29715 - Basic principles of electrical technology

Información del Plan Docente

Academic Year	2018/19
Subject	29715 - Basic principles of electrical technology
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	434 - Bachelor's Degree in Mechanical Engineering
ECTS	6.0
Year	2
Semester	Second semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Aims of the course

The subject "Fundamentals of Electrical Engineering" and its expected results meet the following approaches and objectives:

The course is intended to the acquisition of basic knowledge about the use of electric energy in its various forms (DC and AC current), and the need and use of electrical machines in the processes of energy transformation.

1.2.Context and importance of this course in the degree

"Fundamentals of Electrical Engineering" is part of the industrial sector subjects and it is taught in the second semester of the 2nd academic year in the Mechanical Engineering degree. In order to attend it, knowledge acquired in "Mathematics" and "Physics" subjects (1st academic year) are required. The subject explains important electrical bases related to the "Automatic Systems" subject, belonging to the 2nd semester of the 3rd academic year of the degree. It also presents contents that are important for the "Fundamentals of Electronics" subject, belonging to the 3rd academic year of the degree.

1.3.Recommendations to take this course

To take the subject of "Fundamentals of Electrical Engineering", basic knowledge of mathematics and general physics are essential. It is advisable to have taken the subjects of Mathematics I and II , and Physics I and II , which are taught in first year in the Degree in Chemical Engineering.

Continuous work is strongly recommended to pass the course.

2.Learning goals

2.1.Competences

29715 - Basic principles of electrical technology

2.2.Learning goals

2.3.Importance of learning goals

The successful completion of the subject aims to complete the scientific and technical training student, and set the basic electrical knowledge needed to develop job skills associated with the Degree in Chemical Engineering.

With this intention, it is intended that the student is able to:

* Analyze and solve basic electrical DC and AC circuits, containing passive elements (resistors , inductors and capacitors)

* Know the management of major electric measuring instruments (multimeters, powermeters, oscilloscopes, etc)

* Select an electrical machine according to the requirements on energy transformation

* Perform the electrical assembly of a circuit or connection with an electrical machine

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 evaluation of the following activities:

- Laboratory sessions (15% of the final mark): It is required to attend all the sessions. In order to evaluate each session, the student will present a final report, by filling in a questionnaire before the end of the session. To pass the course is necessary to obtain a minimum score of 5.
- Tutorized works/cases (15% of the final mark): Throughout the semester, the resolution of practical cases, similar to those resolved in the contact sessions, will be proposed. The exercises will be reviewed personally to each student, and content, understanding and presentation will be evaluated.
- Evaluation test (20% of the final mark): **a midterm theoretical** and practical written exam (test and problems) of 1,5 hours (approximately), is performed. **This midterm exam** cover topics related to units 1 to 6.
- Final written exam (50% of the final mark). The final exam consist of a written exam to be performed at the end of the course. It consists of a theoretical part (test questionnaire) and a practical part (problem solving), which evaluates all the knowledge seen in lessons. Each one of the parts represents 50% of the exam, being necessary to obtain a minimum score of 3.5 in each part. To pass the course is necessary to obtain a minimum score of 4.0 on the final exam.
- Final written exam (85% of the final mark): similar to the final exam in option 1. To pass the course is necessary to obtain a minimum score of 5.
- Laboratory exam (15% of the final mark). A practical exam where the student will demonstrate that it is able to perform any of the sections proposed in the laboratory sessions. For this exam, students can have his/her lab notebook. To pass the course is necessary to obtain a minimum score of 5.

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

- Final written exam (85% of the final mark): similar to the final exam in option 1. To pass the course is necessary to obtain a minimum score of 5.
- Laboratory exam (15% of the final mark). A practical exam where the student will demonstrate that it is able to

perform any of the sections proposed in the laboratory sessions. For this exam, students can have his/her lab notebook. To pass the course is necessary to obtain a minimum score of 5.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that is designed for this subject is based on the following:

The learning process has been proposed to encourage continued student work and focuses on the basic theoretical aspects to understand, analyze and apply that knowledge to solve real problems.

For the development of the subject, on the one hand, theoretical sessions will be held with the whole group, in which the theoretical foundations of the subject will be presented in the form of lectures. On the other hand, the theoretical sessions will be complemented with the solving of numerical problems and practical cases.

