Machine-2-Machine Communications

Academic Year: (2020 / 2021) **Review date: 16-11-2020**

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: SANCHEZ FUENTES, RAFAEL

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Communications systems and protocols

OBJECTIVES

BASIC COMPETENCES

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 ability to solve problems in new or unfamiliar 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 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 that sustain them to specialized and non-specialized audiences in a clear and unambiguous way

GENERAL COMPETENCES
CG3 Capacity to develop basic distributed applications for the transport, storage and management of information.
CG5 Capacity for basic analysis of the requirements for information management and treatment of large volumes of data.

SPECIFIC COMPETENCES
CE5 Ability to know and understand the structure of networks and protocols involved in distributed applications and IoT / M2M environments
CE6 Ability to design and control some next-generation wireless networks in industrial applications
CE7 Ability to apply the communication of devices, both among them and globally, in the environment of Connected Industry 4.0

LEARNING RESULTS
After completing this SUBJECT MATTER, the student will be able to_
- Design a communications network adapted to the productive needs of the factories and services.
- Design, manage and use wireless communications networks in industrial, non-industrial, urban and rural environments, including 5G.
- Manage Cloud / Edge distributed computing technologies and the implementation of applications based on virtual reality.
- Manage augmented reality technology for the design and implementation of distributed applications in the context of Industry 4.0 by collecting information from different data sources.
- Adopt solutions for intelligent operations based on the integration of augmented reality systems, visual and / or acoustic recognition, natural language and data flows from "industrial data lakes".

DESCRIPTION OF CONTENTS: PROGRAMME

- Introduction to the protocol architecture.
- Application layer protocols: HTTP-REST, CoAP, MQTT / MQTT-SN, others.
- Application layer protocols and public cloud
- Introduction to on-device machine learning
- Case studies.
- Programming in a Machine-Machine Communications environment.

LEARNING ACTIVITIES AND METHODOLOGY

TRAINING ACTIVITIES:
AF1 Theoretical class. Classroom activity consisting of the presentation of the main concepts as a summary. Discussion and clarification of doubts about the concepts acquired by the student in the self-learning process.
AF2 Practical classes. Classroom sessions in which problems arise that the students must solve in debate with the teacher.
AF4 Laboratory practices. Classroom sessions in the laboratory in which supervised practical assignments will be carried out by the teacher.
AF5 Tutorials. Tutorials with the teacher, individual or group.
AF6 Group work. Non-classroom activity consisting in the realization in groups of works proposed by the teacher.
AF7 Individual work of the student. Non-classroom activity consisting of individual study by the student.
AF8 Partial and final exams. Realization of classroom exams.

Code Activity	No. Total hours	No. Classroom	hours% Classroom
AF1	12	12	100
AF2	6	6	100
AF4	3	3	100
AF5	2	2	100
AF6	25	0	0
AF7	25	0	0
AF8	2	2	100

EDUCATIONAL TRAINING METHODOLOGIES:
MD1 Exhibitions in the teacher's class with support of computer and audiovisual media, in which the main concepts of the subject are developed and the bibliography is provided to complement the students' learning.
MD2 Critical reading of texts recommended by the teacher of the subject: articles, reports, manuals and / or academic articles, either for further discussion in class, or to expand and consolidate the knowledge of the subject.
MD3 Resolution of practical cases, problems, etc. raised by the teacher individually or in groups
MD4 Exhibition and discussion in class, under the teacher's moderation of topics related to the content of the subject, as well as case studies

ASSESSMENT SYSTEM

The assessment of the subject will be according to the following:
- Individual or group work carried out during the course (SE2): 50% of the final grade.
- Final exam (SE3): 50% of the final grade.
Both must be passed separately.

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

BASIC BIBLIOGRAPHY

- Al-Fuqaha, A.; Guizani, M.; Mohammadi, M.; Aledhari, M.; Ayyash, M. Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications, Communications Surveys & Tutorials, IEEE , vol.17, no.4, pp.2347-2376, Fourth quarter 2015
- Douglas Comer The ZigBee IP Protocol Stack, The Internet Protocol Journal, Volume 17, No. 2, December 2014
- Ilya Grigorik HTTP/2: A New Excerpt from High Performance Browser Networking, O¿Reilly, 2015
- Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri Internet of Things: Architectures, Protocols and Standards, Wiley. ISBN: 978-1-119-35967-8, Nov. 2018
- Stallings, W. Internet of Things: Network and Security Architecture, in Internet Protocol Journal, vol.18, no. 4, pp. 2-24, Dec 2015
- V. Karagiannis, P. Chatzimisios, F. Vázquez-Gallego, J. Alonso-Zarate A Survey on Application Layer Protocols for the Internet of Things, in Transaction on IoT and Cloud Computing, Vol. 1, No. 1, January 2015
- Villaverde, B.C.; De Paz Alberola, R.; Jara, A.J.; Fedor, S.; Das, S.K.; Pesch, D. Service Discovery Protocols for Constrained Machine-to-Machine Communications, in Communications Surveys & Tutorials, IEEE , vol.16, no.1, pp.41-60, First Quarter 2014