

Academic Year: (2024 / 2025)

Review date: 11-09-2024

Department assigned to the subject: Telematic Engineering Department

Coordinating teacher: CALLEJO PINARDO, PATRICIA

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- Communications systems and protocols

OBJECTIVES

The objective of this course is to provide students with in-depth knowledge of machine-to-machine (M2M) communication architecture and protocols within the context of Industry 4.0. Key M2M application protocols, such as CoAP and MQTT, will be covered, along with their integration with public cloud platforms. Additionally, students will be introduced to machine learning on edge devices, with a focus on TensorFlow Lite. Through practical case studies and programming in M2M environments, students will acquire essential skills to implement advanced communication and data processing solutions in industrial settings.

DESCRIPTION OF CONTENTS: PROGRAMME

- Introduction to the protocol architecture.
- Application layer protocols: HTTP-REST, CoAP, MQTT / MQTT-SN, others.
- Discovery layer.
- Application layer protocols and public cloud.
- Introduction to on-device machine learning. Introduction to TensorFlow Lite.
- 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

% end-of-term-examination:	50
% of continuous assessment (assignments, laboratory, practicals...):	50

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.

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
- 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

ADDITIONAL BIBLIOGRAPHY

- 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
- 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