



FDD3256 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 FDD3256 valid from Spring 2023

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Programming experience 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

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 parallelization, depending on the application and the current parallel system
- Write parallel programs for multicore processors and cluster systems with OpenMP and MPI
- List the power consumption, carbon footprint, and environmental impact of HPC devices and supercomputers

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

In addition, power consumption, carbon footprint, and environmental impact of HPC devices and supercomputers are discussed in a lecture.

Examination

- EXA1 - Examination, 7.5 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.

To pass the course, the student must complete three assignments and an advanced final project (report and oral presentation) related to the Ph.D. research.

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.