DN2264 Parallel Computations for Large-Scale Problems, Part 1 6.0 credits

Parallella beräkningar för storskaliga problem, del 1

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 DN2264 valid from Spring 2009

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

Language of instruction

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

Intended learning outcomes

The overall goal of the course is to provide a basic understanding of how to develop algorithms and how to implement them in distributed memory computers using the message-passing paradigm.

This understanding means that after the course you are able to

- explain parallelization strategies;
- select and/or develop an algorithm for solving a given problem which has the potential for an efficient parallelization;
- select and/or develop data structures for implementing parallel computations;
- theoretically analyze a given parallel algorithm with respect to efficiency;
- implement a given algorithm on a distributed-memory computer using the message passing library MPI;
- understand the message flow and avoid unwanted situations (e.g. deadlock, synchronization delays);
- modify and adapt a set of basic routines to special situations;
- experimentally evaluate the performance of a parallel program;
- explain differences between the theoretically expected performance and the practically observed performance.

Course contents

Basic ideas including hardware architectures, memory hierarchies, communications, parallelization strategies, measures of efficiency;

Simple numerical algorithms including matrix operations, Gaussian elimination;

Algorithms on graphs including graph partitioning problems;

Parallel sorting;

More advanced parallel problems including the n-body problem;

Advanced numerical methods including multi-grid and FFT methods;

Standard libraries.

Course literature

To be announced at least 2 weeks before the course starts at the web page for the course.

Examination

- HEM1 - Assignment, 3.0 credits, grading scale: P, F
- LAB1 - Laboratory Work, 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.

Other requirements for final grade

Homework and a mid-term quiz (HEM1; 3 university credits)
Lab report (LAB1; 3 university 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.