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220046 - Telemetry and Smart Electronics Projects

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 710 - EEL - Department of Electronic Engineering

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)

ECTS credits: 3 Teaching languages: English

Teaching staff

Coordinator: DAVID GONZALEZ DIEZ

Others: RAUL FERNANDEZ GARCIA

Degree competences to which the subject contributes

Specific:

1. A basic understanding of the use and programming of computers, operating systems, databases and computer programs with applications in engineering

Teaching methodology

This course is based in the practical development of a "hands-on" project of an electronic system applied to any kind of engineering problem. Projects, that could be proposed by lecturers or students as well, can address any kind of engineering problem (supervision and monitoring, control, robotics, mechatronic applications, thermal engineering, etc). Projects will be mainly based on open-hardware platforms, such as Arduino, and will consider its interfacing with commercial or open-source software packages (Matlab/Simulink, Matlab-Octave, LabView, etc). Some other hardware platforms, such as RaspberryPI, can be also considered.
Theory classes: In this lectures, teachers will introduce basic concepts of data acquisition, sampling, interfaces, hardware description and programming. All these explanations are practically oriented and they will be illustrated with real examples to facilitate their understanding.
Practical classes: Once the project to be developed by each group of students has been decided, teachers will asses each students teamwork in order to help them in the project development.
Self-study: Students, organized in teamwork, need to work on the materials provided by teachers in order to develop solutions according to the project goals.
Students will be asked to prepare written reports, oral presentations and public demonstration of the project functionality.
Teachers provide the curriculum and monitoring of activities through ATENEA.

Learning objectives of the subject

This course covers the design, construction, programming and testing of electronics systems, based on open-source hardware platforms, through team projects. Projects cover several aspects such as: electronics, instrumentation, sensing, data acquisition, communications, sensors network, data analysis and programming. At the end of the course, students should be able:
- to discuss and properly apply electronics to address engineering problems
- to develop a performing real solution with a given hardware
- to have improved practical skills in implementation and deployment of electronic systems.

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Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Self study:	45h	60.00%

Content

Module 1: Introduction to Arduino: Hardware description & programming tools

Learning time: 12h 30m
Theory classes: 5h
Self study : 7h 30m

Description:
Introduction to Arduino hardware. Pinout description. Overview of capabilities.
Basics of programming
Examples of applications

Related activities:
Project Kick-off Report
Project Final Report
Final Exam

Module 2: Basics of sensor, A/D and D/A conversion. PWM techniques and motor control

Learning time: 12h 30m
Theory classes: 5h
Self study : 7h 30m

Module 3: Interface Arduino with the world

Learning time: 12h 30m
Theory classes: 5h
Self study : 7h 30m

Module 4: Project development

Learning time: 37h 30m
Theory classes: 15h
Self study : 22h 30m

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Qualification system

The final grade depends on the following assessment criteria:

- Project Kick-off Report, weight: 20 %
- Project Final Report, weight: 50 %
- Final Exam, weight: 30 %

Bibliography

Basic:

Margolis, Michael. Arduino cookbook. Farnham: O'Reilly, 2011. ISBN 9780596802479.

Others resources:

Hyperlink

http://www.raspberrypi.org/