

Micro- and Nanoelectronic Circuit Design

Basic information

Sivuaine suomeksi: Mikro- ja nanoelektroniikkasuunnittelu

Biämne på svenska: Mikro- och nanoelektronik-design

Code: ELEC3041

Extent: 25 credits

Language: English

Responsible professors: Jussi Rynänen and Kari Halonen

Target group: All students with sufficient prerequisite knowledge.

Application procedure: No separate application procedure.

Prerequisites: B.Sc. level knowledge on electronics and circuit theory

Content and structure of the minor

Integrated circuits are the enablers of the complex functionality embedded in all present day electronic devices. Combining logic, processors, memory, analog and digital signal processing and radio frequency communications electronics have provided miniaturised implementations of functions that decades ago could not be even dreamed of. In future, it is envisioned that number of integrated circuits per person will continue to increase rapidly simply because the emerging ubiquitous intelligence in all areas of life can not be implemented without them. There is no application that could run without electronic hardware platform.

To be able to design integrated circuits for in embedded devices, the designers needs to handle not only the the theory of electronics, but also the design flow principles, tools, and understand the various abstraction layers of the design presentations. For example, designing he analog front-end amplifier that directly connects to brain sensor, or the RF front-end connecting to antenna, requires understanding of transistor and transmission line models for analog custom circuit and layout design. On the other hand, implementing digital digital circuits, such as processors, DSP accelerators and high speed digital interconnects necessitate the knowledge on hardware efficient implementation methods of signal processing algorithms and good coding practices for hardware description languages, added with capability of efficient and highly automated usage of implementation and verification tool chains.

After completing the major the student knows the most common technologies used in the integrated circuit design. He understands the operation and theory of common circuits used in the circuit design. He knows the design tools used in the design flow and can utilize the functionalities of these programs. Based on student interest student understands basics of the analog and/or RF and/or digital circuits. The student is able to understand design flow and design simple integrated circuit blocks from specifications to producible layout.

Code	Name	Credits	T e a c h i n g p e r i o d
Compulsory courses		15	
ELEC-E3120	Analysis and Design of Electronic Circuits *	5	I- II
ELEC-E3510	Basics of IC Design	5	III
ELEC-E3520	Digital Microelectronics I P	5	III
Optional courses		10	

ELEC-E3540	Digital Microelectronics II P	5	I V - V
ELEC-E3560	IC Design Project	5	I V - V
ELEC-E3530	Integrated Analog Systems P	5	I V - V
ELEC-E3550	Integrated RF-circuit P	5	I V - V

* This is a compulsory course if it is not a part of the student's programme.