EE-426

Radio frequency circuits design techniques

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.
MNIS	MA3	Opt.
Microtechnics	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

RF has changed our daily life in our ever connected wireless world (guess how many radios you have in your smartphone?). The goal of this course is to get familiar with RF design techniques in view of understanding the basics behind wireless communication.

Content

This course will teach you basic concepts of RF circuit design.
We will investigate the following items:
Passives and resonant circuits
Impedance matching
HF filters
Noise and Distorsion
S-Parameters
LNA and mixers
Oscillators & PLL
Power amplifiers
Transceiver Architectures

Keywords

Radio-Frequency, Wireless communication, IoT, Bluetooth, WIFI, Radar, Receiver, Transmitter

Learning Prerequisites

Required courses

Electronics

Learning Outcomes

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

- Analyze the building blocks of RF transceivers
- Categorize RF applications
- Design basic RF building blocks
- Sketch a system overview of any wireless TRX

Teaching methods

Ex cathedra, hands-on using Cadence Virtuoso or LT Spice and exercises depending on the subject. It's not a problem if you attend the EDA lab when there is a conflict during the hands-on hours as you will get familiar with Cadence anyway!

Expected student activities

Students could run examples of presented concepts on their own PC using Cadence Virtuoso or a simpler LT Spice CAD tool. For the Cadence afficionados, that work could be consolidated in an RF design project of your choice (part of a receiver, transmitter or PLL) including a 20' presentation during the exam day replacing the written exam!

Assessment methods

Open book written exam or 20' presentation during the exam session of your RF Cadence design project to be done in pairs throughout the semester. The 2nd option is recommended as you will develop significantly more skills and it willl open up internship opportunities in the microelectronic industry!

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

Yes

Notes/Handbook

Lecture notes will be available in PDF on Moodle.
You might be interested in:
RF Microelectronics from Behzad Razavi (Second Edition), Pearson
This is an excellent reference textbook with many examples and it will be available in .pdf at the library.
Alternatively:
The Design of CMOS Radio Frequency Integrated Circuits from Thomas Lee, Cambridge Uni Press

Moodle Link

- https://go.epfl.ch/EE-426