

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 |
| Courses | 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](#)
- [CMOS Circuit Design, Layout, and Simulation / Baker](#)
- [Design of Analog CMOS Integrated Circuits / Razavi](#)