

Academic Year: ( 2019 / 2020 )

Review date: 14-05-2020

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: MALFAZ VAZQUEZ, MARIA ANGELES

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

**OBJECTIVES**

- To know the basic fundamentals of the Industrial Systems.
- To know the fundamentals of automation and control methods.
- The students acquire and understand the knowledge about the modelling and the automation of industrial processes by using professional hardware and software tools.
- To get the ability of modelling and simulating discrete events systems using State Diagrams and SFCs.
- To know the usual technology used in the industry for systems automation.
- To get the capacity of designing control and automation systems for discrete events systems.
- To get the ability of solving industrial processes automation problems using specific computational tools: sensors selection, actuators, modelling, and programming PLCs using professional software.
- To generate professional documentation related to simple projects.

**DESCRIPTION OF CONTENTS: PROGRAMME**

1. Presentation and Introduction of the subject.
2. Discrete events system modelling.
  - 2.1 State Diagrams
  - 2.2 SFC
3. Introduction to automation technologies.
  - 3.1 Wiring and programmable systems
  - 3.2 PLC hardware.
4. PLCs programming languages
  - 4.1 Ladder (LD)
  - 4.2 Functional diagram (SFC)
5. Actuators
  - 5.1 Electric engines.
  - 5.2 Hydraulic actuators
  - 5.3 Pneumatic (actuators, valves, symbology)
6. Sensors
  - 6.1 Classification
  - 6.2 Features
  - 6.3 Types of sensors
7. Introduction to field buses.

**LEARNING ACTIVITIES AND METHODOLOGY**

- Theoretical lessons and doubts solving sessions in aggregated groups, tutorial support sessions and student personal work; related to the acquisition of theoretical knowledge (3 ECTS).
- Laboratory and problem solving sessions in reduced groups, tutorial support sessions and student personal work; related to the acquisition of practical abilities (3 ECTS).

**ASSESSMENT SYSTEM**

- Continuous assessment consist in two midterm exams:
  - Exam 1: state and functional diagrams. PLC programming. Ladder programming.
  - Exam2: a practical programming exercise will be done individually in the laboratory.

Compulsory

attendance is required to 80% of laboratory sessions and classes in Computer Classroom to perform this exam.

- The final exam consists in several practical exercises about modelling, programming and theoretical questions. It is required to obtain a minimum mark of 3 in this final exam in order to pass the subject.

<b>% end-of-term-examination:</b>	50
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	50

#### BASIC BIBLIOGRAPHY

- John, Karl-Heinz IEC 61131-3, programming industrial automation systems : concepts and programming languages, requirements for programming systems, aids to decision-making tools., \*, 1995
- \* International Standard IEC 1131-3. IEC., \*, 1993
- Bonfatti, Flavio IEC 1131-3 programming methodology : [software engineering methods for industrial automated systems], \*, 1997
- J. Balcells y J.L. Romeral Autómatas Programables, Marcombo, 2000
- Piedrafita Moreno, Ramón. Ingeniería de la automatización industrial., Ra-Ma, 2003
- R.W. Lewis Programming Industrial Control Systems Using IEC 1131-3, IEEE, 2000

#### ADDITIONAL BIBLIOGRAPHY

- G. Michel Autómatas Programables. Arquitecturas y Aplicaciones , Marcombo Boixareu, 1990
- Romera, Juan Pedro Automatización : problemas resueltos con autómatas programables. , Paraninfo, 2001
- V.A. Martinez Automatización con Autómatas Programables, Ra-Ma, 1991