

## 340120 - AUIN-K5007 - Industrial Automation

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	707 - ESAIL - Department of Automatic Control
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (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)
ECTS credits:	6
Teaching languages:	Catalan, Spanish

### Teaching staff

Coordinator: CRISTOBAL RAYA GINER

### Prior skills

Generic knowledge of electronic instrumentation, industrial computer science and control

### Requirements

Fonaments d'automàtica (FOAU), Sistemes Electrònics (SIEK)

### Degree competences to which the subject contributes

Specific:

4. CE28. Applied knowledge of industrial and communication computing.
1. CE12. Knowledge of fundamental automatism and control methods.
2. CE15. Basic knowledge of production and fabrication systems.
3. CE29. Ability to design automation control systems.

Transversal:

5. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
6. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
7. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
8. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
9. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
10. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

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### Teaching methodology

In the learning sessions of this subject, the professor will introduce theoretical explanations and illustrative examples, concepts, methods and basic results of the matter. These sessions are made of theoretical classes and sessions of laboratory. Along the course the method of project/problems based learning (PBL) will be applied.

In the theoretical classes the theoretic explanations and the basic concepts of the subject of study will be introduced, and in the practical sessions of laboratory the professor will increase the knowledge with the concepts and necessary methods to be able to carry out the problems or projects to solve in the practical work. The practices of laboratory will come true individually, or in reduced groups.

The tasks outside of the classroom that one must carry out or individually or in group, they are the base of the activities, and obligatory to be able to progress appropriately in the subject. These activities include the problems and proposed works, and the previous works to be able to carry out the practices.

### Learning objectives of the subject

Presenting the general characteristics of the automatic systems of production

Capacity of developing projects of automation and supervised control.

Recognizing the nature from the input-output signals to the system and choosing the appropriate interfaces for his use.

Analyzing a problem, specifying elements hardware adequate and designing an algorithm that resolves it with his temporary restrictions.

To program in a programming language he structures it corresponding to an algorithm of efficient way.

Evaluating the reliability of a solution of an automatic system and control, and if necessary identifying errors and accomplishing the necessary modifications in order that related solution obtain the expected results.

### Study load

Total learning time: 150h	Hours large group:	15h	10.00%
	Hours medium group:	0h	0.00%
	Hours small group:	45h	30.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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### Content

#### T1 Introduction

Degree competences to which the content contributes:

Description:

Automated manufacturing systems. Manufacturing processes. CIM Concept.

Related activities:

Evaluation in the exam.

Specific objectives:

#### T2 Sensors and industrial actuators

Degree competences to which the content contributes:

Description:

Types and characteristics of the industrial sensors. Types and characteristics of the industrial actuators. Pneumatics.

Related activities:

Evaluation in the exam. Realization of works and or problems.

Specific objectives:

#### T3 Programmable logic controllers

Degree competences to which the content contributes:

Description:

Architecture of PLCs and computer peripherals. Programming languages of PLCs according to standard IEC 1131-3. GRAFCET. Gemma guides. Security systems.

Related activities:

Evaluation in the exam. Realization of works and/or problems. The learning will be supplemented by means of laboratory activities in that they were carried out practical applications with PLCs.

Specific objectives:

#### T4 Supervision of industrial processes

Degree competences to which the content contributes:

Description:

SCADA systems. Industrial communications networks. Design of supervisory interfaces and HMI. Monitoring of processes.

Related activities:

Evaluation in the exam. Realización de trabajos y/o problemas. Realization of works and/or problems. The learning will be supplemented by means of laboratory activities.

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Specific objectives:

### PR Practices in laboratory

Degree competences to which the content contributes:

Description:

Different practices and projects based on the programming of logical programmable (PLCs) controllers and programmable relays will develop, and the monitoring of PLCs with SCADA and HMI.

Related activities:

Realization of the activities of laboratory in a present way.

Specific objectives:

### Qualification system

This evaluation is formed by one or two exams of evaluation PA, practical works (including exam) PR, and works or problems in a group or individual TGI.

The weighted average of the final note NF corresponds to

$$NF = 0,45xPA + 0,4xPR + 0,15xTGI.$$

### Regulations for carrying out activities

The evaluation tests will be carried out individually.

It is indispensable condition to have carried out the practices with sufficiency and in a present way.

For the realization of the practices one must have carried out the previous necessary studies correctly

A follow-up of the progress of the works will be carried on and its presentation.

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### Bibliography

#### Basic:

Mandado Pérez, Enrique [et al.]. *Autómatas programables : entorno y aplicaciones*. Madrid: International Thomson Paraninfo, 2011. ISBN 8497323289.

Hanssen, Dag H.. *Programmable logic controllers : a practical approach to IEC 61131-3 using CODESYS* [on line]. Chichester West Sussex, United Kingdom: Wiley, 2015 [Consultation: 26/10/2018]. Available on: <<https://onlinelibrary.wiley.com/doi/book/10.1002/9781118949214>>. ISBN 9781118949214.

Boix Aragonès, Oriol; Sudrià Andreu, Antoni; Bergas Jané, Joan. *Automatització industrial amb GRAFCET* [on line]. Barcelona: Edicions UPC, 2001 [Consultation: 30/07/2019]. Available on: <<http://hdl.handle.net/2099.3/36537>>. ISBN 8483014998.

Ponsa Asensio, Pere. *Automatización de procesos mediante la guía GEMMA* [on line]. Barcelona: Edicions UPC, 2005 [Consultation: 07/10/2014]. Available on: <<http://hdl.handle.net/2099.3/36684>>. ISBN 848301811X.

#### Complementary:

Rodríguez Penin, Aquilino. *Sistemas SCADA* [on line]. 2a ed. Barcelona: Marcombo, 2012 [Consultation: 25/07/2019]. Available on: <[https://discovery.upc.edu/iii/encore/record/C\\_\\_Rb1366974?lang=cat](https://discovery.upc.edu/iii/encore/record/C__Rb1366974?lang=cat)>. ISBN 9788426714503.

Junestrada, Stefan [et al.]. *Domótica y hogar digital*. Madrid: Thomson Paraninfo, 2005. ISBN 8428328919.

#### Others resources:

##### Hyperlink

<http://www.infopl.net>

Actualitat i recursos d'automatització industrial

<http://industrial.omron.es>

Informació del fabricant de components d'automatització industrial OMRON, amb documentació i altres informacions.

<http://domotica.net>

Informació i enllaços de domótica