29911 - Electrotechnics

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	435 - Bachelor's Degree in Chemical Engineering
ECTS	6.0
Year	2
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

Brief presentation of the subject.

The subject "Fundamentals of Electrical Engineering" develops and applies the basic fundamentals of electrical circuit analysis , use of electricity , and the principle of operation and main characteristics of electrical machines.

1.2.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.

1.3.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 first semester of the 2nd academic year in the Degree in Chemical Engineering. 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 2nd 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.

1.4.Activities and key dates

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.
- 3 hours of control tests, divided into a written (theoretical and practical) test (1.5 hours approximately), and various web platform self-assessment tests (1.5 hours distributed throughout the course).

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- 15 hours of laboratory lessons, over 5 sessions of 3 hours/lesson, throughout the semester.
- 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 limit dates for each specific activities , as well as all kind of information and documentation on the subject , will be published in the educational web platform (http://moodle2.unizar.es/).

2.Learning goals

2.1.Learning goals

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

- He/she knows the basics of circuit theory and electrical machines
- He/she understands the principles of circuit theory and electrical machines and has ability to apply them to simple problems analysis of electrical circuits and electrical machines

2.2.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.Aims of the course and competences

3.1.Aims of the course

The subject 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.

3.2.Competences

By passing this subject, students will be more competent to ...

C04- Solve problems and make decisions with initiative, creativity and critical thinking.

C06- Communicate and transmit knowledge, skills and abilities.

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C21- Know and use principles of electrical circuits and electrical machines.

4.Assessment (1st and 2nd call)

4.1.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 tests (20% of the final mark): a midterm theoretical and practical written exam (test and problems) of 1.5 hours (approximately), is performed (20%). This midterm exam cover topics related to units 1 to 6. Likewise, and evenly distributed along the course, the students could complete different self-assessment questionnaires (not compulsory, 0%) from the educational web platform (http://moodle2.unizar.es/). In these questionnaires, theoretical and practical student knowledge of electrical circuits, electrical machines and power lines (units 1 to 11) will be evaluated.
- 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.

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.

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

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. 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 use of electrical machines.

Additionally, during the semester, students will be required to solve exercises supervised by the teacher as well as some control test through the web and/or presentially in a classroom.

5.2.Learning tasks

The program offered to the student includes the following activities ...

- Classroom Lessons (45 hours). 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). 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). 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). 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 (6 hours). The evaluation is also a learning tool with which the student checks the degree of understanding and assimilation of knowledge and skills achieved. Due to this reason, there are not only a final written exam, but also various self-assessment tests distributed along the course (via web) and a midterm written exam.

5.3.Syllabus

The contents of the course are divided into two main blocks, in which concepts of "Circuit Theory" and "Electrical Machines" are developed. In addition, the program adds a first introductory subject in order to review basic issues (important for the subject understanding), and a final theme to describe the power lines which connect electrical machines. So, the program is distributed as follows...

Introduction.

- Unit 1: Electric and magnetic fields

Electric Circuit Theory.

- Unit 2: Elements of an electric circuit
- Unit 3: Electric DC circuits
- Unit 4: Electric single-phase AC circuits
- Unit 5: Power in single-phase AC circuits
- Unit 6: Electric three-phase AC circuits

Electric machines.

- Unit 7: Electric machines: introduction
- Unit 8: Electric DC machines
- Unit 9: Electric asynchronous AC machines
- Unit 10: Electric transformers

Power lines.

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

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5.4.Course planning and calendar

The lessons in the classroom (3h / 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). There will be a self-assessment questionnaire on the educational web platform 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 the educational web platform (http://moodle2.unizar.es/), specific dates for completion of each activity will be detailed.

5.5.Bibliography and recommended resources

BB	Castejón Oliva, Agustín. Tecnología eléctrica / Agustín Castejón Oliva, Germán Santamaría Herranz ; revisión técnica Antonio Plácido Montanero Molina . [1a. ed. en español, reimpr.] Madrid [etc.] : McGraw-Hill, D.L. 2000
BB	Edminister, Joseph A.. Circuitos eléctricos / Joseph A. Edminister, Mahmood Nahvi ; traducción, Rafael Sanjurjo Navarro, Eduardo Lázaro Sánchez, Pablo de Miguel Rodríguez . 3ª ed. Madrid [etc.] : McGraw-Hill, D.L. 2001
BB	Electrotecnia de potencia : curso superior / Wolfgang Muller [et al.] . Barcelona [etc.] : Reverté, D.L.1984
BB	Fraile Mora, Jesús. Problemas de máquinas eléctricas / Jesús Fraile Mora, Jesús Fraile Ardanuy . 2ª ed. [Madrid] : Garceta, D.L. 2015
BB	García Trasancos, José. Instalaciones eléctricas en media y baja tensión / José García Trasancos . 6ª ed. Madrid [etc.] : Paraninfo, D. L. 2011
BB	Moreno Alfonso, Narciso. Problemas resueltos de tecnología eléctrica / Narciso Moreno, Alfonso Bachiller, Juan Carlos Bravo . - 1ª ed., 2ª reimp. Madrid : Thomson, imp. 2006

LISTADO DE URLs:

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Material diverso: apuntes, transparencias, colección de problemas y guiones de prácticas de la asignatura. [https://moodle2.unizar.es/add/]