

Foundations of internet of things

Academic Year: (2023 / 2024)

Review date: 02-05-2023

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: GARCIA GUZMAN, JAVIER

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

- * Programming (Year 1 / Semester 1)
- * Software Development (Year 2 / Semester 2)
- * Operating Systems (Year 2 / Semester 2)

SKILLS AND LEARNING OUTCOMES

- ¿ Know the different types of devices and operating systems of an Internet of Things system.
- ¿ Using programming interfaces (APIs) for IoT device programming
- ¿ Apply operating system fundamentals to package and virtualise microservices to manage IoT device clouds.

OBJECTIVES

The goal of this course is to introduce students into the organization, structure and internal vision of the operating systems necessary for Internet of Things systems. Students will learn the services that integrate sensor and actuator based systems and understand the influence that design decisions have on the behavior of an Internet of Things System.

DESCRIPTION OF CONTENTS: PROGRAMME

1. IoT Systems Architecture
2. Sensors and Actuators
3. Embedded Operating Systems for IoT devices
4. Fundamentals of programming IoT Devices
5. IoT Edge to Cloud Protocols
6. Microservices for IoT Devices Cloud Management
7. Packaging and deployment of microservices for IoT

LEARNING ACTIVITIES AND METHODOLOGY

- * Lectures: 1 ECTS. They aim to achieve the specific cognitive competences of the subject, as well as the transversal competences of analysis and abstraction.
- * Practical classes: 1 ECTS. They aim to initiate the development of the specific instrumental competences, as well as the transversal competences problem solving and application of knowledge.
- * Practical workbooks: 3 ECTS. Initiated during the practical classes and completed outside of them, they aim to complete the development of the specific instrumental competences and to initiate the development of the specific attitudinal competences, as well as the transversal competences problem solving and application of knowledge.
- Final exam: 1 ECTS. It aims at influencing and complementing the development of the specific cognitive and procedural skills. It reflects especially the use of master classes.
- Tutorials: TUTORIALS. Individualized assistance (individual tutorials) or in group (collective tutorials) to the students by the professor.
- Relation between results and evaluable activity.

ASSESSMENT SYSTEM

ORDINARY CALL

The continuous evaluation is made up of: Notebooks of Practical Exercises and, exceptionally, partial theory exams.

Regarding continuous evaluation:

- + All practical exercise workbooks must be delivered
- * The average mark of the practices must be greater than or equal to 5 out of 10.

- + Exceptionally, the final exam of the subject may be replaced by partial exams
- * The average grade of the partial exams must be greater than or equal to 5 out of 10.

The final exam:

- + Includes all the content and aspects of the subject: theory and practice. The theory part will be evaluated by a test and the practical part will be evaluated by means of a final challenge to be delivered the date stated for the course exam.
- + The final exam has a minimum grade of 5 out of 10.

The grade of the subject (by following the continuous evaluation) is calculated as follows:

$$\text{Final grade} = \text{Final exam grade} * 0.60 + \text{Practical exercises notebooks} * 0.40$$

Alternatively, the final exam will represent 60% for all those students who do not join the previous continuous assessment system.

The minimum grade of each of the parts must be equal to or greater than 5 out of 10.

EXTRAORDINARY CALL

The final exam will represent 60% of the grade and the Final Challenge 40%.

The minimum grade of each of the parts must be equal to or greater than 5 out of 10.

CLARIFICATIONS

- 1) Cheating programming assignments, lab assignments, etc. will be prosecuted. Not only the continuous evaluation is lost but further punishment actions will be taken. Both, copying from other group or copying from Internet works are considered cheating.
- 2) For all group works, the related skills and abilities must be fulfilled by all members. All members share the responsibility for the submitted work.
- 3) Depending on the total number of students, the academic calendar, number of groups, etc., some adaptations will be necessary in order to unwrap the course. Aula Global will be used to introduce the supplementary norms to the ones introduced here.
- 4) In order to obtain the best possible grade, not only academic aspects will be considered but also how the student has been collaborating in the general learning process of the course.

% end-of-term-examination: 60

% of continuous assessment (assignments, laboratory, practicals...): 40

BASIC BIBLIOGRAPHY

- Anand Tamboli Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours, Apress, 2019
- Bob Familiar Microservices, IoT, and Azure: Leveraging DevOps and Microservice Architecture to Deliver SaaS Solutions, Apress, 2015
- Gabriel N. Schenker, Hideto Saito, Hui-Chuan Chloe Lee, Ke-Jou Carol Hsu Getting Started with Containerization, Packt Publishing, 2019
- Perry Lea Internet of Things for Architects, Packt Publishing, 2018
- Peter Waher Mastering Internet of Things, Packt Publishing, 2018
- Qusay F. Hassan Internet of Things A to Z, Wiley-IEEE Press, 2018
- Richard Blum, Christine Bresnahan Sams Teach Yourself Python Programming for Raspberry Pi in 24 Hours, Second Edition, Sams, 2015