# Embedded systems

**Academic Year: ( 2019 / 2020 )** **Review date: 29/04/2019 17:43:53**

**Department assigned to the subject: Electronic Technology Department**

**Coordinating teacher: PORTELA GARCIA, MARTA**

**Type: Electives ECTS Credits : 3.0**

**Year : 1 Semester : 1**

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Some subject related to microprocessors is strongly recommended

## OBJECTIVES

After completing this subject, the students shall be able:
- To know the different kinds of embedded systems and their application fields, including reconfigurable devices, including those based on generic operating systems (e.g. Android).
- To know the differences between a reconfigurable digital system and a microprocessor-based digital system, and to be able to evaluate for a given application what is the best solution in an embedded system.
- To know and exploit the advantages and disadvantages to develope an embedded system, by using a platform based on a generic operating system.
- To know developtment tools for embedded systems.

## DESCRIPTION OF CONTENTS: PROGRAMME

Embedded systems are digital processing and computation systems that are in charge of a certain number of specific functions, and usually working in real time. They can be implemented in a variety of ways, including the use of microcontrollers, or embedding microprocessors in a reconfigurable device. In this subject the different available technologies for developing embedded systems will be described. The student will learn how to evaluate and compare which of the different development approach is more suitable for a certain application. It will also be taught how to identify and specify the real-time processing functions, and their hardware-software efficient implementation.

1. Introduction to embedded systems
   - Embedded systems definition and main features
   - Types
   - Design challenges
2. Hardware component
   - Typical architecture
   - Inputs and outputs types
   - Processing unit
3. Software component
   - Necessary tools
   - Standalone applications
   - Operating Systems
4. Embedded systems in FPGA
   - Microprocessors embedded in Xilinx FPGAs
   - Design environments in Xilinx for embedded systems
   - Operating systems
   - Debugging and validation
5. Resource optimitazion
   - Critical parameters
   - Evaluation and optimization techniques
     + HW/SW co-design
     + HW techniques

+ SW techniques

## LEARNING ACTIVITIES AND METHODOLOGY

Theory classes
Practical and laboratory classes
Tutorials
Work in groups
Individual work

## ASSESSMENT SYSTEM

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

Continuous assesment:
- Lab work (in group) 25%
- Exercises 15%
- Final exam 60%

June Exam:
Final mark will be obtained by applying the same rules than in the continuous assessment or by a final exam (with 100% of the mark).

## BASIC BIBLIOGRAPHY

- J. K. Peckol Embedded Systems: A Contemporary Design Tool, Wiley, 2008

- P. Marwedel Embedded System Design, Springer, 2nd edition, 2011