DD2356 Methods in High Performance Computing 7.5 credits

Metoder inom högprestandaberäkningar

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 DD2356 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

Experience in programming in C/C++ and/or Fortran is necessary.

Language of instruction

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

Intended learning outcomes

The general aim of the course is to give basic knowledge of theory as well as hardware and software methods for parallel computations, especially issues in hardware and software as well as the interaction between them. Special focus will be put on the programming of multicore and cluster architectures. Also research questions in this field will be brought up.

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

- account for properties of different parallel architectures,
- discuss the efficiency of multicore systems and cluster systems,
- assess the potential for and limitations of parallel computations as well as improve scalability and efficiency of parallel computations,
- choose between different techniques for parallelisation, depending on application and the current parallel system,
- write parallel programs for multicore processors and cluster systems with OpenMP and MPI.

Course contents

The course focuses on three fields:

- Parallel computer architecture and parallel software. This includes the presentation of processor and memory systems of parallel computers. Furthermore, different types of parallelism (on instruction level, on computational task level and data parallelism) as well as performance models for parallel systems is described.
- Programming of multicore systems with OpenMP. Introduction to basic as well as more advanced concepts of OpenMP.
- Programming of cluster systems with MPI. Presentation of MPI and approaches for the parallelisation of programs.

Hardware and software for different platforms on CSC and PDC will be introduced at the first laboratory session.

Course literature

The reading list will be announced on the course web at least 4 weeks before the start of the course.

Examination

- LAB1 - Laboratory Assignments, 4.5 credits, grading scale: P, F
- LAB2 - Project, 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.

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.