Universidad Zaragoza

Year : 2020/21

28836 - Advanced Automation and Control Engineering

Syllabus Information

Academic Year: 2020/21
Subject: 28836 - Advanced Automation and Control Engineering
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 424 - Bachelor's Degree in Mechatronic Engineering
ECTS: 6.0
Year: 4
Semester: Second semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

Objectives of the subject:

The main objectives of the subject can be divided into theoretical and practical types.

The theoretical contents pursue that the students know and manage in a fluent way the concepts necessary for the analysis and development of controls in different industrial processes.

- Define the concept of the control system and identify and distinguish the variables acting and the process.

The practical contents, basically, seek that the student knows how to manage the industrial components in the market as well as the programming and configuration settings necessary to implement different controls in real processes.

- Configure, program and implement different types of PLC`s network via industrial buses.
- Understand and manage specific software for the configuration of HMI and SCADA system

1.2.Context and importance of this course in the degree

The subject Automatización Avanzada e Ingenieria de Control is part of the degree of Mechatronics Engineering that EUPLA teaches within the group of subjects that make up the common training module. This is a fourth course optional subjects in the second semester with an academic load of 6 credits.

This subject gives a thorough insight into the control system, industrial communications, setting of SCADA in a practical way enabling the students to analyze, develop and start-up of the different processes in the industrial field.

1.3.Recommendations to take this course

The development of the subject Automatización Avanzada e Ingenieria de Control requires knowledge and strategies learnt from other subjects related to automatization e Informatica industrial, the reason why it is advisable that the student has studied this subject in the previous semester.

2.Learning goals

2.1.Competences

On passing the subject, the student will have acquired the following competences:

(GI03) Knowledge of basic and technological subjects, enabling them to learn new methods and theories, and endow them with versatility to adapt to new situations.

(GI04) Ability to solve problems and take decisions with initiative, creativity, critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering and in the field of electronics industrial particulary.

(GI06) The handling of specifications, regulations and mandatory standards.

(GC02) Interpret experimental data, contrast them with theorists and draw conclusions.

(GC03) Abstraction and logical reasoning.

(GC04) Learning continuously, self-directed and autonomous way.

(GC05) Evaluate alternatives

(GC06) Adapt to quickly changing technologies.

(GC08) Locate technical information, as well as its understanding and assessment.

(GC14) Understand the functioning and develop the maintenance of equipment and facilities.

(GC16) Configure, simulate, build and test prototypes of electronic and mechanical systems.

(EI06) Knowledge of the fundamentals of automatism and control methods.

(EE11) Applied knowledge of industrial informatics and communications.

(EE12) Design control systems and industrial automation.

2.2.Learning goals

In order to pass this subject, students must demonstrate the following results:

- Understand concepts related to automation and industrial control.
- Configure, program and start up systems based on PLC's, Scadas and robotic systems.
- Acquire industrial communications fundaments.
- Realization and interpretation of plans and diagrams according to the appropriate regulation and symbology.

2.3.Importance of learning goals

On passing the subject, the student acquires the capacity to analyze different industrial processes, revealing their main characteristics, and the student will be able to propose control solutions and choose the most suitable one in each situation.

The student will be able to propose solutions that improve or increase the effectiveness of existing systems. This clearly benefits the industrial process, obtaining results by reducing costs and/or increasing product qualities.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

CONTINUOUS ASSESSMENT SYSTEM

The continuous assessment system has two parts with their respective activities:

1.- Individual part

- Theorical and practical test

2.- Group part

- Practical works proposed (all of works)
- Projects: ?industrial processes

To pass the subject:

- Pass the two parts separately.
- The final note will be the arithmetic mean of both.

At least 80% of the live activities (laboratories, technical visits, classes, etc.) must be attended.

FINAL COMPREHENSIVE ASSESSMENT TEST

The student must opt for this modality when, due to his/her personal circumstances, he/she cannot adapt to the pace of work required in the system of continuous assessment, has failed or would like to increase his/her grade having participated in this methodology.

The evaluation criteria to be followed for the activities of the comprehensive assessment test system are as follows:

- Theory Test (30%)
- Practical Test (70%)

The subject will have been passed with 50% of the points of the different evaluation elements.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The teaching organization will be carried out following the following guidelines:

? Lectures: Theoretical activities imparted in a fundamentally expository way by the teacher, in such a way as to expose the theoretical supports of the subject, highlighting the fundamental content, structuring it in themes and relating those themes to each other.

? Practice Sessions: The teacher explains and helps in understanding the use and management of necessary software for

configuring and programming control devices (PLC's)

? Laboratory practices: Students will perform tests, measurements, assemblies, etc. in the laboratories arranged in roups, following a script provided by the teacher.

? Individual tutorials: They will be carried out in the department through personalized attention to the student, with the goal of solving the doubts and difficulties the student faces. These tutorials can be carried out either face-to-face or virtually.

If classroom teaching were not possiible due to health reasons, it would be carried out on-line.

4.2.Learning tasks

The course consists of 6 ECTS, which represent 150 hours of student's work during the semester, which would equal to 10 hours every week during the 15 weeks the semester lasts. The degree of experimentation is deemed high.

The student's activities this semester, organized by duration are as follows:

- 25 hours of master classes (theoretical teaching and problem solving)
- 25 hours of laboratory practice, arranged in 2-hour sessions
- 10 hours of tests (written and practical)
- 90 hours of personal study

4.3.Syllabus

The course will address the following topics:

Theoretical contents

1.- Industrial communications

- Physical standards
- Flow control technique
- Network topology
- Methods to access
- Networks interconnections (gateways)

2.- Industrial communication networks AS-i

3.- Industrial communication networks PROFIBUS

4.- Industrial communication networks PROFINET

5.- Introduction to supervision

- SCADA (WinccFlexible)
- Monitoring and data acquisition devices

Practical content

1.-Profibus-DP network

- PLC(s7-300) as master and ET200 as a slave
- PLC(s7-300) as master and frequency converter (MM440) as a slave

2.- WinCC flexible

- Introduction
    - Operator panels types
    - Creating a project
    - Establish connections or communication parameters
- Variables
    - Creating variables, data types and addressing
- Images
    - Creating images, System image.
    - Navigation between images.
    - Text fields.
    - Input/Output fields.:numeric, graphical and symbolic.
    - Graphic libraries.
    - Use of buttons, switches, bars and other controls.
- Message management
- Recipes
- Configurations transfering.

        - Updating an operator panel's operating system.
        - Communication transferring.
    - Configuring and programming a ?Flexible Cell?
        - Grafcet.
        - Defining the different functional stages of the cell
        - Defining the different operation modes
        - SCADA system.
        - Communicating the different stages through PROFIBUS.

4.4.Course planning and calendar

Face-to-face sessions calendar and project presentation

The schedule of the lectures and laboratory practices will be established by the centre at the beginning of each course. (This schedule will be published on the centre website.).

The rest of the activities (assignments hand-in, evaluation tests, etc...) will be planned according to the necessary groups and will be communicated to the students in advance at the beginning of the course.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28836&year=2019