IS1500 Computer Organization and Components 9.0 credits

Datorteknik och komponenter

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for IS1500 valid from Spring 2019

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed upper secondary education including documented proficiency in Swedish corresponding to Swedish B and English corresponding to English A. For students who received/will receive their final school grades after 31 December 2009, there is an additional entry requirement for mathematics as follows: documented proficiency in mathematics corresponding to Mathematics A. And the specific requirements of mathematics, physics and chemistry corresponding to Mathematics D, Physics B and Chemistry A.

One of the fundamental courses in computer science/programming DD1314, DD1339, DD1345, or equivalent.

Language of instruction

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

Intended learning outcomes

After the course, the student will be able to

- Analyze and demonstrate how logic gates, blocks, combinational circuits, and sequential circuits work.
- Implement low-level programs in the C programing language and in an assembly language.
- Analyze processor microarchitectures, with and without a pipeline.
- Explain the principles of memory hierarchies, including cache structures.
- Implement low-level programs with input-output, timers, and interrupts.
- Explain the principles of multiprocessor computers and how they can be programmed.
- Explain and describe technical solutions, both orally and in writing.

Course contents

The course gives fundamental knowledge of computer organization, both from a hardware and software perspective. The course is organized in six modules that include, among other things, the following concepts and terms:

1. C and Assembly Programming: pointers, functions, stack, assembly language, machine language, instruction coding, and processor registers.
2. Input/Output Systems: timers, interrupts, and memory mapped input/output.
3. Digital Design: truth tables, gates, Boolean algebra, multiplexer, decoder, adder, combinational logic, sequential logic, and registers.
4. Processor Design: arithmetic logic unit, datapath, control unit, and pipeline.
5. Memory Hierarchy: instruction cache, data cache, and virtual memory.
6. Parallel Processors and Programs: Amdahl's law, various kinds of parallelism, and multicore.

Course literature

Selected chapters from the books:

- David Money Harris and Sarah L. Harris. Digital Design and Computer Architecture, Second Edition, Morgan Kaufmann, 2012.
- David A. Patterson and John L. Hennessy. Computer Organization and Design – the Hardware/Software Interface, Fifth Edition, Morgan Kaufmann, 2013.

The course literature also includes material from lectures, laboratory exercises, and exercise sessions.

Examination

- ANN1 - Component Demostration, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Works, 4.5 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.

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.