VLSI Design

Programme course

12 credits

VLSI-konstruktion, CDIO

TSEK06

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
- Information Technology, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Specific information
The Entrepreneurship part overlap with other CDIO courses and cannot be included more than once in a degree.

Exchange students may apply for the course after arrival to LiTH but before it starts. The international officer for exchange studies must be contacted before applying.

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
Good knowledge in fundamentals of electronics, digital technique, MOS transistors and CMOS technology, digital and analog integrated circuits. The following courses cover most of the above knowledge: Introduction to VLSI Design (TSTE86), advanced VLSI Design (TSEK36), and Analog and Discrete-Time Integrated Circuits (TSTE80)

Intended learning outcomes

This course is intended to give knowledge and experience in design and fabrication of CMOS VLSI chips. This includes:

1. Deep insight in physical design of VLSI chips.
2. Knowledge and experience of using professional CAD tools for design, simulation, layout, and verification of VLSI chips.
3. Design of a 'real' and functional chip, starting from the idea and behavioral modeling to detailed circuit design at transistor level, circuit layout, and final verifications.
4. Complete the project using a systematic and professional approach required by industry to run large and complex VLSI projects:
    - Organize a project group, make project plan, and divide the task efficiently among the group members.
    - Promote teamwork, create a dynamic and functional group, and actively monitor the progress of the project.
    - Apply the knowledge from previous courses, search for supplementary knowledge and material, take the initiative, and find creative solutions.
    - Meet the project milestones and the final deadline, document the project, and show the progress by written reports and oral presentations.

A purpose for the course is also for the students to acquire knowledge and abilities within the general area of entrepreneurship, with particular focus on business planning for new ventures. After the course, students should be able to:

- account for models that describe what it takes for a new venture to have a stable basis for further development and to asess the level of development of ventures using such models; and
- account for the information and analyses needed to evaluate a development project from a business point of view and have the ability to collect and analyse relevant information for the purpose.

Course content

Labs include: a small project-example intending to demonstrate a full custom (handwork) and an automated VLSI design flow as well as introducing major CAD tools to be used throughout the design projects.

Design project includes: Team building, project planning, project management, pre-study of the project, architectural exploration, behavioral modeling and verifications, logic and transistor-level design and circuit simulations, circuit layout, layout verifications, tape out, and the final project documentation.

Lectures support the project moments including: Course description, introduction to VLSI design methodology, project description, advanced circuit and layout techniques, interconnect interface circuits, on-chip power delivery, clock distribution, synchronization techniques, IO drivers, and pads, testability and reliability considerations, and other related topics.

Teaching and working methods

Lectures, labs and the chip design project, where the task is: Design, simulation, and fabrication-ready layout of VLSI functional blocks on a chip in 0.35µm CMOS Technology.
The core of the course is the project, which will be selected and carried out by a group of 4-to-8 students in an independent manner. The complete chip-design should be ready by the end of Vt2, and a written report should be handed to a supervisor (one for a design team). The chips can be fabricated provided the design is accepted and the students declare to attend the course Evaluation of an Integrated Circuit.
The course runs over the entire spring semester.

Examination

UPG1	Entrepreneurship Assignments	3 credits	U, G
LAB1	Laboratory Work	1.5 credits	U, G
PRA1	Project Work	7.5 credits	U, G

Grades are given as ‘Fail’ or ‘Pass’.

Grades

Two-grade scale, U, G

Other information

Supplementary courses: Evalution of an Integrated circuit.

Department

Institutionen för systemteknik

Director of Studies or equivalent

Tomas Svensson

Examiner

Atila Alvanpour

Course website and other links

http://www.isy.liu.se/en/edu/kurs/TSEK06/

Education components

Preliminary scheduled hours: 60 h
Recommended self-study hours: 260 h

Course literature

Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "Digital Integrated Circuits", Prentice Hall, Second Edition (International edition), ISBN 0-13-120764-4 Kompendium om projektmodellen LIPS (köps på Bokakademin).

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.