28822 - Electrotechnics

Información del Plan Docente

Academic Year	2016/17
Academic center	175 - Escuela Universitaria Politécnica de La Almunia
Degree	424 - Bachelor's Degree in Mechatronic Engineering
ECTS	6.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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

Strong interaction between the teacher/student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

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The current subject Electrotechnics is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities.

The organization of teaching will be carried out using the following steps:

— **Theory Classes** : Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.

— **Practical Classes** : The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.

— **Laboratory Workshop** : The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.

— **Individual Tutorials** : Those carried out giving individual, personalized attention with a teacher from the department. Said tutorials may be in person or online.

5.2.Learning activities

The programme offered to the student to help them achieve their target results is made up of the following activities...

Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

— **Face-to-face generic activities** :

● Theory Classes: The theoretical concepts of the subject are explained and illustrative examples are developed as support to the theory when necessary.

● Practical Classes: Problems and practical cases are carried out, complementary to the theoretical concepts studied.

● Laboratory Workshop: This work is tutored by a teacher, in groups of no more than 20 students.

— **Generic non-class activities** :

● Study and understanding of the theory taught in the lectures.

● Understanding and assimilation of the problems and practical cases solved in the practical classes.

● Preparation of seminars, solutions to proposed problems, etc.

● Preparation of laboratory workshops, preparation of summaries and reports.

● Preparation of the written tests for continuous assessment and final exams.

- Tutored autonomous activities.
Although they will have more of a face character have been taken into account in part for their idiosyncrasies, they will be primarily focused on seminars and tutorials under the supervision of the teacher.

- **Reinforcement activities.**

Non-contact marking character, through a virtual learning portal (Moodle) various activities that reinforce the basic contents of the subject be addressed. These activities can be customized or not, controlling their realization through it.

5.3.Program

The guidelines followed to develop the program of the course were as follows:
- Respect those proposed in the verification report content.
- Develop an agenda whose chapters are generally consistent with the titles of the specified program. When this was not done it was because of its size and / or correlation was included in another.
- Select a large bibliography of recognized technical, classical and current issues.
He selected the best literature topics treated and turned into a single text, design and own format, with innovative teaching resources. The teacher has not claimed to be unprecedented in its preparation, is based on texts by renowned, are only original objectives, organization and presentation of the material and drafting of some sections of the issues. The full text is available in the reprographic service of the school, as well as on digital media published in Moodle.
-The Main characteristics of text form can be summarized in eight subjects have, consistent with the content, completely developed, avoiding summaries.
-The Specific objectives achieved with the development of the text itself can be summarized as follows:

● Highlight the relationship between conceptual analysis and problem solving, using the number of examples needed to show approaches to solving them, stressing that solving is a process in which the conceptual knowledge is applied, and not It is merely a mechanized model for the solution. Therefore, in the text and the mental processes worked examples of problem solving based on the concepts, instead of highlighting the mechanical procedures are highlighted.

● Provide students practice in the use of analytical techniques presented in the text.
● Show students analytical techniques are tools, not goals, allowing quepractiquen in various situations in the choice of the analytical method they will use to obtain the solution.
● Encourage student interest in engineering activities, including real application problems.
● Develop problems and exercises using realistic values representing feasible situations.
● Encourage students to evaluate the solution, either with another method of resolution or by testing to see if it makes sense in terms of the known behavior of the circuit, machine or system.
● Show students how the results of a solution for additional encontrarinformación about the behavior of a circuit, machine or system are used.
● The resolution of most problems will require the type of analysis to be performed by an engineer to solve

real-world problems. Developed examples, where the mindset own engineering emphasizes, also serve as a basis for solving real problems.

The subject is structured around two complementary components contents:
- Theorists.
- Practical.

THEORETICAL CONTENTS.

The choice of the content of the various teaching units was made seeking clarification express purpose terminal so that the union of incidents knowledge, the student obtain a structured, easily assimilable for Mechatronics Engineers.
The theoretical contents are articulated based on eight teaching units attached table, indivisible blocks of treatment, given the configuration of the subject that program. These topics collect the contents needed for the acquisition of predetermined learning outcomes.

Topic 1	Agenda	**Three phase sinusoidal alternating current.** 1.1 Introduction. 1.2 Phase system of electromotive forces. 1.3 Load in a three phase system. 1.4 Powers. 1.5 Improved power factor.
	Study guide	Knowledge, understanding and application of the principles of three phase alternating current. Recognition of the importance of alternating current progress and social welfare. Correctly interpreting circuit diagrams three phase alternating current, less in each case the electrical variables at play.
Topic 2	Agenda	**Direct current lines.** 2.1 Introduction. 2.2 Considerations necessary in the calculation of a direct current line. 2.3 Determination of the section of the conductor. 2.4 Classification of direct current lines. 2.5 Uniform section lines. 2.6 Nonuniform section lines.

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	Study guide	Knowledge, understanding and application of the principles of calculating sections in the current lines, without neglecting other influential aspects of their design and dimensioning. Correct interpretation of energy balance, closely linked to the resulting energy efficiency.
Topic 3	Agenda	**Single phase alternating current lines.** 3.1 Introduction. 3.2 Considerations necessary in the calculation of a single phase line. 3.3 monophasic ohmic character lines. 3.4 Single phase lines ohmic-inductive character. 3.5 Determination of the section of the conductor. 3.6 Study of the types of single phase lines.
	Study guide	Knowledge, understanding and application of the principles of calculating sections in single-phase alternating current lines, without neglecting other influential aspects of their design and dimensioning. Application of equivalent circuits as a means of simplifying their study.
Topic 4	Agenda	**Three phase alternating current lines.** 4.1 Introduction. 4.2 Considerations necessary in the calculation of a three phase line. 4.3 Triphasic ohmic character lines. 4.4 Three phase lines ohmic-inductive lcharacter. 4.5 Determination of the section of the conductor. 4.6 Study of the types of three phase lines.

