29813 - Electrotechnics

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura 326 - Escuela Universitaria Politécnica de Teruel
Degree	440 - Bachelor's Degree in Electronic and Automatic Engineering 444 - Bachelor's Degree in Electronic and Automatic Engineering
ECTS	6.0
Year	2
Semester	First semester
Subject Type	Compulsory
Module	---

1.General information

1.1.Introduction

Brief introduction to the course

Electrotechnics is a course of 6 ECTS credits, which are equivalent to a total of 150 hours of work. These hours are distributed as follows: 60 classroom hours (classroom lessons, laboratory, etc.) and 90 non-classroom hours (problem solving tasks, study, etc.).

This course addresses the basis of electrical machines: structure, operating principles and their main industry applications.

1.2.Recommendations to take this course

The course of Electrotechnics requires previous knowledge of mathematics, physics and electrical circuits. This relates to several first-year courses of the Degree: Mathematics I and II, Physics I and II and specially, Basic principles of electrical technology.

Studying and working continuously, from the first day of the year, is essential to pass the course in the best conditions.

It is important to resolve any question that may arise. For that, students are supported by the professor in both the classroom sessions and the tutorials.

1.3.Context and importance of this course in the degree

The Electrotechnics course is taught in the first semester of the second year of the Bachelor's Degree in Electronic and Automatic Engineering. To enrol this subject, it is important to have solid previous knowledge of mathematics, physics and electrical circuits. Thus, it is recommended to have passed the first-year courses of Mathematics I and II, Physics I and II and Basic principles of electrical technology.

29813 - Electrotechnics

The knowledge acquired in this course is the basis for other courses such as "Power Electronics" (Electrónica de Potencia) in the 3 rd year and "Electrical Installations" (Instalaciones Eléctricas) in the 4 th year.

1.4.Activities and key dates

The detailed schedules of the different activities will be set once the University and the Center have approved the school calendar (it will be published in the webpage of the Center).

The list of the activities to be performed, their dates, the course resources and any other kind of related information will be published in the ADD: https://moodle2.unizar.es/add

(to access this page, students must be enrolled in the course)

2.Learning goals

2.1.Learning goals

To pass the course, a student should control the following results...

He/she understands the operating principles of the electrical machines and is able to apply them to the steady-state and transient-state analyses.

He/she is able to identify, classify and describe the performance of electrical machine-based systems, using suitable analytical methods and modelling techniques.

He/she understands the use needs in the selection of electrical machines.

He/she has working skills in the electrical engineering laboratory.

He/she understands the practical codes and standards of the industry related to the electrical machines.

He/she identifies, classifies and describes the low, medium and high voltage electrical installations as well as the electrical protections.

2.2.Importance of learning goals

The knowledge acquired in this course is relevant since it sets the principles of the electrical machines which are essential to develop key courses of the Bachelor's Degree in Electronic and Automatic Engineering such as "Power Electronics" (to design control electronic stages), "Industrial Automatization" (Automatización Industrial) and "Industrial Robotics" (Robótica Industrial), among others.

3.Aims of the course and competences

3.1.Aims of the course

The expected results of this course and its objectives are the following:

29813 - Electrotechnics

- Students know the performance of the main electrical machines in both theoretical environments and practical scenarios.
- Students know the main industrial applications for each machine.
- Students acquire minimum practical skills with the laboratory tests and the electrical machine instrumentation.

3.2.Competences

Once a student has passed this course, he/she will have more skills to...

Apply the electrical engineering knowledge.

Solve problems and make decisions with initiative, creativity and thinking critically.

Use the required engineering techniques, skills and tools.

Manage the information, use and application of the technical specifications as well as the required legislation to develop a professional activity in the engineering field.

Learn continuously, developing strategies to learn also autonomously.

Communicate and teach knowledge and skills in Spanish.

4.Assessment (1st and 2nd call)

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

Students should demonstrate that the learning outcomes have been achieved through the following assessment activities...

1. **Works and evaluation activities (20%)**

   In order to promote the continuous work and facilitate the learning process, several evaluation activities will be performed during the course. These activities will be scheduled each course, comprising individual exercises, questionnaires, etc. The specific activities and their weight in the assessment will be announced well in advance.

   The grade will be in the interval 0 to 10 points, being a 20% of the final grade. To pass the course, it is required a minimum of 4 points over 10. This mark is maintained for the two calls of the course.

2. **Laboratory sessions (20%)**

   The following aspects will be valued in this type of evaluation activity: the previous preparation (a test will be delivered at the beginning of the session and it will be the 50% of the total mark), the performance of the laboratory session, including the ability to assembly and operate with the equipment (35%), and the results obtained (15%).

   The grade will be in the interval 0 to 10 points, being a 20% of the final grade (if a student does not attend a session at the scheduled time, he/she will have a grade of 0 in that session). To pass the course, it is required a minimum of 5 points over 10. This mark is maintained for the two calls of the course.

3.

Final examination (60%)

The exam will consist of a theoretical part, which will represent 30% of the final grade, and a problem-resolution part, which will constitute the remaining 70% of the final grade (in order the exam to be considered it is necessary that the mark of each part is equal or higher than 4 out of 10 points).

The grade will be in the range 0 to 10 points, being a 60% of the final grade of the student. To pass the course, it is required a minimum of 5 points over 10.

If a student does not reach the minimum grade in any of the three previous blocks, he/she should take the Global Assessment that is described below.

