EE-520

Advanced analog and RF integrated circuits design I

Enz Christian

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

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	Written
Workload	60h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

Summary

This course covers the design of advanced analog integrated circuits, focusing on the design of switched-capacitor and continuous-time integrated filters. The objective is to be able to design integrated filters starting from the system specifications and choosing the appropriate technique.

Content

1) Background : Review of fundamental passive and active integrated components and their models.

2) Noise Analysis and Modeling : noise characterization; thermal noise; flicker noise; other types of noise; noise models of circuit elements; noise analysis in circuits; examples: single-stage OTA.

3) Fundamentals of Filter Design : types of filters; frequency and impedance normalization; filter specifications; approximation; passive synthesis; second-order sections - the biquads; high-order filter design; non-ideal effects.

4) Integrated Active Filters Implementations : continuous-time filters: RC-active, Gm-C filters, MOSFET-C filters; switched-capacitor filters: basic building blocks, basic operation and analysis, first-order filter, biquad filters; high-order filters: component simulation of LC ladders, operational simulation of LC ladders; non-ideal effects.

Keywords

Analog circuits, integrated circuits, CMOS, filters

Learning Prerequisites

Required courses

EE-331 Circuits et systèmes électroniques I,II

Recommended courses

EE-320 Circuits intégrés I

Important concepts to start the course

Linear circuits analysis, Fourier and Laplace transforms, small-signal schematic, analysis of basic circuits.

Learning Outcomes

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

- Analyze simple analog circuits.
- Design analog filters.

- Select appropriately an appropriate filter architecture.

Transversal skills

- Use a work methodology appropriate to the task.

Teaching methods

Ex cathedra and exercices

Expected student activities

Solve several exercises.

Assessment methods

Written

Resources

Moodle Link

- http://moodle.epfl.ch/course/view.php?id=180

Prerequisite for

Semester projects and master thesis projects in micro- et nanoelectronics