particle model ODE or PDE.

Course contents

The course focuses on three fields:

â€¢ Particle models. Explicit time-step methods, N-body problem and sparse approximations. Applications e g on the solar system, mass-spring systems or molecular dynamics.

â€¢ ODE models. Implicit time-step methods, algorithms for sparse systems of non-linear equations. Applications in e g population dynamics, system biology or chemical reactions.

â€¢ PDE models. Space discretisation through particles, structured grids or unstructured grids. Grid algorithms, refinement, coarsening, optimisation. Stencil methods, function approximation, Galerkin's method, the finite element method.

For each area, computer implementation and algorithms for parallel and distributed computation are discussed, which also is practiced in computer exercises.

Course literature

Will be announced four weeks before the start of the course.

Examination

- LAB1 - Laboratory Assignments, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 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.

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.