



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## COURSE SYLLABUS

### Laboratory of Electronics I

2425-1-F1701Q144

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#### Aims

The aim of the course is to illustrate the various aspects related to the development of CMOS integrated circuits. The course consists of three separate but coordinated parts

- Concepts of analog design of CMOS integrated circuits
- (Introduction to the) Use of CADENCE software
- Introduction to laboratory equipment

#### Contents

- Concepts of analog design in CMOS technology
- Use of CADENCE software for simulation of CMOS analog circuits
- Concepts of electronic instrumentation for the characterization of integrated circuits

#### Detailed program

The course introduces the student to the development of a CMOS integrated circuit and consists of three parts:

- lectures on CMOS design. The following topics will be addressed: CMOS technology, analog switches, current mirrors, voltage and current references, gain stages, operational amplifiers.
- laboratory experiences for the use of CADENCE software for the design of analog integrated circuits. Examples of experiences: Design of a current mirror, of a bandgap reference, of a single and two-stage operational amplifier, of an analog filter.
- laboratory experiences for the knowledge of electronic instrumentation for the characterization of analog

integrated circuits

## **Prerequisites**

Bachelor in physics or equivalent. Basic notions of analog electronics

## **Teaching form**

Lectures and laboratory experience will be held in person.

## **Textbook and teaching resource**

### **References:**

A. Baschirotto "Dispense di Microelettronica"

Gray, Hurst, Lewis, Meyer, "Analysis and design on analog integrated circuits"

F. Maloberti, "Analog designfor CMOS VLSI systems"

B. Razavi, "Design of analog integrated circuits"

M. Norgia, R. Ottoboni, A. Pesatori, C. Svelto, "Misure - Dai fondamenti alla strumentazione", Ed. Esculapio.

Nihal Kularatna, "Digital and Analogue Instrumentation: Testing and Measurement", IEE.

## **Semester**

1st semester

## **Assessment method**

Oral examinations (colloquium) in presence on appointment (to be fixed via mail to [andrea.baschirotto@unimib.it](mailto:andrea.baschirotto@unimib.it))

The student may present two Laboratory Reports based on:

1. Design and simulation of simple single transistor analog circuits;
2. Electrical and electronic measurements on simple circuit configurations.

The exam will consist of:

- Colloquium on Laboratory Reports (if presented)
- Colloquium on topics covered during the lessons

## **Office hours**

Discussions with prof. Baschiroto will take place upon appointment (contact via mail [andrea.baschiroto@unimib.it](mailto:andrea.baschiroto@unimib.it)).

## **Sustainable Development Goals**

INDUSTRY, INNOVATION AND INFRASTRUCTURE

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