

60977 - Microelectronic circuit design

Syllabus Information

Academic year: 2023/24

Subject: 60977 - Microelectronic circuit design

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 623 - Master's Degree in Telecommunications Engineering

ECTS: 6.0

Year: 2

Semester: Second semester

Subject type: Optional

Module:

1. General information

The purpose of this subject is to train the student in the fundamentals of mixed analogue-digital microelectronic design for the implementation of application-specific integrated circuits (ASICs). The analysis, simulation and design tools necessary for the realization of integrated circuits will be used, with the analog-to-digital converters as a mixed system reference.

The knowledge acquired in the compulsory subjects oriented to the design of analogue and digital electronic systems is required. In addition, prior knowledge of semiconductor devices and their modelling, basic analogue cells and analogue-digital signal processing is recommended.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>) and certain specific targets, so that the acquisition of the learning results of the subject will contribute to some extent to the achievement of targets 8.2 and 8.4 of Goal 8, and target 9.4 of Goal 9.

2. Learning results

- To know the techniques to manufacture integrated microelectronic circuits and to use the specific tools for analysis, simulation and design of a mixed application specific integrated circuit (ASIC).
- To choose and apply the most appropriate microelectronic technology to implement analogue-digital devices in communications applications.
- To apply integrated microelectronic design in the fields of sensing, home automation and environmental actuation systems.
- To solve real electronic engineering problems by applying specific simulation and design techniques for integrated circuits.

3. Syllabus

- BLOCK 1: Introduction
- BLOCK 2: CMOS submicron technologies
 - Technological processes
 - Devices, characterization and modelling
 - *Layout* strategies: *matching*, noise minimization, *crosstalk*, etc.
- BLOCK 3: Analog design flow
- BLOCK 4: Digital design flow
- BLOCK 5: Mixed analogue-digital system design
 - Analog-to-digital conversion

4. Academic activities

- **Participatory master class:** 16 hours

The fundamental contents of the subject will be presented, with a practical orientation based on mixed microelectronic design.

- **Problem solving and case studies:** 9 hours

We will work on real examples of mixed designs.

- **Laboratory practices:** 15 hours

There will be different practical sessions where the necessary CAD tools for microelectronic design will be used, allowing the acquisition of the necessary skills and abilities to approach the design of a mixed IC.

- **Special practices:** 5 hours

Visits to specialized laboratories, manufacturing companies, research centres, etc.

- **Teaching assignments:** 39 hours

Both the evaluable teaching assignments and the preparation of laboratory practice reports are included.

- **Study and personal work:** 60 hours
- **Assessment tests:** 6 hours.

5. Assessment system

The subject will be evaluated by the **continuous assessment** system by means of the following activities:

- **Intermediate activities and tests**(50% of the grade, minimum 4 out of 10).

In order to encourage the student's continuous work and the realization of the complete design of an integrated circuit, evaluable teaching assignments and individual theoretical-practical tests will be proposed. The evaluation will consider the autonomy, the quality and originality of the solution, and the analytical and critical capacity of the student.

- **Laboratory practices** (50% of the grade, minimum 4 out of 10).

There will be several laboratory practices distributed throughout the semester. The following aspects will be evaluated:

- Previous preparation of the practice.
- Management of the required design tools and solutions provided to the problems encountered.
- Deepening in practice.
- Report made at the end of each practice.
- Student autonomy and participation.

If the student has not passed any of these activities during the semester, they will have the opportunity to pass the subject by means of a global test in the two official exams.