Wireless Devices in IoT

Academic Year: (2022 / 2023) **Review date: 25-05-2022**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: AMOR MARTIN, ADRIAN

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

To have completed the course on Protocols and Communication Systems, or to have completed the courses on High Frequency Technologies or Antennas in their corresponding bachelor degree.

OBJECTIVES

Basic skills

CB6 To acquire and understand basic knowledge that provides a basis and opportunity to be original in the development and/or application of ideas, often in a research context.
CB7 To allow the students to apply the acquired knowledge for the resolution of problems in new or not well-known environments, inside wide or multidisciplinary contexts related to their area of study.
CB8 To allow the students to integrate the acquired knowledge, and to deal with the complexity of making judgments from incomplete or limited information, that must include issues of social and ethical responsibility associated with the application of said knowledge and judgments.
CB9 To qualify the students to communicate their conclusions and the knowledge and reasons that support them, in a clear and non-ambiguous way, to specialized and non-specialized audiences.

General skills
CG1 Capacity to identify, define and formulate problems related to IoT applications. This capacity should include the simultaneous assessment of all the problem factors, technical and environmental, and civil liability.
CG3 Proactive capacity to approach and solve the problems formulated in new and unknown environments, in the context of IoT.
CG4 Capacity for teamwork, integrating multidisciplinary points of view.

Specific skills
CE3 Capacity to identify the security risks of communications in IoT environments, and to identify the communication protocols suited to mitigate the identified risks.
CE4 Capacity to design and implement communication networks for IoT environments.
CE11 Capacity to design and control the last generation wireless networks in IoT applications.
CE12 Capacity to implement the communication of devices, both between them and in a global way, in IoT environments.

Learning outcomes
The results of the learning process should be the following:
- Knowledge of the different communication architectures for IoT, and how are they integrated into more general mobile communication architectures.- ¿
- Capacity to develop radiofrequency equipment and subsystems for IoT.
- Capacity to design electromagnetic sensors and antennas for the radiofrequency systems used for IoT.
- Capacity to integrate sensors and antennas in transmitters and receivers for IoT.
- Capacity to analyze, design, and plan complete mobile communication systems, considering the specifications and fundamental quality factors.

DESCRIPTION OF CONTENTS: PROGRAMME

The subject is structured into two parts: a practical part, which is the most important from the point of view of evaluation, and a theoretical part, where basic concepts and hot topics in IoT are taught.

Theoretical part:
1. Overview of basic concepts of radiation

2. NFC
3. Small antennas
4. Electromagnetic sensors
5. Measurement of antennas
6. Harvesting

Practical part:
MATLAB design of a radiolink with a practical case of use

LEARNING ACTIVITIES AND METHODOLOGY

Formative activities included in the curriculum

AF1 Theoretical class
AF4 Laboratory practices
AF5 Office hours
AF6 Teamwork
AF7 Individual work of the student
AF8 Midterm and final exams

Activity code	Total hours	Classroom hours	% classroom hours
AF1	18	18	100
AF4	3	3	100
AF6	3	1	33
AF7	48	0	0
AF8	3	3	100
TOTAL	75	25	33%

Methodology

MD1 Master class supported by computing and audiovisual media, where the main topics are exposed, and bibliography is provided to complement the learning by the students.
MD2 Critical reading of recommended texts: press articles, reports, textbooks and/or academic papers, both to be later discussed in class, or to complement and consolidate the knowledge of the topic.
MD3 Resolution of practical cases, problems, etc., proposed by the teacher, individually or in groups.
MD4 Exposition and discussion in class of topics related to the course and practical cases, under teacher moderation.
MD5 Elaboration of assignments and reports individually or in groups.

ASSESSMENT SYSTEM

SE1 Class participation.
SE2 Individual or group exercises during the term.
SE3 Final exam.

Evaluation method	Minimum weighing (%)	Maximum weighing (%)
SE1	10	20
SE2	20	60
SE3	30	80

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

BASIC BIBLIOGRAPHY

- Balanis Modern Antenna Handbook, Wiley, 2008
- D.M. Dobkin The RF in RFID: uhf RFID in practice. , Newnes, 2012
- Klaus Finkenzeller RFID Handbook, Wiley , 2010
- Pozar Microwave Engineering , Wiley, 2010
- S. A. Ahson, M. Ilyas. RFID handbook: applications, technology, security, and privacy. , CRC press. , 2008