Computer Hardware and Architecture Y

Programme course

6 credits

Datorteknik Y

TSEA28

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

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 Software Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Applied Physics and Electrical 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
Switching theory and logical design. Basic knowledge in analogue electronics. Be able to perform a simple programming task.

Intended learning outcomes

To give knowledge about how a computer works and how it is programmed at the lowest level. After the course the student shall be able to:

- Design a simple computer by use of discrete components. The computer shall support arithmetic instructions, memory instructions, jump instructions and subroutines.
- Make calculations by use of binary arithmetics, such as two's complement
- Implement hardware for binary calculations
- Implement the instruction set in a computer by use of microprogramming.
- Explain basic mechanisms that are used in order to improve the performance of a computer system, such as pipelining, cache, and DMA Have knowledge of advanced techniques that are can be used in a computer in order to increase the parallelism such as superscalar processors, multiprocessor systems, and ASIPs
- Programme a computer in assembly language, including I/O handling and exceptions
- Have knowledge of the functionality of typical I/O units
- Be able to analyze the performance of a computer program

Course content

Binary arithmetic: addition, subtraction, shift, multiplication, ALU.

Computer architecture: computer models, microprogramming, addressing, interrupts, I/O handling, DMA, assembly programming, pipelining

Memory hierarchy, cache memory

Computer performance, profiling

Typical I/O units

Introduction to advanced computer architecture, superscalar processors, multiprocessor systems, ASIPs

Teaching and working methods

Lectures, tutorials, and laboratory work. An introductory lecture on switching theory is given for those students who haven't read that course yet.
The course runs over the entire spring semester.

Examination

LAB1	Laboratory work	3 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information
Supplementary courses: Electronics project, Computer Engineering and Real-time Systems, Design of embedded DSP processors, A Computer System on a Chip

Department
Institutionen för systemteknik

Director of Studies or equivalent
Tomas Svensson

Examiner
Kent Palmkvist

Course website and other links

Education components
Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Course literature
Alan Clements:Computer Organization & Architecture - Themes and Variations
Laborationsanvisningar

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://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.