Sensor networks and embedded systems communication

Academic Year: (2019 / 2020) **Review date: 19-12-2017**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: LOPEZ ONGIL, CELIA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 1

OBJECTIVES

SKILLS

Students should be able to apply their knowledge and shoulod have the ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study .

Students should be able to integrate knowledge and handle complexity, and formulate judgments based on information that, being incomplete or limited, includes thoughts about social and ethical responsibilities linked to the application of their knowledge and judgments.

Developing concise, clear and justified documentation and specifing the work to be done for the development, integration and implementation of complex and high added value electronic systems.

Ability to conceive, design , implement and maintain an electronic system in a specific application.

Ability to work within a design team integratin multidisciplinary focuses

Adopting the scientific method as a fundamental working tool in both professional and research carreers.

Ability to design electronic systems at the behavioral level, from a set of certain specifications, such as at system level, using modeling and simulation tools , such as at subsystem level, using hardware description languages.

Ability to handle tools, techniques and methodologies for designing advanced electronic systems or subsystems

Ability to design a device, system or application that meets a given specification , using a systemtic and multidisciplinary approach and integrating modules and advanced tools that are specific to the field of Electronic Engineering .

Ability to solve practical problems derived from interaction within an electronic system and external elements, with effects such as signal interferences, EMI or thermic management, in design, prototyping and redesign stages.

Ability to search efficiently for information as well as to identify the state of the art of a technological problem in the electronic systems scope and its possible application to new systems

LEARNING OUTCOMES

The students passing this course should be able to:

- From a set of specifications and requirements of the diffrenet blocks involved in an electronic system, for a given professional application or research activity, to know the tools required for designing and developing every block and for planning system integration
- To know the differences between a reconfigurable digital system and microprocessor-based digital system, and to assess their usage for every application or even their integration witing an embedded system.
- To know the elements involved in a data communication system and the different abstraction levels, with a block specification focus (considering required elements for an electronic system working in a network)
-To know the different networks topologies applied to the design and specification of electronic systems, including sensor networks.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Sensor Networks
   - 1.a. Communication networks, Sensor networks, OSI model
   - 1.b. Sensor networks built with Embedded Systems
   - 1.c. Dealing Sensor Data
2. Nodes Hardware
   - 2.a. Sensores
   - 2.b. Node Architecture
   - 2.c. Node-Sensor Interface

2.d. Energy harvesting, power consumption
3. Networks and Communications
3.a. Topologiess (architectures)
3.b. Routing & communications
3.c. Networking, Broadcast & Dissemination
4. Wired and Wireless Protocols
4.a. Wired
4.a.i. Automotive
4.a.ii. Space
4.a.iii. General
4.b. Wireless
4.b.i. Bluetooth
4.b.ii. Wifi
4.b.iii. Zigbee
5. Seminar taught by an expert in the field

LEARNING ACTIVITIES AND METHODOLOGY

LEARNING ACTIVITIES
Lectures
Theoretical and practical classes
Practical classes

Individual support when required by student
Team work

TEACHING METHODOLOGIES
Teacher explanations supported with audiovisual media and information technology, in which the main concepts of the subject are developed and the reference literature is provided to supplement student learning.
Demonstration of practical cases, problems, etc.. The cases are posed by the teacher and solved individually or in groups with support of CAD tools

ASSESSMENT SYSTEM

Continual Assesment (40%). It is composed of:
- 1 short test (or short questions exams) (10%) after the seminar
- 1 computer lab work with the hardware supplied by the professor (10%)
- 1 team work where knowledge acquired during course should be applied (20%)

Final exam (60%)

Extraordinary Exam:

Assessment can be fitted with the continuous assessment process with the same system as in ordinary system or a final exam with the 100% of qualification.

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

BASIC BIBLIOGRAPHY

- Mohammad Ilyas, Imad Mahgoub Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems. ISBN: 9780849319686, CRC Press, 2004
- W. Dargie, C. Poellabauer "Fundamentals of Wireless Sensor Networks Theory and Practice" ISBN: 978-0-470-99765-9, Willey Series on Wireless Communication and Computing, 2010

ADDITIONAL BIBLIOGRAPHY

- J. Fraden Handbook of Modern Sensors, Physics Design and Applications, Springer, 2004
- Peter Marwedel Embedded System Design, Springer Science, 2011. 2nd Edition