

Computer Hardware and Architecture

Programme course

8 credits

Datorkonstruktion

TSEA83

Valid from:

Determined by

Board of Studies for Computer Science
and Media Technology

Date determined

2017-01-25

Main field of study

Computer Science and Engineering, Electrical Engineering

Course level

First cycle

Advancement level

G1X

Course offered for

- Computer Science and Engineering, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Computer Hardware and Architecture, Digital Design

Intended learning outcomes

The course gives a basic introduction to how computers work and are constructed at a low level. After the course you shall be able to:

- Explain how a simple computer is constructed. Which components and why. The computer shall support several addressing modes, branch instructions and subroutines.
- Perform calculations in binary arithmetic so that you can implement arithmetic instructions in a processor.
- Explain variations on processor architecture e.g. pipelining, cachememory and RISC.
- Explain the connexion between hardware, software, system performance and architecture.
- To achieve these goals both assembler- and microprogramming is used.
- Design a working digital apparatus, typically a simple computer
- Formulate a requirement specification
- Present a structured solution in a design specifikation
- Translate the design into VHDL, which can be simulated
- Implement the design with programmable logic
- Trouble shooting with logic analyzer
- Write a technical report and give an oral presentation
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Course content

- Computer architecture: Internal dataflow in a simple computer model. Instructions, instruction formats, addressing modes, interrupts, cachememory, pipelining, micro code.
- Memories: Definitions and concepts. Memory types.
- Busses: Definitions and concepts. Serial/Paralell, performance
- Input- and output units. Mapping of devices.
- Computer graphics, a simple graphics controller, VGA
- Programmable logic, FPGA, VHDL for FPGA-synthesis, Design examples, synchronism, Components, memories, UART.

Teaching and working methods

The course consists of lectures, 4 laborations (4h each) and a project.

Examination

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|------|--------------------|-----------|------|
| LAB1 | Laboratory work | 2 credits | U, G |
| PRA1 | Project assignment | 6 credits | U, G |

In the course the marks Failed/Passed are given.

Grades

Two-grade scale, U, G

Other information

Supplementary courses: Computer hardware - a system on chip, Design with microcontrollers, Design of DSP processors

Department

Institutionen för systemteknik

Director of Studies or equivalent

Tomas Svensson

Examiner

Anders Nilsson

Course website and other links

<http://www.isy.liu.se/edu/kurs/TSEA83/>

Education components

Preliminary scheduled hours: 44 h

Recommended self-study hours: 169 h

Course literature

Hennessy, Patterson. Computer Organization and Design. The Hardware/Software Interface. (Morgan Kaufmann). Clements, Alan. The Principles of Computer Hardware. (Oxford University Press). Föreläsningsunderlag. Laborationshandledningar.

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.