School of Technology and Management
Course Unit Syllabus

Level of qualification:
Second Cycle (EQF level 7) - Master
Study cycle:
Internet of Things

Course Unit: – **Devices for the Internet of Things**

Year 1 **Semester 1** **ISCED Code: 0714** **ECTS: 6**

Type of Course Unit: Compulsory **Delivery Mode:** Face-to-face / Distance Learning **Language of Instruction:** Portuguese

COURSE COORDINATOR: José Jasnau Caeiro

HOURS OF WORK

TOTAL HOURS	Contact Hours								Hours in autonomous work
	Theory	Theory and practice	Practical and laboratory work	Field work	Seminar	Internship	Tutorial guidance	Other	
150		**29**							**121**

Prerequisites (if applicable): n.a.

LEARNING OUTCOMES (knowledge, skills and competence)

1. Know the concepts, devices, testing, and measurement equipment for basic electronics;

2. Design simple electrical and electronic circuits for interaction with external systems (sensors and actuators) with appropriate signal conditioning;

2. Characterize the energy consumption of IoT systems;

3. Know and describe the technical characteristics, as well as the specific areas for use of current computing systems for developing applications for IoT;

4. Develop applications for the IoT using different current computing systems and their interfaces, with implementation of adaptation circuits and interface to external systems and devices;

5. Summarize, in a report format, the work carried out to implement IoT applications in current computing systems.

CONTENTS

1. Raspberry Pi microcomputer architecture.

2. Arduino and ESP32 microcontroller architecture.

3. Electrical and electronic circuit analysis.

4. Electronic instrumentation.

5. Passive and active electronic devices.

6. Sensors and actuators.

DEMONSTRATION OF THE CONTENTS COHERENCE WITH THE COURSE UNIT'S LEARNING OUTCOMES

Each theme will be taught with content lectures at the beginning. Bibliographical resource search will be emphasized.

Experiments will be proposed to the students destined to put at work the equipments discussed in the lectures.

The instalation of the operating system of the Raspberry Pi microcomputer (item 1 of contents) and to test the communication with the Arduino microcontroller (item 2 of contents).

The students will have the opportunity to implement electronic circuits with sensors that will be connected to the microcomputer and to the microcontroller (items 3, 4, 5 and 6 of the contents).

From the start of the semester emphasis will be given to the implementation of the mini-project according to the lecturing progression (all content items).

TEACHING METHODOLOGIES

The teaching of each subject will begin with the presentation and discussion in class of the content planned for the course (all items).

After the introduction of each topics addressed in contents 3 to 6, laboratory work will be carried out for implementation and testing of electrical and electronic circuits. After the introduction of the topics of contents 4 to 6, laboratory work will address the design and implementation of simple circuits to interface with sensors and actuators.

For each of the topics of contents 1, 2, 4, 5, 6, laboratory work will be carried out (with simulation and implementation) aimed to the understanding and acquisition of skills in developing applications for IoT, using the various subsystems and GPIO of each computing system.

DEMONSTRATION OF THE COHERENCE BETWEEN THE TEACHING METHODOLOGIES AND THE LEARNING OUTCOMES

It is the course objective that students know the main concepts of electrical and electronic engineering, as well as the ability to design simple interconnection circuits to external sensors and actuators controlled by current computing systems.

In order to ensure contact with this variety of concepts and tools, the lecture periods in the classroom will be interspersed with interrogative methods and followed by practical application in laboratory.

In this practical component, students will perform several laboratory work addressing the basic electronic component of the course, and subsequently proceed to the development of control applications in current computing systems, for interaction with external sensors and actuators.

EVALUATION METHODS

The evaluation will be done with a mini project, understanding:

* mini-project report

* equipment implementation

The final results will be expressed in a 0 to 20 points scale and will be fully based on this evaluation.

The second chance evaluation will be based on the improvement of the mini-project in order to attain enough results that will prove the outcomes for the curricular unit.

MAIN BIBLIOGRAPHY

1. Manuel Medeiros da Silva. (2001). Introdução aos Circuitos Eléctricos e Electrónicos. Fundação Calouste Gulbenkian.

2. Charles Platt. (2016). Encyclopedia Of Electronic Components (Light, Sound, Heat, Motion, Ambient, And Electrical Sensors). O'Reilly Media, Inc.

3. Simon Monk. (2016). Raspberry Pi Cookbook: Software and Hardware Problems and Solutions. O'Reilly Media, Inc.

4. Jeremy Blum. (2013). Exploring Arduino: Tools and Techniques for Engineering. John Wiley & Sons.

6. Paul Scherz, Simon Monk. (2016). Practical Electronics for Inventors, 4th edition, McGraw-Hill Education.

7. Paul Horowitz e Winfield Hill, (2015). The Art of Electronics, 3rd edition, Cambridge University Press.

Year of implementation: 2021/2022 | Date of approval by the Technical-Scientific Board: 2021-06-23