Design and analysis of automated processes

Academic Year: (2023 / 2024) **Review date: 12-02-2024**

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: ALONSO MARTIN, FERNANDO

Type: Compulsory ECTS Credits : 3.0

Year : 5 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Industrial Automation

SKILLS AND 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.
ECRT6. Ability for the analysis, design, simulation and optimisation of processes and products.
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
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

Basic competences
- Advanced knowledge in automated processes (CB1).
- Professional application of acquired knowledge. (CB2).

General competences
- Problem-solving capability in an autonomous way (CG1).
- Capability of designing automated processes (CG3).
- Knowledge of design and simulation tools of automated processes (CG9).

Specific competences
- Ability to analyse, design, simulate, and optimize automated processes (ECRT6).

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to the course
a. Rules and evaluation
b. Review of concepts
c. General terms definitions (PLC, SCADA, RTU (remote terminal unit), DCS (distributed control

system), ¿)
d. Industry 4.0
2. Flexible manufacturing systems and Lean manufacturing
a. History
b. Principles
c. Pros and cons
d. Examples of application
3. Information management
a. CIM architectures
b. CIMOSA (Computer Integrated Manufacturing Open System Architecture)
c. Communication protocols
d. Field buses
e. Industrial Ethernet
f. Cloud information management
4. Material management
a. Strategies for material management
b. Automated storage and retrieval systems
c. Automated guide vehicles
5. SCADA systems
a. Requirements and definition
b. Components and architectures
c. Human-machine interface
d. Security
6. Analysis and simulation tools
a. Goals
b. Methods
c. Tools
d. Examples
7. Quality management
a. What is quality management?
b. Quality planning
c. Quality control
d. Quality improvement
e. Quality assurance
f. Examples

LEARNING ACTIVITIES AND METHODOLOGY

Theoretical lessons and doubts solving sessions, support sessions and student personal work; this is aimed at the acquisition of theoretical knowledge.

Laboratory and problem solving sessions, support sessions and student personal work; this is aimed at the acquisition of practical abilities.

ASSESSMENT SYSTEM

Continuous assesment: 50% (minimal mark: 2,5)
- Project: 20%
- Labs: 20%
- Class participation: 10%

End-of-term exam: 50% (minimal mark: 2,5)

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

BASIC BIBLIOGRAPHY

- - Slides and problems available in Aula Global, -.

- David Bailey, Edwin Wright Practical SCADA for industry, Elsevier, 2003

- J. Balcels y J.L. Romeral. Autómatas Programables., Marcombo..

- J. R. Tony Arnold, Stephen N. Chapman, Lloyd M. Clive Introduction to Materials Management, SIXTH EDITION , Pearson Prentice Hall.

- James A. Regh Computer Integrated Manufaturing (third edition), Prentice Hall, 2004

- Piedrafita Moreno, Ramón. Ingeniería de la automatización industrial, Ra-Ma, 2003

ADDITIONAL BIBLIOGRAPHY

- Mike Wilson Implementation of robot systems : an introduction to robotics, automation, and successful systems integration in manufacturing, Elsevier.