Curricular Unit Sheet

1. Curricular Unit Syllabus.

1.1. Curricular Unit

Robotic Systems

1.2. Scientific area acronym

EE

1.3. Duration

Campo alfanumérico (100 carateres).

1.4. Total of Working Hours

162

1.5. Contact hours

4.5h

1.6. ECTS

6

1.7. Observations

Campo alfanumérico (1.000 carateres).

2. Responsible Academic staff and lecturing load in the curricular unit (enter full name)

Maria da Graça Vieira de Brito Almeida	

3. Other academic staff and lecturing load in the curricular unit

Campo alfanumérico (1.000 carateres).	

4. Learning outcomes of the curricular unit

To get acquainted with an industrial robot arm kinematics. To implement a project with the available robot arm through a computer connected to it by serial communication. Analyze the characteristics of manipulators and microcontrollers used in industrial automation and interpret their specifications; Develop programs based on microcontrollers, including the programming of a PWM signal

5. Syllabus

Background of Industrial Robot Technology. Robot Arm Anatomy. Robot Arm Kinematics. The Direct Kinematics Problem. Homogeneous Coordinates. Links Joints and their Parameters. Denavit-Hartenberg Algorithm. The Inverse Kinematics Solution.
The microcontrollers pic18F4431 and PIC18F4520 and their programming in high-level language. Development of applications with microcontrollers focusing on the exploration of PWM modules and A/D converter and also their application in mobile robotics.

6. Demonstration of the syllabus coherence with the curricular unit's objectives

The study of a typical robot arm is based on a coherent set of topics associated with theoretical problem resolution and experimental work supported in simulations build with MATLAB and the robot. Then we move on to the detailed study of the microcontrollers, developing applications where the PWM modules and the A/D converter are explored.

7. Teaching methodologies (including evaluation)

This course is taught in theoretical lectures, theoretical-practical lectures, and laboratory practice. To complete with success this, course the student has to do a set of experimental work and has the necessary grade in the oral and written part related to the work done. It is mandatory to do all the experimental work. Final grade is obtained by 50% for the right realization of experimental work and 50% for the written part.

8. Demonstration of the coherence between the teaching methodologies and the learning outcomes

Experimental work shows the topics presented to the student in theoretical lectures are well assimilated. This work is based on simulations implemented in MATLAB about robot kinematics and the use of PWM signals generated with microcontrollers, used In robotics.

9. Bibliography

- Support sheets for the Curricular unit
- K.S.Fu, R. C. Gonzalez and C. S. G. Lee, "Robotics: Control, Sensing, Vision and Intelligence", McGraw-Hill Intern. Ed., Singapore, 1987.
- Sistemas Baseados em Microcontroladores PIC, Victor Gonçalves, Publindústria, 2008
- Advanced PIC Microcontroller projects in C", Dogan Ibrahim, Elsevier, 2008