# Embedded Software

Programme course

6 credits

Programmering av inbyggda system

TDDI11

Valid from: 2017 Spring semester

**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
G2X

## Course offered for
- Computer Engineering, B Sc in Engineering
- Engineering Electronics

## 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
Basic course in Computer Hardware and Architecture
Basic/Good programming skill.

## Intended learning outcomes
After the course the student should be able to:

- Describe the characteristics of embedded systems, embedded systems design methods and basic developement trade-offs.
- Describe the embedded systems hardware-software interface.
- Use important parts of the embedded systems tool-chain.
- From an abstract description design and implement a small but typical embedded time-ordered application for one emulated target machine.

# Course content

Preliminary contents:

- Embedded Programming: Preprocessing. Assembly and Linking. Basic Compilation Techniques. Coding issues and optimization. Programming Input and Output. Bit-manipulation. Interrupts, Exceptions, and Traps. Memory layout.
- Embedded Computing: Characteristics of Embedded Computing Applications. The Embedded Systems Design Process.
- The Embedded Computing Platform: Architectures. Bus Protocols. Memory Devices. I/O Devices. Timers and Counters. Component interfacing.
- Embedded Application Design: Basic system models. State-machines. Time-ordered applications. Concurrent tasks and communication. Scheduling.

# Teaching and working methods

The course consists of a series of lectures, lessons, and laboratory work. The examination consist of a set of theory questions and an implementation part where the student solve an embedded systems programming problem.

# Examination

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|---|---|---|---|
| LAB2 | Laboratory work | 4 credits | U, G |
| TEN2 | Written examination | 2 credits | U, 3, 4, 5 |

# Grades

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

# Other information

*Supplementary courses:*
Distributed Embedded Software and Networks, Embedded Systems Design

# Department

Institutionen för datavetenskap

# Director of Studies or equivalent

Ahmed Rezine

# Examiner

Ahmed Rezine

# Education components

Preliminary scheduled hours: 46 h
Recommended self-study hours: 114 h

# Course literature

Fastställs inför kursstart. Typisk litteratur: Programming Embedded systems - An introduction to Time-Oriented Programming by Frank Vahid & Tony Givargis Programming Embedded Systems: with C and GNU development tools by Michael Barr & Anthony Massa See kurshemsidan för fler rekommendationer och online material.

# 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.