



# IS1200 Computer Hardware Engineering 7.5 credits

Datorteknik, grundkurs

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 IS1200 valid from Spring 2015

## 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.**

- Registered on course IE1204 or IE1205
- Registered on course ID1018 or ID1004

## Language of instruction

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

## Intended learning outcomes

**After this course, the student will be able to:**

- Describe and explain the micro-architecture of a pipelined processor
- Describe and explain priority interrupt handling and direct memory access
- Write assembler-language programs for simple calculations and input/output
- Describe, explain and use hardware and software priority used by operating systems
- Describe and explain cache memory and pipelining in order to discuss qualitative aspects of computers
- Describe, explain and write low-level C-code
- Describe and explain the relationship between C-code and assembler code
- Describe and explain time-sharing the processor and how programs use semaphores to cooperate

## Course contents

Computer engineering fundamentals: What is a program, and how is it executed inside a pipelined processor.

Addressing methods in assembly language.

The C language for Java programmers.

Subroutines - the C language level, the assembler language level and hardware support.

Computer Arithmetic: Binary representation of integers and floating point numbers - how computers perform calculations.

Low-level programming: combining C code and assembler code.

Static and dynamic variables on the C level and on the assembler language level.

Argument passing: pointers, call by reference and call by value.

Communication between the central processing unit, the memory system, and the input/output subsystem, using a simple processor bus.

Communication, priority interrupt handling and direct memory access.

RISC architecture fundamentals including the cache memory concept.

There are six laboratory sessions treating:

- Assembler language programming
- Input/output
- Interrupt handling
- Combining C and assembler code
- Processor architecture and cache memories
- Time-sharing the processor

## Course literature

David A Patterson, John L Hennessy: Computer Organization and Design - The Hardware/Software Interface, Fifth Edition

Morgan Kaufmann, USA, 2014, ISBN 978-0-12-407726-3

Nios II Processor Reference Manual, Chapters 3 and 8

Slides and notes from lectures and other sessions

Collected Exercises with solutions

Laboratory Instructions

## Examination

- LAB1 - Laboratory Work, 4.5 credits, grading scale: P, F
- TEN1 - Examination, 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

- Passed written examination (TEN1; 3 hp) grading A-E
- Passed laborative sessions (LAB1; 4,5 hp)

## 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.