Design of Digital Systems

Programme course

6 credits

Konstruktion av digitala system

TSTE12

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
Second cycle

Advancement level
A1X

Course offered for
- Electronics Engineering, Master's Programme
- Computer Science and Engineering, M Sc in Engineering
- Electronics Design Engineering, M Sc in Engineering
- Information Technology, 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
Basic courses in digital circuits. Basic courses in programming.

Intended learning outcomes
The course includes methods and tools for design and implementation of complex electronic systems. The emphasis is put on the design process.

- Design executable models using a hardware descripition language
- Model digital systems at different abstraction levels using an hardware description language
- Perform a project task following a project model
- Use logic synthesis and modelling tools to create prototypes and applications in FPGA and VLSI
- Use VHDL for modelling and synthesis of advanced digital systems
- Know about how IP blocks works and are used in FPGA and VLSI designs
- Know about how FPGA circuits function and can be used

Course content
Design of complex digital systems. Problem definition, specification, design process. Complexity, partitioning, and validation. Hardware description languages, introduction to VHDL.
Behavioral descriptions, modeling techniques, time delays. Test benches and verification methods. Hard real-time systems. Computational properties of algorithms, methods for scheduling, resource allocation and assignment. Synthesis of optimal architectures. Tools for design and simulation. Description of the design process for logic synthesis, optimization for VLSI implementation. Fast prototyping using FPGA.

Teaching and working methods
Besides lectures, the course includes a laboration series and a small project.

Examination

LAB1	Laboratory Work	2 credits	U, G
PRA1	Project	4 credits	U, G

Grades are given as ‘Fail’ or ‘Pass’.

Grades
Two-grade scale, U, G

Other information
Supplementary courses: System Design, CDIO

Department
Institutionen för systemteknik

Director of Studies or equivalent
Tomas Svensson

Examiner
Kent Palmkvist

Course website and other links
http://www.isy.liu.se/en/edu/kurs/TSTE12/

Education components

Preliminary scheduled hours: 44 h
Recommended self-study hours: 116 h

Course literature

Additional literature

Books

K. L. Short, (2009) *VHDL for Engineers* Prentice Hall
Svensson T., Krysander C, (2011) *Projektmodellen LIPS* Studentlitteratur

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.