

EE-431

Advanced VLSI design

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	4 weekly
Lecture	2 weekly
Exercises	2 weekly
Number of positions	

Summary

In this project-based course, students collect hands-on experience with designing full-custom digital VLSI circuits in dynamic logic. They learn to carry out the design and optimization on transistor level, including logic and clock tree, the verification, and the layout.

Content**Introduction to dynamic logic:**

An alternative logic style derived from CMOS, used for high-speed logic, as basis for the project

Introduction to fast adder circuits:

Fast adder structures as basic building block of computer arithmetic

Layout and floorplanning:

Practical guidelines for full-custom layout of custom digital circuits

PROJECT (covers 80% of the course):

Build a 1GHz 64 Bit Parallel Prefix Adder in a 90nm technology on transistor level, including logic design, schematic entry, clock tree design, simulation, parasitic estimation, layout, and verification.

Keywords

VLSI, CMOS, transistor level, layout, adder, dynamic logic

Learning Prerequisites**Required courses**

EE-429 Fundamentals of VLSI design

EE-490(b) Lab in EDA based design (or experience with CADENCE Virtuoso)

Learning Outcomes

By the end of the course, the student must be able to:

- Compose a transistor-level integrated circuit
- Analyze its performance
- Anticipate layout effects
- Design its layout

Teaching methods

Project based course with few lectures

Resources

Moodle Link

- <https://go.epfl.ch/EE-431>