Last update: 23-04-2019

205201 - RA - Robotics and Automation

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

Teaching unit: 707 - ESAII - Department of Automatic Control

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT 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: Rita Maria Planas Dangla

Others: Laureano Tinoco Gomez

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Teaching methodology

The course is divided into parts:

- Theoretical and work group sessions
- Laboratory sessions

Self-study (including proposed exercises and activities) will be also contemplated.

In the theory classes, teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding. Students, working in groups will use the new concepts to specify its solution in order to solve the laboratory tasks.
In the lab sessions, teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning.

Students will be able to integrate a robotized and automated solution in order to obtain the complete and correct operation of the system consisting of a robot, a process station and a supervision and control system emulating an Industrial task. At lab, students will work in pairs, in order to promote contact and use the basic tools needed to solve problems.
Students, independently, need to work on the materials provided by teachers in order to fix and assimilate the concepts. The teachers provide the syllabus and monitoring of activities (by ATENEA)

Learning objectives of the subject

This course is based in the practical development of a "hands-on" application of a robotics and automation real case study. The applications must be proposed by lecturers and includes a different set of technologies all of them often used in industrial environments (PLCs, OPC, SCADA systems, Industrial Robots, Industrial Communications, Data Bases, etc.). Applications will be developed by pairs and teachers will assess and supervise each student?s teamwork in order to help them in the project development and to solve possible doubts.

Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	45h	60.00%

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Content

Module 1: ROBOTICS

Learning time: 25h

Theory classes: 10h
Self study : 15h

Description:
* Introduction.
* Robot Elements: Drive System, Control System, Sensors, End Effectors,
* Robot Coordinate Systems: Robot coordinate system representation, transformation, homogeneous transform, relating the robot to its world
* Robot Programming: language based programming.
* Applications: application of robots to a specific tasks..

Related activities:
To develop a Robot program in order to solve the given robotized task

Module 2: AUTOMATION

Learning time: 37h 30m

Theory classes: 15h
Self study : 22h 30m

Description:
* Automation Fundamentals: Automation and its importance, automation applications, expectations of automation. Types of plant and control (continuous, discrete and mixed processes). Automation hierarchy. Automation Current Trends.
* Programmable Logic Controllers (PLC): Definition and Architecture. Programming PLCs
* Supervision, Control and Data Acquisition (SCADA): SCADA Introduction, Elements of SCADA, Features of SCADA, SCADA communications, SCADA development for any one typical application.

Related activities:
To develop a PLC program in order to solve the complete automation of a given production station
To develop a SCADA application in order to supervise the complete industrial task.

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Module 3: COMMUNICATIONS AND SYSTEM INTEGRATION	Learning time: 12h 30m Theory classes: 5h Self study : 7h 30m

Description:
* LAN Connectivity; Bridges, Routers and Switches
* Solving Distance and Capacity Problems With Full Duplex Ethernet
* Principles of The TCP/IP Architecture
* Features of The Internet Computing Architecture
* Key Elements of The Internet Protocol

Related activities:
To configure an OPC server in order to make possible the complete system integration.

Qualification system

Laboratory test (individually): 20%
Project results (in group): 50%
Small project modification (individually): 30%

Bibliography