



Universitat de Lleida

DEGREE CURRICULUM
**EMBEDDED AND UBIQUITOUS
SYSTEMS**

Coordination: GUIRADO FERNÁNDEZ, FERNANDO

Academic year 2019-20

Subject's general information

Subject name	EMBEDDED AND UBIQUITOUS SYSTEMS			
Code	103056			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Master's Degree in Informatics Engineering	1	COMPULSORY	Attendance-based
Course number of credits (ECTS)	4.5			
Type of activity, credits, and groups	Activity type	PRALAB	TEORIA	
	Number of credits	3	1.5	
	Number of groups	1	1	
Coordination	GUIRADO FERNÁNDEZ, FERNANDO			
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
Teaching load distribution between lectures and independent student work	30% lecture 70% autonomous work			
Important information on data processing	Consult this link for more information.			
Language	English			
Distribution of credits	20% theoretical content 30% classroom activities 50% laboratory			
Office and hour of attention	Email to the professor			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GUIRADO FERNÁNDEZ, FERNANDO	fernando.guirado@udl.cat	4,5	

Subject's extra information

The topic is related to the subjects: Intelligent Systems and Computer graphics and multimedia.

The common goal is to develop a videogame.

- 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 topic "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.

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 adaptación 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

General Competences

CG1. Capacity to project, calculate and design products, processes and installations in all fields of Computer Engineering.

CG8. Capacity to apply the knowledge acquired for solving problems in new and unfamiliar situations within broader and more multidisciplinary contexts, and to be capable of integrating this knowledge.

Basic Competences

CB2. That the students can apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.

CB3. Students are able to integrate knowledge and handle complexity, and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.

University of Lleida strategic competences

UDL2 - Master a foreign language.

UDL3 - Master Information and Communication Technologies.

Degree-specific competences

CE11 - Capacity to design and develop computer systems, applications and services to built-in and ubiquitous systems

Degree-transversal competences

EPS4 - 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

3. Real Time Systems

- Introduction
- Functional Requirements
- Temporary Requirements

- Real-Time: Modeling
- Real-Time: Scheduling
- Real-Time: Design

4. Internet of Things

- Introduction
- Components
- Technology Convergence
- Security

Methodology

The methodology is based on :

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

Development plan

Week	Contents	Scheduling
1	Ubiquitous Computing, Embedded Systems, RTOS, Internet of Things	6h lecture/9h autonomous work
2	Development and prototyping: AVR and ARM platform	6h lecture/9h autonomous work
3	Working with sensors and cross-platform data transmission. Definition of the project	6h lecture/9h autonomous work
4	Prototype development	6h lecture/9h autonomous work
5	Prototype development	6h lecture/9h autonomous work

Evaluation

Activity	% grade	Minimum grade	Group/Individual	Mandatory
Forum participation	10%	No	Individual	Yes
Sensors and interaction (1)	30%	No	Group	Yes
Characterizing the project (Technical Report & Presentation) (2)	20%	No	Group	Yes
Project development (2)	30%	No	Group	Yes
Project integration	10%	No	Individual	Yes

(1) Implies multiple exercises with sensors

(2) Implies an oral presentation

Bibliography

Basic Bibliography

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.
3. *Designing the Internet of Things*: A. McEwen, H. Cassimally, Wiley, 2014

Supplementary Bibliography

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