The lab sessions will be conducted in small groups, where students will work as a member of a pair. The purpose of the internship is to apply the knowledge acquired in the theoretical sessions, focusing on circuit assemblies, electrical measurements and connections and use of electrical machines.

Simultaneously, during the different weeks of the semester, students will have to solve exercises supervised by the teacher. In addition to this, two written control exams, distributed throughout the semester, will be proposed.

4.2.Learning tasks

The program that the student is offered includes the following activities ...

Classroom Lessons (45 hours; 1.8 Cr). The explanation of theoretical contents will be made, related to the analysis of DC and AC circuits (single phase and three phase circuits), and with different types of electrical machines (constructive parts, operating principles, connection, selection, etc.). Different written material prepared by teachers will be available on the educational web platform (http://moodle2.unizar.es/), to help the lesson understanding (lecture notes and lecture slides). In addition, case studies related to the theoretical presentations (circuit calculation, selection of electrical machines, etc.) will be developed.

Laboratory Lessons (15 hours; 0.6 Cr). The student will use a lab notebook, available on the educational web platform (http://moodle2.unizar.es/) with the description of each lab session.

Tutorized Work (24 hours; 0.96 Cr). During the first weeks of the course, at the end of each topic, students will be suggested to solve numerical problems and practical cases, similar to those solved in the classroom. The statements of these jobs will be available on the educational web platform (http://moodle2.unizar.es/).

Individual study (60 hours; 2.4 Cr). These hours of personal work are distributed along the 15 weeks of the course. The ongoing work of the student will be promoted, by the distribution of the different learning activities throughout the semester.

Assessment exams (4,5 hours; 0.18 Cr). The evaluation is also a learning tool with which the student checks the degree of understanding and assimilation of knowledge and skills achieved. Because of this reason, there are not only a final written exam, but also a midterm written exam.

29715 - Basic principles of electrical technology

4.3.Syllabus

Introduction.

Unit 1: Electric and magnetic fields Electric Circuit Theory.

Unit 2: Elements of an electrical circuit

Unit 3: Electrical DC circuits

Unit 4: Electrical single-phase AC circuits

Unit 5: Power in single-phase AC circuits

Unit 6: Electrical three-phase AC circuits

Electric machines.

Unit 7: Electrical machines: introduction

Unit 8: Electrical DC machines

Unit 9: Electrical asynchronous AC machines

Unit 10: Electrical transformers

Power lines.

Unit 11: Low-voltage power lines: wires and protections

4.4.Course planning and calendar

The subject consists of 6 ECTS credits, equivalent to 150 hours of student work, to perform both as classroom contact hours, distributed as follows:

* 45 hours of classroom lessons, divided into 3 hours per week. Theoretical contents will be explained, and problems and practical cases (coordinated with theoretical presentations) will be developed.

* 1,5 hours of a control test, corresponding to a written (theoretical and practical) exam.

* 15 hours of laboratory lessons, over 5 sessions of 3 hours/lesson, throughout the semester.

29715 - Basic principles of electrical technology

* 24 hours of supervised work, which will consist of the solving of numerical problem and practical cases (similar to those solved in the classroom). The cases will be distributed during the course.

* 60 hours of personal study.

* 3 hours of examination, corresponding to the official written test.

The lessons in the classroom (3hours per week) will serve to present the theoretical and practical contents of the subject, as well as perform numerical problems/cases.

Five laboratory sessions (3hours per lab session) will be made, distributed along the semester (one lesson every two weeks). The three first sessions will be related to circuit analysis (units 2 to 6), and the two last ones will be related to the electrical machines (units 7 to 10).

Students will be asked to resolve several practical cases, distributed in 4 tutorized works, corresponding to units 3, 4-5, 6 and 8-9, respectively.

A theoretical and practical written exam will be made at mid-term (corresponding to units 1 to 6). In addition to this, there will be a self-assessment questionnaire on the educational web platform (http://moodle2.unizar.es/) for each one of the 11 units of the course. The student can answer each questionnaire from a personal PC, using all the necessary material (notes, slides, bibliography, etc).

Through advertisements given by the teacher in class, via e-mail or through educational web platform, specific dates for completion of each activity will be detailed.

4.5.Bibliography and recommended resources