Industrial Automation

Academic Year: (2023 / 2024) **Review date: 28/03/2023 10:41:07**

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

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.
CG10. Ability to design and carry out experiments and to analyse and interpret the data obtained.
CG23. Knowledge of the fundamentals of automatisms and control methods.
ECRT9. Knowledge of automatic regulation and control techniques and their application to industrial automation.
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA3. Engineering Design: To be able to design industrial products that comply with the required specifications, collaborating with professionals in related technologies within multidisciplinary teams.
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

OBJECTIVES

- To know the basic fundaments of the Industrial Systems.
- To know the fundaments 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

% end-of-term-examination/test:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

- 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. 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.

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. Balcels 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