

Mixed-Signal IC Design

1. **Course number and name:** 020CCIES4 Mixed-Signal IC Design
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
3. **Instructor's or course coordinator's name:** Rayan MINA
4. **Instructional materials:** Carusone, Johns, Martin, "Analog Integrated Circuit Design", 2nd Ed. 2011.
 - a. **Other supplemental materials:**
Professor's material (PowerPoint slides)
5. **Specific course information**
 - a. **Catalog description:**
In this applied course, the students are introduced to the use of an industrial EDA Software tool to acquire computer-Aided Design skills in the field of Integrated Circuit Design. The course contents are as follows: IC Design Flow, Fabrication Technology and Packaging. Multi-stage Amplifiers, Current mirrors and Active Loads, Basic Biasing concepts, Differential signaling, Operational Amplifier Transistor-Level Design, Filters, Sampled circuits, Buffers, Frequency response of analog feedback circuits, Introduction to stability of feedback amplifiers, Simulation and Evaluation of the electrical performance of ICs using EDA Software. Introduction to Noise and Linearity in Electronics.
 - b. **Prerequisites:** 020ELNES2 Digital Electronics
 - c. **Selected Elective** for CCE and EE students
6. **Educational objectives for the course**
 - a. **Specific outcomes of instruction:**
 - Identify the IC Design Flow steps: Design, Fabrication Technology and Packaging.
 - Analyze and design (transistor-level) Multi-stage Amplifiers circuits with active loads and biasing mirrors, using EDA software.
 - Analyze and design (transistor-level) BiCMOS Differential Amplifiers circuits using EDA software.
 - Identify and analyze the frequency response of analog feedback amplifiers.
 - Apply criteria and analyze the stability of amp-amp systems.
 - Design and realize a complete electronic analog circuit that meet a set of desired needs and perform specific functions (Lab sessions and Project).
 - Extract circuit performance using EDA software.

b. PI addressed by the course:

PI	1.3	2.1	2.2	2.4	6.3	6.4
Covered	x	x	x	x	x	x
Assessed						

7. Brief list of topics to be covered

- Introduction to IC Design Flow steps, Fabrication Technology and Packaging (2 lectures)
- Multi-stage amplifier (4 lectures)
- Current Mirrors , active loads, biasing (4 lectures)
- Lab-session on EDA software: Active loads (2 lectures)
- Lab-session on EDA software: Current Mirrors (2 lectures)
- Differential signalling, differential amplifiers (3 lectures)
- Lab-session on EDA software: differential amplifiers (1) (2 lectures)
- Lab-session on EDA software: differential amplifiers (2) (2 lectures)
- Frequency response of analog circuits, stability of op-amp circuits (2 lectures)
- Lab-session on EDA software: Frequency response (2 lectures)
- Sampled circuits, introduction to noise and NL (1 lecture)
- Lab-session on EDA software: Sampled circuits, noise and NL (2 lectures)