



Universitat de Lleida

DEGREE CURRICULUM

INDUSTRIAL AUTOMATION

Coordination: GUIRADO FERNÁNDEZ, FERNANDO

Academic year 2019-20

Subject's general information

Subject name	INDUSTRIAL AUTOMATION			
Code	102115			
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Character	Modality
	Bachelor's Degree in Energy and Sustainability Engineering	2	COMPULSORY	Attendance-based
	Not informed	2	COMPULSORY	Attendance-based
	Bachelor's Degree in Automation and Industrial Electronic Engineering	2	COMPULSORY	Attendance-based
	Master's Degree in Industrial Engineering	1	COMPLEMENTARY TRAINING	Attendance-based
	Bachelor's Degree in Mechanical Engineering	2	COMPULSORY	Attendance-based
Course number of credits (ECTS)	6			
Type of activity, credits, and groups	Activity type	PRAULA	TEORIA	
	Number of credits	3	3	
	Number of groups	4	2	
Coordination	GUIRADO FERNÁNDEZ, FERNANDO			
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING			
Teaching load distribution between lectures and independent student work	40% lectures 60% autonomous work			
Important information on data processing	Consult this link for more information.			
Language	Català			
Distribution of credits	20% theoretical content 30% classroom activities 50% laboratory			

**Office and hour of
attention**

Fernando Guirado - Dilluns de 17h a 18h, despatx 3.17 edifici EPS
Rosa Gil . Please contact rgil@diei.udl.cat

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
GABALDÓN PONSÀ, ELOI	eloi.gabaldon@udl.cat	3	
GUIRADO FERNÁNDEZ, FERNANDO	fernando.guirado@udl.cat	15	

Subject's extra information

Most practical course in which the study is based on problem solving and recommended mandatory. It is essential for personal work skills set and gain the skills to properly use the tools that work with the course.

Materials can be found on the Virtual Campus: <http://cv.udl.cat>

The use of Virtual Campus access to resources is fundamental to the subject, the notifications delivery dates workout, schedule meetings and finally delivering practical assessment tests.

Learning objectives

- Know the existing technologies when it comes to creating an industrial process
- Acquire knowledge about the fundamentals of automation and methods of control.
- Determine the transfer function of dynamic electrical systems.
- Explain the concept of an open loop control system and closed loop and identify the elements that make up them.
- Understand the meaning of the concepts of Control System and Industrial Process, understanding its relation.
- To know the different types of automation and their integration in the control systems.
- Know how to design simple wiring automation.
- Understand the internal architecture of a PLC.
- Understand the cycle of operation of a PLC differentiating each one of the existing phases.
- Know the components of the GRAFCET diagrams.
- Know how to design a GRAFCET that implements a sequential industrial process.
- Know the different programming languages of a PLC.
- Know how to program and debug a PLC.

Competences

Strategic Competences of the UdL

UdL3. Mastering ICT's.

Specific competences

GEM3. Basic knowledge of the use and programming of computers, operating systems, databases and computer programs with applications in engineering.

GEM12. Knowledge of the basics of automatisms and control methods.

GEEIA3. Basic knowledge of the use and programming of computers, operating systems, databases and computer programs with applications in engineering.

GEEIA12. Knowledge of the basics of automatisms and control methods.

GEEIA26. Knowledge of automation and technical regulation of control and his application to the industrial automation.

GEEIA29. Capacity to design systems of industrial automation control.

Cross-disciplinary competences

EPS5. Capacity of abstraction and of critical, logical and mathematical thinking.

EPS6. Capacity of analysis and synthesis.

EPS9. Capacity for unidisciplinary and multidisciplinary teamwork.

EPS11. Capacity to understand the needs of the user expressed in a no technical language.

Subject contents

1. Introduction to automation control systems.

2. Wired automation.

3. Programmable automation.

4. Sequential processes: GRAFCET

Methodology

This subject combines theoretical sessions and problems, practical exercises and work in the laboratory with specific software and PLCs.

Most practical activities will be developed in reduced work teams.

