Universitat de Lleida

# DEGREE CURRICULUM
# EMBEDDED AND UBIQUITOUS SYSTEMS

Coordination: Fernando Guirado

Academic year 2015-16

## Subject's general information

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|---|---|
| **Subject name** | EMBEDDED AND UBIQUITOUS SYSTEMS |
| **Code** | 103056 |
| **Semester** | 2n Quadrimestre 2N Cicle Informàtica i Màster |
| **Typology** | Obligatòria |
| **ECTS credits** | 4.5 |
| **Theoretical credits** | 2.5 |
| **Practical credits** | 2 |
| **Coordination** | Fernando Guirado |
| **Office and hour of attention** | Email to the professor |
| **Department** | Informàtica i Enginyeria Industrial |
| **Teaching load distribution between lectures and independent student work** | 40% lecture<br>60% autonomous student work |
| **Modality** | Presencial |
| **Important information on data processing** | Consult this link for more information. |
| **Language** | English |
| **Degree** | MASTER in Computer Enginneering |
| **Distribution of credits** | 20% theoretical content<br>30% classroom activities<br>50% laboratory |
| **Office and hour of attention** | Email to the professor |
| **E-mail addresses** | f.guirado@diei.udl.cat |

Fernando Guirado Fernández

## Subject's extra information

We recommend programming skills in C ++

Most practical course in which the study is based on solving exercises recommended and required. It is essential for individual work skills and acquire the skills set necessary to properly use the tools that work with during the course.

The use of the Virtual Campus is essential to access the resources of the subject notifications about delivery dates exercises, schedule meetings, and finally delivering practical and assessment tests.

Course taught during the 2nd half of the 1st year of the degree.

Subject corresponding to "Computers" in the module "Information Technology"

## Learning objectives

**University of Lleida strategic competences**

- To use office automation tools for the development of technical documents
- Create presentations using office automation tools
- Understand technical documents in English

**Degree-specific competences**

- Ability to evaluate the hardware and software requirements for the development of embedded and ubiquitous systems
- Understand the concept of embedded system and ubiquitous
- Know how to design, describe i validate embedded electronic systems with industrial application
- Know and be able to use methods and tools for development and debugging of programs implemented with microcontrollers
- Understand and know the different technological options for developing embedded systems
- Identify control requirements, interaction and security you have to give in an embedded system
- Identify requirements of E / S necessary to develop an embedded system

**Degree-transversal competences**

- Independent learning ability and adapatación to new situations, able to foster creativity and sensitivity for quality
- Analytical skills, organization or planning in the area of computer and embedded systems

## Competences

**University of Lleida strategic competences**

- Master Information and Communication Technologies.

- Master a foreign language.

**Degree-specific competences**

- Capacity to design and develop computer systems, applications and services to built-in and ubiquitous systems

**Degree-transversal competences**

- Capacity to draft, design and implement projects and/or give novel solutions, using engineering-related tool

## Subject contents

1. Ubiquitous Computing

    Introduction

    Ubiquitous Computing Characteristics

    Input/Output interaction

    Middleware Architectures

2. Embedded Systems


    Introduction

    Embedded systems characteristics

    Architecture

    Transducers

    Bus and communications

    Real Time Systems


## Methodology

The methodology is based on :

- Theoretical lectures in the classroom.
- Individual exercises.
- Several practical activities

## Development plan

During 2015/16 this topic is related to the subjects: Intelligent Systems and Computer graphics and multimedia.

The common goal is to develop a game similar to the "Pacman".

- The topic "Intelligent Systems" is based on adding artificial intelligence to the game characters .

- The topic  "Computer graphics and multimedia" will work the graphic issue.

And finally the subject "Embedded Systems and Ubiquitous Computing" the user interaction will be the main goal.

By this reason it is recommended to take this three subjects simultaneously, although it is not considered a requirement.

Scheduling

**- 1st week**

- Ubiquitous computing
- Introduction to Embedded Systems

**- 2nd week**

- Development environment – Arduino
- Examples – Sensors and communication

**- 3rd week**

- Definition of the project. BGC (Biometric Game Controller)
- Biometric parameters

**- 4th and 5th weeks**

- Proposal definition
- Biometric Control parameters
- Prototype development

To develop the prototype may be necessary to access to the electronics laboratory.

## Evaluation

- During the course (30%)

    – Technical reports

    – Exercises

- PBL – Project Based Learning (70%)

    – Analysis and project scope

    – Development

    – Dissertation defense

## Bibliography

**BIBLIOGRAFIA BÀSICA**

1. *Ubiquitous Computing Fundamentals:* J. Krumm (ed.), CRC Press, 2010

2. *Smart Sensors to Network the World:* D. E. Culler, H. Mulder, Scientific American, Jun 2004.

**BIBLIOGRAFIA RECOMANDA**

1. *Ubiquitous Computing: Smart Devices, Environments and Interactions:* S. Poslad, Wiley, 2009