IoT Network Architectures

Academic Year: (2019 / 2020) **Review date: 16-05-2019**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: SOTO CAMPOS, IGNACIO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

It is expected that students taking this course have a basic prior knowledge of the fundamentals of network and protocol technologies.

OBJECTIVES

Core Competencies
CB6 Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context.
CB7 That students know how to apply the knowledge acquired and their problem-solving ability in new or poorly known environments within broader (or multidisciplinary) contexts related to their area of study.
CB8 That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
CB9 That students know how to communicate their conclusions and the knowledge and ultimate reasons behind them to specialized and non-specialized audiences in a clear and unambiguous manner.

General Competences
CG1 Ability to identify, define and formulate problems to be solved related to IOT applications. This capability includes simultaneous assessment of all factors at play, not only technical, but also environmental and liability.
CG3 Proactive capability to address and solve problems posed under new or poorly known environments within the IoT context.
CG4 Capacity for teamwork, integrating multidisciplinary approaches.

Specific competencies
CE4 Ability to design and implement communications networks for IoT environments.
CE11 Ability to design and control state-of-the-art wireless networks in IoT applications.
CE12 Ability to apply device communication, both between devices and globally, in the IoT environment.

LEARNING OUTCOMES
The learning outcomes that students should have are:
- To know the different architectures of mobile communication.
- To know the different communication architectures of IoT and how they are integrated in the mobile communication architectures.
- Ability to design a communication architecture in IoT, integrating it into the ideal mobile communication architecture.
- Ability to analyse, design and plan complete mobile communications systems according to fundamental quality requirements and parameters.

DESCRIPTION OF CONTENTS: PROGRAMME

1. IoT Network Architectures
   1.1. Design of IoT network architectures
   1.2. Standardized IoT network architectures (Onem2m, IoTWF, ...)
   1.3. Reference model for connectivity solutions in IoT
2. Connectivity in IoT
   2.1. Short range communication technologies (IEEE 802.15.4, Zigbee, BLE, Wi-Fi)
   2.2. Long range communication technologies (LoRa, Sigfox, NB IoT, LTE-M, 5G - Massive IoT...)
   2.3. PLC/G3-PLC
3. Network protocols
   3.1. IP in IoT (6LowPAN...)
   3.2. Routing in IoT

LEARNING ACTIVITIES AND METHODOLOGY

The training activities applied in this subject will be:
- Theoretical classes
- Laboratory Practices
- Group work
- Individual student work
- Partial and final examinations

The subject will use the following teaching methodologies:
- Exhibitions in the teacher's class with computer and audiovisual support, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.
- Critical reading of texts recommended by the subject teacher: press articles, reports, manuals and/or academic articles, either for later discussion in class, or to expand and consolidate knowledge of the subject.
- Resolution of practical cases, problems, etc. raised by the teacher individually or in group.
- Presentation and discussion in class, under the teacher's moderation of topics related to the content of the subject, as well as practical cases.
- Elaboration of works and reports individually or in group.

ASSESSMENT SYSTEM

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

The evaluation will be based on:
- Assessment of practical sessions (20%)
- Individual or group work done during the course (30%)
- Final Exam (50%)

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

BASIC BIBLIOGRAPHY

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

- Perry Lea Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, Packt Publishing, 2018

ADDITIONAL BIBLIOGRAPHY

- Jean-Philippe Vasseur, Adam Dunkels Interconnecting Smart Objects with IP: The Next Internet, Morgan Kaufmann, 2010

- James Kurose, Keith Ross Computer Networking: A Top-Down Approach, Pearson Education Limited, 2016

- Raffaele Gravina, Carlos E. Palau, Marco Manso, Antonio Liotta, Giancarlo Fortino Integration, Interconnection, and Interoperability of IoT Systems, Springer, 2017

- Vasuky Mohanan, Rahmat Budiarto, and Ismat Aldmour Powering the Internet of Things With 5G Networks, IGI Global, 2017