EE-423

Low power electronics: analog mixed signal design

Koukab Adil

Cursus	Sem.	Type
Data and Internet of Things minor	H	Opt.
Electrical and Electronical Engineering	MA1, MA3	Obl.
MNIS	MA3	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	3 weekly
Exercises	1 weekly
Number of positions	

Summary

This course deals with the analyze, design and optimization of CMOS analog circuits, emphasizing low-power solutions required in a broad range of applications (e.g. IoT, wearables, Biosensors ...). Some examples of mixed-signal design are also addressed.

Content

- Introduction: Low-Power AMS design and applications (IoT, Wearable, Sensors, Healthcare, …)
- MOS Transistor: Modelling, Operation and trade-offs
- Voltage references and regulators
  - Supply and temperature independent biasing
  - Low-Voltage solutions

- Operational-Amplifiers:
  - Applications (Amplification, Filtering and Regulation)
  - Frequency analysis and Stability
  - Noise, Offset and Mismatch
  - Filly Differential and common mode feedback
  - Low-voltage solutions: Rail to Rail Amp.

- Introduction to Mixed-Signal Design:
  - ADC, DAC and PLL
  - Digital calibration of analog circuits
  - Comparators
  - Practical aspects in MS-SOC

Keywords

MOS transistor, Modelling, Analog Design, Current Mirrors, Voltage references, Regulators, Amplifiers, Stability, low-power, Low-noise, Low Voltage, digital calibration, mixed-signal

Learning Prerequisites

Required courses

Electronics I, II, IC Design I

Resources

Bibliography

•Reference books (electronic version available at epfl.library.ch):
– Analog Design Essentials by W. Sansen
- CMOS Circuit Design, Layout, and Simulation by J. Baker
•Reference books (paper version available at epfl's library):
- Design of Analog CMOS Integrated Circuits By B. Razavi

Ressources en bibliothèque

- Analog Design Essentials / Sansen
- Design of Analog CMOS Integrated Circuits / Razavi
- CMOS Circuit Design, Layout, and Simulation / Baker