Universitat Autònoma de Barcelona

2020/2021

RFID Technology and Sensor Systems

Code: 104552
ECTS Credits: 6

Degree	Type	Year	Semester
2503743 Management of Smart and Sustainable Cities	OT	3	2

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Raul Aragonés Ortiz

Ferran Paredes Marco

Prerequisites

It is advisable to have taken the following subjects:

- Fundamentals of Electronics

- Instrumentation and Sensors

- Digitization and Microcontrollers

Objectives and Contextualisation

The overall goal of the subject is to provide the basic knowledge and techniques that allow the student to enter the Internet of Things (IoT) sector and its applications in smart city management.The subject covers different technologies, such as RFID, NFC, intelligent sensing, positioning systems, etc.The subject will be carried out from an eminently practical approach and oriented to the application of each one of these technologies.

Competences

- Critically analyse work carried out and demonstrate a desire to improve.
- Design platforms of management, integration of public and government services applying technologies and systems of sensorization, acquisition, processing and communication of data.
- Generate innovative and competitive proposals in professional activity.
- Identify and use different sources, models and data bases of information generated by urban activity, as well as their principles of operation, access policies and standards.
- Solve problems of urban or regional management on a basic level for the implementation of processes for decision making.

- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.

Learning Outcomes

1. Assess the capabilities of existing radio-frequency identification technologies so as to integrate these into applications of use to the public.
2. Combine information sensed/captured with information from the medium already processed in databases.
3. Critically analyse work carried out and demonstrate a desire to improve.
4. Generate innovative and competitive proposals in professional activity.
5. Identify examples of the application of digital sensors in smart and sustainable cities.
6. Recognise information on the general environment required for decision making.
7. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
8. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
9. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
10. Use geolocation as a tool to add value to the information captured from the environment.

Content

Short-range technologies: NFC, LF-RFID, HF-RFID

Long-range technologies: UHF-RFID, MW-RFID

Differences between active and passive technologies and applications (Integration of citizen cards, traffic management, mail and logistics management, etc.)

Digital sensors and embedded systems in digital sensing.

Positioning systems.Position and range sensors.Units of inertial measurement.

Introduction to DSPs (Digital Signal Processing).

Sound and image.Voice recognition.Digital cameras.

Sensors for building and digitization in urban space.

Methodology

Directed activities:

Master CLasses: The teacher will explain the topics using the projection cannon and blackboard.

Problem seminars: The teacher will perform, or in some cases the students themselves, example problems in small groups of students.

Laboratory sessions: Prior to the practice session, the student must prepare it and after it must submit a report.
Note: - The teaching materials of the subject will be available in the Virtual Campus of the UAB
-The preferred form of communication between teachers and students will be e-mail

Supervised activities: tutorials outside of class hours.

Autonomous activities:

Study at home

Solving class problems prior to completing them.

Preparation of Laboratory sessions.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Laboratory sessions	12	0.48	2, 5, 9, 7, 8, 6, 10, 1
Master classes	26	1.04	2, 4, 5, 7, 6, 10, 1
Problems seminars	12	0.48	3, 2, 4, 5, 7, 8, 6, 10, 1
Type: Supervised			
Tutorials outside of class hours	7.5	0.3	2, 5, 9, 8, 10, 1
Type: Autonomous			
Laboratory sessions preparation	12	0.48	3, 2, 4, 5, 9, 7, 8, 10, 1
Solve problems at home	15	0.6	5, 7, 6, 1
Study at home	25	1	3, 2, 4, 5, 7, 8, 6, 10, 1

Assessment

The subject will be evaluated from the delivery of two projects with a weight of 37.5% each and the results of the reports of laboratory work with a weight of 25%.
The projects will be averaged between themr and if the average result is higher than 4 they will average with the practices
In the case of not passing the subject, the part corresponding to the projects will be able to recover in a single final exam where all the contents of the course will be evaluated. To participate in the recovery, you must have previously evaluated activities that involve a minimum of 2/3 of the final grade of the subject.
If the subject is not passed, the final grade will correspond to the grade obtained in the final exam (or to the projects in the case of not appearing in the final exam).
Failure to attend any of the lab sessions or not having a grade in the projects or the final exam will mean that the student will be declared non-assessable.
Granting an honorary enrollment grade is the decision of the faculty responsible for the subject. UAB regulations state that MHs can only be awarded to students who have obtained a final grade equal to or higher than 9.00. Up to 5% MH of the total number of students enrolled can be awarded.
Without prejudice to other disciplinary measures deemed appropriate, irregularities committed by the student that may lead to a variation in the grade of an assessment act will be graded with a zero. So, copying, plagiarism, cheating, copying, and so on. in any of the assessment activities it will involve suspending it with a zero. Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the course, this course will be suspended directly, without

the opportunity to retake it in the same course.
In case of repeating thesubject, the same evaluation system will be followed as the rest of the students.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1st project delivery	37.5	15	0.6	3, 4, 9, 7, 8, 6, 1
2nd project delivery	37.5	15	0.6	3, 2, 4, 5, 9, 7, 8, 6, 10
Delivery of Lab reports	25	10.5	0.42	3, 2, 4, 5, 9, 7, 8, 6, 10, 1

Bibliography

1. V.D. Hunt, A. Puglia and M. Puglia. RFID. A guide to Radio Frequency Identification. John Wiley & Sons, New Jersey 2007.2. H. Lehpamer. RFID design principles. Artech House, Norwood 2008.3. D. M. Dobkin. The RF in RFID. Passive UHF RFID in Practice. Elsevier 2008.

2. H. Lehpamer. RFID design principles. Artech House, Norwood 2008.

3. D. M. Dobkin. The RF in RFID. Passive UHF RFID in Practice. Elsevier 2008.

4. Fortino, Giancarlo, Liotta, Antonio. Internet of Things. Technology, Communications and Computing. Springer. ISSN: 2199-1073