Universidad Zaragoza

Year : 2019/20

60836 - Electric systems in industry

Syllabus Information

Academic Year: 2019/20
Subject: 60836 - Electric systems in industry
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 532 - Master's in Industrial Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject Type: Optional
Module: ---

1.General information

1.1.Aims of the course

The subject and its expected results meet the following approaches and objectives:

The design of the course is eminently practical and direct application of acquired knowledge for professional practice is important.

In the course "Electrical Systems in the Industry" it is intended that students:

? Acquire a clear idea of the different parts that make up an electrical system for controlling an industrial production process.

? Know the different ways of integrating electromechanical drives in the control systems.

? Meet the various electrical devices used to capture signals during the production process and product quality.

? Have a clear idea of the capabilities of electrical control systems, as well as in terms of logic programming of the process as regards to the information process management.

? Know the various large-scale electrical systems that allow communication between various devices of an industrial system.

? Know the necessary steps to ensure quality results in the product or controlled process.

1.2.Context and importance of this course in the degree

The subject is taught in the optional block "Electrical Systems", which covers specific skills training of the Master in Industrial Engineering. It serves as an introduction for students to learn specific concepts of control production systems through the use of electrical devices.

1.3.Recommendations to take this course

To take the subject of "Electrical Systems in the Industry", basic knowledge in mathematics, electromagnetism, electrical circuit analysis and electrical engineering in general are required.

2.Learning goals

2.1.Competences

By passing this subject, students will be able to...

1: Generic competences:

- Apply the acquired knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study (CB7).
- Communicate their conclusions and the knowledge and rationale underpinning to specialists and non-specialists in

a clear and unambiguous way (CB9).

2: Transversal competences:

- Design, calculate and design products, processes, facilities and plants (CG2).

3: Specific competences:

- Have knowledge and skills to perform verification and control of facilities, processes and products (CM22).
- Have knowledge and skills to perform certifications, audits, inspections, tests and reports (CM23).

2.2.Learning goals

The student, for achieving this subject, should demonstrate the following results...

He/she calculates, designs and integrates electrical systems in industrial processes and elect

He/she knows the procedures for doing certifications, audits, inspections, tests and reports.

2.3.Importance of learning goals

The issues addressed in this course enable students to undertake projects of electrical systems process control at medium and large scale at all levels, from the equipment and electrical components that physically make up the installation through knowledge of the logic control intelligent control systems, to the junction with the technologies that enable the management of a quality control system. After passing the course, the student is competent to demonstrate fluency in industrial electrical control for both implementation tasks and management tasks.

3.Assessment (1st and 2nd call)

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

The student must demonstrate that he/she has achieved the intended learning outcomes through the following evaluation activities:

Option 1: To encourage ongoing work of the student, it can be applied an overall assessment, by means of the continuous evaluation of the following activities:

- Laboratory sessions (20% of the final mark): It is required to attend all the sessions. To pass the course is necessary to obtain a minimum score of 5 out of 10.
- Exercises (30% of the final mark): Throughout the semester, the resolution of practical exercises, similar to those solved in the contact sessions, will be proposed.
- Evaluation tests (20% of the final mark): several written tests (theory and practice) will be made during the course.
- Final work (30% of the final mark): A midcourse performing work will be proposed, in which the student will demonstrate the assimilation and integration of all the concepts presented in the course. The student will present the work at the end of the semester.

Option 2: Students who do not follow the assessment of Option 1 are entitled to an alternative

- Written exam (50% of the final mark): written test, comprising theory and practice of the subject matters.
- Laboratory exam (50% of the final mark).

To pass the course following this alternative assessment, it is necessary to obtain a minimum score of 5 out of 10 in each of the two exams.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, laboratory sessions, and student participation.

4.2.Learning tasks

The course includes the following learning tasks:

- **Lectures (4 weekly hours)**. The explanation of theoretical contents, supported with practical examples and real industrial references. Classroom notes and materials will be available on Moodle (http://moodle2.unizar.es/).
- **Laboratory sessions**. 5 sessions of 4 hours each, organized according to the syllabus (session 1-2: Section 1. session 3-5: Section 2). These sessions take place in small groups, where students will carry out the assembly/integration of various real devices used in electrical control systems. The students will have task instructions provided in advance, with a description of the assembly and the steps to follow. Students should read previously the instructions for a good use of each session.
- **Case study**. In the middle of the course, the solving of a final case will be proposed. This will cover comprehensively aspects of design and control of a real situation of an electric system or an electrical installation for industrial control. The student must present the work at the end of the semester.
- **Autonomous work and study**. The ongoing work of the student will be promoted, by the distribution of the different learning activities throughout the semester. It includes the preparation of laboratory sessions, study time, and case study. Periodically, students will complete exercises and cases, some of them will be solved in the lectures.
- **Tutorials**. The student can ask the teacher to solve doubts related to the course. For this, the teacher will communicate their office hours.
- **Assessment exams**. The evaluation is also a learning tool the student can use to check the degree of understanding and assimilation of knowledge and skills achieved. Because of this reason, various assessment tests will be distributed along the course.

4.3.Syllabus

The course will address the following topics:

Lectures

Section 1. Industrial Quality and Safety.

- Topic 1: Introduction to quality and industrial safety.
- Topic 2: Organizations.
- Topic 3: Directives and standards. Technical instructions.
- Topic 4: Electrical safety.
- Topic 5: Electromagnetic compatibility.
- Topic 6: Machinery Safety.

Section 2. Control of Electrical Systems.

- Topic 1: Introduction to control of electrical systems.
- Topic 2: Control by using programmable controllers.
- Topic 3: Monitoring of electrical systems in the industry.
- Topic 4: Communications in the industrial environment.

Laboratory sessions

- Session 1: Measurement of dielectric strength and insulation resistance of electrical equipment.
- Session 2: Tests for characterization of electrical cables.
- Session 3: Tests of Electromagnetic Compatibility.
- Session 4: Control system with frequency converter for temperature regulation.
- Session 5: Control and supervision system for electrical power management.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

The subject is taught in the second semester of the second year of the Master in Industrial Engineering.

The start and end dates of the lectures, as well as the date of completion for laboratory works, delivery of final work, etc., will be made public at the start of the course, according to the timetables set by the School of Engineering.

4.5.Bibliography and recommended resources