Internet of Things

Academic Year: (2019 / 2020) **Review date: 08-05-2020**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: CALDERON PASTOR, MARIA CARMEN

Type: Electives ECTS Credits : 3.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Communications networks and services

OBJECTIVES

This course introduces the basic principles of Internet of Things (IoT) and the main IoT standardized architectures, to then focus on the communication networks and services specific of IoT, illustrating its application to different use cases.
The main objective of this course is to analyse both architectural principles and the different technologies that can be used to deploy an IoT system. To achieve this objective, the student must acquire specific knowledge and capacities.

Regarding the Program Outcomes (POs) of the degree, the course covers the following ones:
a) an ability to apply knowledge of mathematics, statistics, science, telecommunication technologies and engineering
b) an ability to design and conduct experiments, as well as to analyze and interpret data
e) an ability to identify, formulate, and solve engineering problems
j) a knowledge of contemporary issues
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Regarding knowledge (PO j), at the end of the course the student will be able to:
- Understand the concept of IoT and its basic principles.
- Understand the main IoT standardized architectures.
- Understand the main connectivity technologies for IoT that can be applied to different use cases.
- Understand how to adapt IP protocol to an IoT environment.
- Understand the main IoT application protocols.
- Understand different IoT use cases.

As for the specific abilities, at the end of the course the student will be able to:
- Know and understand the main reference architectural models for IoT.
- Know and identify different connectivity technologies, both short and long-range, applicable to the IoT domain.
- Ability to design network level solutions, transport and application for IoT.
- Be able to design a network of sensors / actuators and their connection to the Internet according to the requirements of different use cases.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to IoT and basic concepts
2. Standardized IoT architectures: Onem2m, IoTWF, ...
3. Sensors and actuators: smart objects
4. Connectivity in IoT: 5G - Massive IoT, NB-IoT, LTE-M, Sigfox, LoRaWAN, Zigbee, IEEE 802.15.4, ...
5. IP for IoT: 6LowPan, ...
6. Application Protocols for IoT: COAP, MQTT, ...
7. Use Cases

LEARNING ACTIVITIES AND METHODOLOGY

The teaching methodology based on active learning will include:
(1) Lectures. The course has a basic reference book (see bibliography). The course will also propose complementary bibliography to allow students to complete and detail particular chapters. (POs a, j)

(2) Practical classes applied to IoT networks. (PO b, k)
(3) Exercises and study case solved by students as personal work so that they will be able to auto-evaluate acquired skills. (POs e, k)
(4) Group discussion of homework that will allow to develop the skill of analysing and communicating the relevant information so as to solve problems. (POs b, k)

ASSESSMENT SYSTEM

Evaluation:

50% of continous assessment and 50% of end-of-term examination

The continuous evaluation mark will be obtained from:
1) 20% of the assessment of practical sessions
2) 30% of a final work done by students

The extraordinary evaluation will be by means of an exam (100% of the mark)

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- Rob Barton; David Hanes; Gonzalo Salgueiro IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, 2017

ADDITIONAL BIBLIOGRAPHY

- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle. From machine-to-machine to the Internet of things: introduction to a new age of intelligence., Kidlington Oxford: Academic Press., 2014
- Jean-Philippe Vasseur;Adam Dunkels. Interconnecting Smart Objects with IP: The Next Internet., Morgan Kaufmann Publishers Inc., 2010
- Perry Lea. Internet of things for architects: architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security., Packt Publishing., 2018