The methodology used in the topics planned is:

- Master classes where the basic concepts of the contents will be explained.
- Classes of problems where exercises related to master classes will be developed.
- Laboratory practices developing and expanding concepts of different subjects.

The follow-up of the subject will be done by means of the delivery of exercises worked in class.

The Virtual Campus will be used to delivery the activities and the realization of questionnaires.

Development plan

Week	Content	Scheduling
1	1. Lecture class and exercises.	4h Lecture class / 6h Autonomous work
2	1. MatLab exercise.	4h Lecture class / 6h Autonomous work
3	2. Lectura class and exercises.	4h Lecture class / 6h Autonomous work
4	2. Exercises.	4h Lecture class / 6h Autonomous work
5	2. Exercises.	4h Lecture class / 6h Autonomous work
6	3. Lecture class and exercises.	4h Lecture class / 6h Autonomous work
7	3. Lecture class and exercises.	4h Lecture class / 6h Autonomous work

8	3. Practices	4h Lecture class / 6h Autonomous work
9	Midterm-evaluation	
10	4. Lecture class and exercises.	4h Lecture class / 6h Autonomous work
11	4. Lecture class and exercises.	4h Lecture class / 6h Autonomous work
12	4. Practices	4h Lecture class / 6h Autonomous work
13	4. Practices	4h Lecture class / 6h Autonomous work
14	Practice and Project development.	4h Lecture class / 6h Autonomous work
15	Practice and Project development.	4h Lecture class / 6h Autonomous work

Evaluation

The grade of the subject consists of the following sections

- Theory / problems (evaluation by examination)
 - First mid-term - 15%
 - Second mid-term - 15%
- Laboratory practices
 - 6 activities in the laboratory (5% each) - 30%
 - Final practice in the laboratory - 20%
- Exercise of implementation of a sequential process - 20%

The recovery activity allows re-evaluating the tests corresponding to the mid-term examinations.

(1) Attendance at the laboratory is mandatory and at the appointed time

Bibliography

[1] Autómatas Programables. Joseph Balcells, J. L. Romeral, Ed. Marcombo – Serie Mundo Electrónico, ISBN 84-267-1089-1

[2] Automatización. Problemas Resueltos con Autómatas Programables. L. Pedro Romera, J. Antonio Lorite, Sebastián Montoso, Editorial Paraninfo, ISBN 84-283-2077-2

[3] Automatización con GRAFCET, Múltiples autores, Servicio de publicaciones – Universidad de Málaga, ISBN – 84-7496-724-4

[4] Dorf, Richard C. Sistemas modernos de control. 2ª ed. en esp.. Argentina, [etc.]: Addison-Wesley Iberoamericana, 1989. ISBN 0201644177 (ADDISON WESLEY)

[5] Ogata, Katsuhiko. Ingeniería de control moderna. 5a ed.. Madrid [etc.]: Pearson Educación, cop. 2010. ISBN 9788483226605.

[6] Groover, Mikell P. Automation, production systems and computer-integrated manufacturing. 3rd ed.. Upper Saddle River, NJ: Prentice Hall, c2008. ISBN 9780132070737.

Adaptations to the methodology due to COVID-19

Lectures will be done online through the videoconference tool present in the Virtual Campus. They will be also

recorded for later viewing if necessary.

Present in the resources section of the subject, the necessary material will be available.

A free distribution simulator will be used to carry out the Siemens S7-200 PLC programming practices

The student will be able to install the microwin v4.0 programming environment on their personal computer to develop the programs for Siemens S7-200 PLCs

Adaptations to the development plan due to COVID-19

The section on Security Aspects and Industrial Networks will not be carried out in this course.

Adaptations to the evaluation due to COVID-19

The first partial exam (15% of the grade for the course) has been replaced by 5 tests, 3 test type (15% + 25% + 30%) and 2 practical exercises (15% + 15%), carried out in online format.

The second partial exam (15% of the grade for the course) will be carried out using the Virtual Campus evaluation tool and on the date established in the exam calendar. It will consist of a test (25%) and two practical questions (35% + 40%).