Digital Arithmetics

Programme course

6 credits

Digital aritmetik

TSTE18

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

Second cycle

Advancement level

A1X

Course offered for

- Computer Science and Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Electronics Engineering, Master's programme
- Applied Physics and Electrical Engineering - International, M Sc in Engineering
- Information Technology, 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

Basic courses in switching theory and digital design with VHDL or Verilog

Intended learning outcomes

Provide knowledge of different ways to perform numerical computations in integrated circuits.After the course, the student is expected to be able to:

- Describe and use different number representations suitable for implementation in an integrated circuit
- Design and verify circuits that perform basic arithmetic operations such as addition, subtraction, multiplication, and division
- Describe and analyze different methods to speed up carry propagation
- Describe and analyze floating-point number representations and operations
- Describe and analyze methods for approximation of elementary functions

Course content

- Number representations with binary values: fixed-point and floating-point
- Algorithms for and implementation of operations:

    ○ Addition and subtraction of two numbers
    ○ Carry propagation, when is it needed and how to speed it up
    ○ Multi-operand addition
    ○ Multiplication, with and without sign
    ○ Division
    ○ Square root
    ○ Approximation of elementary functions

- Alternative number representations such as decimal, residue, and logarithmic number systems
- What is used in the latest commercial circuits?

Teaching and working methods

The course is organized with combined lectures/exercises, computer exercises, laboratory work, and a small project assignment.
The course runs over the entire autumn semester.

Examination

UPG1	Assignment	2 credits	U, G
LAB1	Laboratory work	4 credits	U, G

Grades are given as 'Fail' or 'Pass'.

Grades

Two-grade scale, U, G

Department

Institutionen för systemteknik

Director of Studies or equivalent

Tomas Svensson

Examiner

Oscar Gustafsson

Course website and other links

http://www.isy.liu.se/en/edu/kurs/TSTE18/

Education components

Preliminary scheduled hours: 58 h
Recommended self-study hours: 102 h

Course literature

Additional literature

Books

M. D. Ercegovac and T. Lang, (2004) *Digital Arithmetic* Morgan Kaufmann

Articles

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.