Integrated circuits and microelectronics

Academic Year: (2019 / 2020) **Review date: 04/05/2020 15:24:34**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: PORTELA GARCIA, MARTA

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Electronics Engineering Fundamentals (2º)
- Digital Electronics (4º)

OBJECTIVES

This subject aims to provide the student with the basic knowledge necessary to design integrated circuits.
- Knowing the design methodology of integrated circuits. Levels of abstraction.
- Designing, simulating and synthesizing digital circuits by using Hardware Description Languages.
- Knowledge and use of computer aided design (CAD) techniques and tools for integrated circuits.
- Knowledge of the technology and manufacturing processes of integrated circuits.
- Analyzing and designing integrated circuits at the physical level.
- Knowledge of integrated circuit test techniques and how it affect the circuit design

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to integrated circuits. Design methodology
2. Digital integrated circuits design and validation by using Hardware Description Languages
3. Manufacturing process technologies
   - Introduction to current technologies. CMOS technology.
   - Design at transistor level
4. Manufacturing processes. Integrated circuits design at physical level
   - Manufacturing steps
   - Layout
   - Manufacturing process effects
5. Test of analog and digital circuits. Design for testability
   - Fault models
   - Testing techniques
   - Design for testability

LEARNING ACTIVITIES AND METHODOLOGY

The subject will be carried out through the following activities:
1. Theoretical classes: In order to present the knowledge that students must acquire, as well as the realization of practical exercises to develop this knowledge in an applied way. To facilitate their development, students will receive the documents used in class and basic texts of reference that will allow them to complete and deepen in those topics in which they are most interested.
2. Practical classes in computer room and laboratories. The objective is that students develop a complete practical case and learn how to use simulation and synthesis tools. A medium-low complexity circuit will be implemented in a programmable circuit. Also practical exercises within the design at lower levels will be proposed.
3. Study of the student: exercises and complementary readings proposed by the teacher. Personal study
4. Exams

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ASSESSMENT SYSTEM

% end-of-term-examination/test:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

- Midterm exams: 30%
- Practical case, in exercises oriented classes and laboratory: 25% (Lab sessions are mandatory)
- Individual exercise 5%
- Final exam: 40%, minimum of 4 out of 10 to pass the course..

BASIC BIBLIOGRAPHY

- A. Rubio, J. Altet, X. Aragonés, J.L. González, D. Mateo, F. Moll Diseño de circuitos y sistemas integrados, Ediciones UPC, 2000

- J. M. Rabaey, A. Chandraskasan, B. Nikolic Digital integrated circuits: a design perspective, Prentice Hall.

- M. Abramovici, M.A. Breuer, A. D. Friedman Digital system testing and testable design, Computer Science Press, 1990

ADDITIONAL BIBLIOGRAPHY

- D. J. Smith HDL chip design, Doone, 1997

- N. H. Weste, D. M. Harris CMOS VLSI Design. A circuits and systems perspective, Addison-Wesley, Pearson, 2011

- R. J. Baker CMOS Circuit Design, Layout and Simulation, Wiley, 2011