

# Digital Circuits

Programme course

4 credits

Digitala kretsar

TSEI03

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

Electrical Engineering

## Course level

First cycle

## Advancement level

G2X

## Course offered for

- 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

Knowledge on basic electrical components like resistors, capacitors, inductors, and semiconductors. Ability to solve basic electrical, switching theory, and logical design problems.

## Intended learning outcomes

The course aims at providing knowledge on the design of digital integrated CMOS circuits. After completing the course the students should be able to perform the following:

- design combinational and sequential circuits
- design static and dynamic circuits
- comprehend and apply electrical models of integrated components
- estimate circuit performance.

## Course content

The lectures, exercises, and laboratory work treat the following subjects:

- electrical and geometrical properties of the MOSFET
- the MOSFET used as a switch
- combinational circuits in CMOS technique
- static and dynamic characteristics of CMOS circuits
- power dissipation in CMOS circuits
- circuit realisation using different logic styles
- sequential circuits and clocking strategies
- latches, flip-flops, and shift-registers
- basic logic and arithmetic blocks
- layout strategies and CAD tools.

## Teaching and working methods

The course consists of lectures, and in connection to those, exercises and laboratory work. The course is given in Ht1 and is completed within one study period.

## Examination

LAB1	Laboratory work	1.5 credits	U, G
TEN1	Written examination	2.5 credits	U, 3, 4, 5

The examination problems test the student's comprehension of circuit structure and function, circuit design skill, and ability to analyse the circuit performance. Three laboratory work passes demonstrate and test CAD tools and circuit design. The laboratory work is complete when all mandatory exercises are completed.

## Grades

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

## Department

Institutionen för systemteknik

## Director of Studies or equivalent

Tomas Svensson

## Examiner

Mark Vesterbacka

## Course website and other links

<http://www.isy.liu.se/edu/kurs/TSEIo3/>

## Education components

Preliminary scheduled hours: 40 h

Recommended self-study hours: 67 h

## Course literature

### Additional literature

#### Books

Jan M. Rabaey, Anantha Chandrakasan, and Borivoje Nikolic, (2003) *Digital Integrated Circuits 2*

ISBN: 0-13-120764-4

Prentice Hall

## 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](http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva).