

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

Offered for the last time

Autumn semester 2025

Main field of study

Electrical Engineering

Course level

First cycle

Advancement level

G2F

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/departments 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.