Universitat Autònoma de Barcelona

Integration of Wireless Sensor Networks: Hardware Solutions

2016/2017

Code: 42840
ECTS Credits: 6

Degree	Type	Year	Semester
4313797 Telecommunications Engineering	OT	2	1

Contact

Name: Carles Ferrer Ramis

Email: Carles.Ferrer@uab.cat

Use of languages

Principal working language: english (eng)

Teachers

Joan Oliver Malagelada

Màrius Montón Macián

Prerequisites

None, though it is recommended to have made the subject of first course.

Objectives and Contextualisation

The aim of this module is to provide knowledge for the development of sensor network nodes that allow both the implementation of the communication protocols of the network of sensors, such as sensors and actuators connected to the node. From the Internet-of-Things applications and design methodologies, the hardware platforms development aspects are reinforced.

Skills

- Be capable of using programmable logic as well as designing advanced electronic systems, both analogue and digital.
- Capacity for critical reasoning and thought as means for originality in the generation, development and/or application of ideas in a research or professional context.
- Capacity for developing electronic instrumentation as well as transducers, actuators and sensors.
- Capacity for working in interdisciplinary teams
- Knowledge of the hardware description languages for highly complex circuits
- Maintain proactive and dynamic activity for continual improvement
- Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously

Learning outcomes

1. Capacity for critical reasoning and thought as means for originality in the generation, development and/or application of ideas in a research or professional context.

2. Capacity for working in interdisciplinary teams
3. Design integrated circuits using hardware description languages through ASICs and/or FPGAs
4. Integration of sensors and actuators with programmable circuits for implementing sensor network nodes.
5. Maintain proactive and dynamic activity for continual improvement
6. Students should know how to apply the knowledge they have acquired and their capacity for problem solving in new or little known fields within wider (or multidisciplinary) contexts related to the area of study
7. Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
8. Use programmable digital logic devices in communications applications

Content

1. Introduction to IoT

Internet of things (IoT), IoT characteristics, IoT layered architecture, Applications and Scenarios of Relevance, Application Areas, Smart Applications.
2. Electromobility
ICE, HEV and EV. Battery Management Systems, Wireless communications, Electronic Control Units.
3. Smart Industry
Smart Factory, Industrial Robots, Autonomous Mobile Robots, Hw platforms for control autonous systems.
4. Smart buildings
ICS & OT. Building Management Systems. Cyber Physical Systems.
5. Security for WSN
SW and HW architecture, Secure Features for WSNs, Authentification and Key Management by FPGA.

Methodology

Theory lectures:
Exhibitions on the board of the theoretical part of the syllabus for the course. Give basic knowledge of course and instructions on how to complete and deepen the content.

Seminars problems:
It works exhibited scientific and technical knowledge in lectures. They solve problems and discuss case studies. Problems with promoting the capacity for analysis and synthesis, critical reasoning, and trains students in problem solving.

The methodology problems is: deliver complete exercises to be solved. In class A review of the doubts that have arisen are resolved and those students have conflicts. In some problems working session group for solving synthetic material.

Practices:
Practices are held during the year and serve to deepen the practical knowledgematter. Students will work in groups of two. In practice, students will develop habits of thought from the course and work group.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Theory lectures	21	0.84	1, 3, 4, 8
Type: Supervised			

Practices	12	0.48	1, 2, 3, 4, 5, 6, 8
Seminars	3	0.12	1, 2, 3, 4, 5, 6, 7, 8
Type: Autonomous			
Study	90	3.6	

Evaluation

The evaluation of the course is broken down into the following items:

1. Evidence of continuous assessment (theory and seminar lectures). The total weight of this subject is 50%. You must get at least 4 points in each partial test for the absence to recover. A 4.5 points the average of the continuous assessment tests to pass the course by the middle notes of items 2 and 3.

2. Laboratory activities. The total weight of the subject is 35%. It is essential to aprove them to pass the course. No recovery mechanism established practice.

3. Student works. The total weight of the subject is 15%. Corresponds to the student works done during the course.

There is a final exam to recover part of the continuous assessment or suspended for up note. In the latter case, the final grade will be that obtained in this last race.

Any modification that has been produced in this forecast assessment due to unforeseen circumstances, will be communicated to students .

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Practices	35%	10	0.4	1, 2, 3, 4, 5, 6, 8
Problems/Seminars	15%	10	0.4	1, 2, 3, 4, 5, 6, 7, 8
Theory	50%	4	0.16	1, 3, 4, 5, 8

Bibliography

Ovidiu Vermesan, Peter Friess: Internet of Things: From Resaerch and Innovation to Market Deployment. River Publishers, 2014.

Bernard Candaele, Dimitrios Soudris, Iraklis Anagnostopoulos: Trusted Computing for Enbedded Systems. Springer, 2014