School of Technology and Management
Course Unit Syllabus

Level of qualification:

Second Cycle (EQF level 7) - Master

Study cycle:

Internet of Things

Course Unit: **2014001 – Devices for the Internet of Things**

Year 1 | **Semester 1** | **ISCED Code: 0714** | **ECTS: 7,5**

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	
187.5		45							142.5

Prerequisites (if applicable): n.a.

LEARNING OUTCOMES (knowledge, skills and competence)

On successful completion of this course unit, the student should be able to:

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 Framing of basic electronic components and computing platforms currently available for implementation of IoT systems.

2 Basics of electrical and electronic circuits: Kirchoff's laws, current voltage dividers, resistive mesh analysis, capacitors and coils, operational amplifiers.

3 Electronic instrumentation: multimeter, power supply, oscilloscope.

4 Solid-state Devices: diode, LED, bipolar and field effect transistors, optocouplers.

5 Sensors and actuators.

6 Signal conditioning and signal processing.

7 Raspberry Pi Development System (architecture and components, application development using subsystems and internal GPIO).

8 Arduino Development System (architecture and components, application development using subsystems and internal GPIO).

9 MSP430 development system (architecture and components, application development using subsystems and internal GPIO).

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

We specify the relevant contents for each learning outcome:

1. Know the concepts, devices, testing and measurement equipment for basic electronics (1, 2, 3, 4, and 5).

2. Design simple electrical and electronic circuits for interaction with external systems (sensors and actuators) with appropriate signal conditioning (2, 3, 4, and 6).

2. Characterize the energy consumption of IoT systems (2).

3. Know and describe the technical characteristics, as well as the specific areas for use of current computing systems for developing applications for IoT (7, 8, and 9).

4. Develop applications for the IoT using different current computing systems, using their interfaces with implementation of adaptation circuits and interface to external systems and devices (2, 7, 8, and 9).

5. Summarize, in the form of a report, the work carried out to implement IoT applications in current computing systems (all contents).

TEACHING METHODOLOGIES

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

After the introduction of each topics addressed in contents 1 to 3, 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 7, 8 and 9, 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 have two components:

1. Laboratory work assignments (70%);

2. Individual written test (30%).

MAIN BIBLIOGRAPHY

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

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

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

Jeremy Blum. 2013. Exploring Arduino: Tools and Techniques for Engineering. John Wiley & sons.

Adrian Fernandez and Dung Dang. 2013. Getting Started with the MSP430 Launchpad. Newnes, Elsevier.

Year of implementation: 2017/2018 | Date of approval by the Technical-Scientific Board: 2016-09-28