GLOBAL ASSESSMENT (OFICIAL CALLS: 100%)

A Global Assessment will be performed in each one of the Official Calls for those students who have not passed any of the previously mentioned evaluation activities. The Global Assessment is structured as follows:

1. **Final examination of the course (60%):** The exam will consist of a theoretical part, which will represent 30% of the final grade, and a problem-resolution part, which will constitute the remaining 70% of the final grade (in order the exam to be considered it is necessary that the mark of each part is equal or higher than 4 out of 10 points). The grade will be in the range 0 to 10 points, being a 60% of the final grade of the student. To pass the course, it is required a minimum of 5 points over 10.
2. **Works and evaluation activities examination (20%):** The grade will be in the interval 0 to 10 points, being a 20% of the final grade. To pass the course, it is required a minimum of 5 points over 10.
3. **Laboratory examination (20%):** It will be conducted in the laboratory. The grade will be in the interval 0 to 10 points, being a 20% of the final grade. To pass the course, it is required a minimum of 5 points over 10.

Students who have passed both the Laboratory Activities and the Works and Evaluation Activities during the teaching period only have to take the final examination of the course. In case a student does not get the minimum required grade in any of the blocks, he/she will get, as the final grade of the course, the lower value between the weighted average of the three parts and 4.0.

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The learning process of this course is structured into three pillars with increasing students' interaction: lectures, problem-solving activities and laboratory activities.

- *Lectures* : The fundamentals of the electrical engineering are presented, including examples and real-world applications.
- *Problem-solving activities* : Problems and cases are solved with the participation of students.
- *Laboratory activities* : In this type of activities, students can see first-hand the operation of the main electrical machines. They are conducted in small groups.

Additionally, in order to promote the continuous and independent work, it is possible that other learning activities are

performed during the semester.

5.2.Learning tasks

PRESENTIAL ACTIVITIES: 2.4 ECTS (60 hours)

1) Classroom lessons (T1 type) (30 classroom hours).

The theoretical and practical contents are introduced on these lessons. The basic concepts and principles of the electrical machines will be presented, illustrating them with real-world examples. The student involvement will be promoted by questions and short debates.

2) Problem-solving sessions and case studies (T2 type) (15 classroom hours).

Problems and case studies will be developed with the help of students. They will be related to the theoretical contents. Students will be encouraged to work the problems previously. Some of these hours could be used to perform the assessment activities set in each year.

3) Laboratory sessions (T3 type) (15 classroom hours).

Students will experience first-hand the operation of the main electrical machines in the laboratory. They will be provided with an instruction sheet that should be prepared previously.

The schedule of the practical sessions is the following:

- Electrical measurements in AC and DC circuits.
- Tests on the three-phase transformer.
- Automatisms: Operations on the asynchronous motor.
- Tests on the asynchronous machine.
- Electronic speed control of an asynchronous motor.
- Tests on the DC machine.

NON-PRESENTIAL ACTIVITIES: 3.6 ECTS (90 hours)

4) Learning works (T6 type) (20 non-classroom hours).

Activities that students will perform in group or individually. They will be proposed by the teacher during the semester.

29813 - Electrotechnics

5) Study (T7 type) (66 non-classroom hours).

This activity involves students' personal study of the theoretical concepts and problem resolution. The continuous work of students is encouraged by the homogeneous distribution of the learning activities throughout the semester. These learning activities are supported by tutorials, direct student attention, identification of learning problems, course orientation, help in exercises and works, etc.

6) Assessment activities (T8 type) (4 non-classroom activities).

The assessment activities are also learning tools through which students can check their level of understanding of the course.

5.3.Syllabus

In order to help to achieve the stated objectives, the following program is provided:

1. Introduction to electrical installations.
   - The power electrical system.
   - The production, transmission and distribution subsystems.
2. General aspects of the electrical machines
1. Selection of electrical machines and their regulations.
3. Transformers
1. Three-phase systems.
2. One-phase and three-phase transformer.
3. Connection of transformers in parallel.
4. Autotransformers and instrumentation and protection transformers.
4. Rotary machines
1. Windings and the rotating magnetic field.
2. Three-phase asynchronous machine.
3. Three-phase synchronous machine.
4. DC machine.
5. Special machines.

5.4.Course planning and calendar

Classroom sessions and work defence schedule

Lectures, problem-solving and laboratory activities are performed in the schedule set by the Center (schedules are displayed on the website).

Each teacher has several hours assigned to support students. The specific schedule is made public at the beginning of the course.

The rest of the activities are planned depending on the number of students and are made public well in advance. These activities are available on the ADD: https://moodle2.unizar.es/add/

5.5.Bibliography and recommended resources

1. Proposed problems, laboratory support materials, and other teaching resources are available on the ADD: https://moodle2.unizar.es/add/

29813 - Electrotechnics

2. Reference books:

- Fraile Mora, Jesús. "Máquinas eléctricas", 6th edition. Ed.: McGraw-Hill/Interamericana, Madrid, 2008
- P. Abad, V. Alcalá, E. Sainz, J. F. Sanz, M. J. Velilla, J. L. Villa, "Máquinas Eléctricas: Máquinas de corriente continua, transformadores y máquinas de corriente alterna". Copy Center Digital, DL-Z5321-2008.

3. Supplementary material:

- Chapman, Stephen J. "Máquinas eléctricas". Ed.: McGraw-Hill, Santa Fe de Bogotá, 2000.
- Fraile Mora, Jesús, Fraile Ardanuy, Jesús. "Problemas de máquinas eléctricas". Ed. McGraw-Hill Interamericana, Madrid, 2005.
- Ras Oliva, Enrique. "Transformadores de potencia, de medida y de protección", 7th edition. Ed.: Marcombo, Barcelona, 1994.