SENSORES E ATUADORES

Code: 20001

Main Scientific Area: Electronics and Instrumentation

Lecturer: António Herculano de Jesus Moreira

Language of Instruction: Portuguese

Regime: T2

Contact Hours: 24h Total Workload: 57h

ECTS: 3,0

Objectives

The learning objectives of this curricular unit are to provide students with solid knowledge of the general principles of sensing physical properties, the most commonly used sensors in different situations and their physical principles of operation. To achieve these objectives, the course will consist of lectures, practical classes and project work. By the end of the semester students should have acquired the basic knowledge and confidence to tackle projects requiring the use of sensors, signal conditioning and data acquisition.

Learning Outcomes

Students who successfully complete this course should be able to:

1. Identify sensors, control elements and actuators present in electronic systems;

2. Specify and select the different components;

3. Know the architecture of the Arduino system prototyping system.

4. Design and implement small systems based on Arduino, sensors and actuators studied.

Course Contents

1. introduction: data acquisition

2. Sensor characteristics

3. Physical principles

4. Sensor components

5. Electronic interface circuits

6. Sensors

a. Position, displacement and level sensors

b. Speed and acceleration sensors

c. Force, deformation and touch sensors

d. Pressure sensors

e. Flow sensors

f. Acoustic sensors

g. Humidity sensors

h. Light detectors

i. Temperature sensors

7. Actuators

8. Study of the Arduino embedded systems prototyping platform

9. Application design in C

Recommended Bibliography

Fraden, J. (2003).Handbook of modern sensors: physics, designs, and applications(3rd edition). AIP Press.

Taya, M., Volkenburgh, E., Mizunami, M. Nomura, S. (2016).Bioinspired Sensors and Actuators. Cambridge University Press. https://doi.org/10.1017/CBO9781107588271

Learning and Teaching Methods

The process of developing sensor and actuator systems enables students to gain the ability to configure a development environment for any prototyping platform. Learning the Arduino architecture provides students with the tools to quickly prototype according to the requirements imposed by the application. The study of example applications in the context of sensors and actuators, as well as knowledge of algorithms, allows the student to specify and select the correct types of equipment taking into account the requirements imposed by the application.

Assessment Methods

Approval in this curricular unit is obtained with a mark of 10 (ten) or more, on a scale of 0 to 20, resulting from the assessments of the different components:

50% Individual Component (minimum mark 9)

50% Group Work (minimum mark 10)

The student will pass the course when the average of the assessment elements (without rounding) is greater than or equal to 9.5 marks. If the student does not obtain the minimum mark in any of the above situations, they can always take an Appeal Exam (only replaces the test mark), with the final mark being the average of the assessment elements.