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	Study guide	Knowledge, understanding and application of the principles of calculating sections in the three-phase alternating current lines, without neglecting other influential aspects of their design and dimensioning. Essential element for the transport and distribution of electric power.
Topic 5	Agenda	**Single phase transformers.** 5.1 Introduction. 5.2 Main constructive aspects. 5.3 Basics of magnetism and electromagnetism. 5.4 Principle of operation of an ideal single-phase transformer. 5.5 Principle of operation of a real single-phase transformer. 5.6 Equivalent circuits. 5.7 Testing. 5.8 Voltage drop. 5.9 Performance.
	Study guide	Ideal load operation and load single phase transformer by its corresponding mathematical justification. Real idling and load single phase transformer and its implications. Process modeling of a single phase transformer with the necessary premises to carry out this process. Connotation of the various tests performed on single phase transformers.
Topic 6	Agenda	**Three phase transformers.** 6.1 Introduction. 6.2Transformación of a three-phase system for single-phase transformers. 6.3 Constructive aspects.

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		6.4 Operation. 6.5 Testing. 6.6 connections.
	Study guide	Extrapolation of the concepts studied for the single-phase transformer which have no place in the three phase transformer, ideal and actual operation, equivalent circuits, testing, voltage drop, performance, etc. Different combinations feasible in primary and secondary wirings of three phase transformers.

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Topic 7	Agenda	**Direct current motors.** 7.1Introducción. 7.2 Constructive aspects of the current machine. 7.3 Principle of operation of the direct current machine. 7.4 induced electromotive force. 7.5 internal electromagnetic torque. 7.6 Reaction induced. 7.7 Switching. 7.8 Overview of the direct current motor. 7.9 Boot. 7.10 Classification of direct current motors. 7.11 Comparison of the main types of direct current motors. 7.14 speed control. 7.15 Reversing the direction of rotation. 7.16 Electrical braking.
	Study guide	Principles of generation of an induced electromotive force. Construction of the current machine and its operation as a motor. Analyze the various schemes of self excited generators. The drive effect and its relationship to torque production engines. Features and vacuum charging speed and torque. Starting torque of the different types of motors for applying appropriate loads
Topic 8	Agenda	**Three phase asynchronous motors.** 8.1Introducción. 8.2 Constructive aspects. 8.3 Rotating magnetic field produced by the stator winding. 8.4 Electromotive force induced in the windings. 8.5 Principle of operation of three phase asynchronous motor.

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		8.6 Equivalent circuits. 8.7 Testing. 8.8 Balance of powers. 8.9 Rotation Torque. 8.10 Regimes operation of the asynchronous machine. 8.11 Curves electrical and mechanical fundamental characteristics. 8.12 Start of three-phase asynchronous motor. 8.13 Speed control.
	Study guide	Principle of operation, construction and operation of the asynchronous machine regimes. Highlights of the three phase asynchronous squirrel cage motor and wound rotor. Tests for obtaining the characteristic parameters of three phase asynchronous motor. Booting and speed regulation.

PRACTICAL CONTENTS.

Laboratory workshop are a very important for the formation of the student coursing the degree of civil ngineering complement. The engineer has to keep in mind always that only well-known that which can be measured, and, above all, accurately measure and if this is not possible, make the error that is being done reading.
The measurement and testing in electrical engineering cover a multitude of instruments that today have reached a high degree of perfection, through which it is possible to measure, monitor, investigate, e

It is impossible to try to give even a minimal description of the various types of appliances and commercial devices used for measuring various electrical parameters. This is not the purpose, but which are covered learning outcomes of the course through a comprehensive program of laboratory practices, encompassing aspects related to the following issues:
- Of Generically, you have a clear idea of the importance of the field of electrical measurements as well as the quality and accuracy of the measure being carried out, knowing the different types of errors that you may encounter when taking a reading.
- That knowledge has, at least, techniques and more used for measuring magnitudes as methods: voltage, current, power, energy, etc.

Those workshop to be developed in the laboratory, which will be performed by students in sessions of one hour below.

Workshop 1	**Study of voltages and currents in three phase systems.** Measurement of voltages and currents in different types of three phase loads.
Workshop 2	**Measurement of active and reactive power cos φ. Improved power factor in three phase systems.** Measurements of electrical quantities for different configurations of three phase voltage systems feeding different types of three phase loads.
Workshop 3	**Direct start of a three-phase asynchronous motor.** Using the following methods: constant contact, continued momentum, momentum and continued momentum or momentum.
Workshop 4	**Reversing the direction of rotation of a three-phase asynchronous motor.** Being used the following methodologies: without going through unemployment, through unemployment and automatic.
Workshop 5	**Star-delta starting a three-phase asynchronous motor.** Using the following methods: manual and automatic.

5.4.Planning and scheduling

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject

is moderate.

Activity	Weekly school hours
Lectures	3
Laboratory	1
Others activities	6

Nevertheless the previous table can be shown into greater detail, taking into account the following overall distribution:

— 45 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.

— 10 hours of laboratory workshop, in 1 or 2 hour sessions.

— 5 hours of written assessment tests, one or two hour per test.

— 90 hours of personal study, divided up over the 15 weeks of the semester.

The dates of the global evaluation test will be published officially in http://www.eupla.unizar.es/index.php/secretaria-2/informacion-academica/distribucion-de-examenes

Written continuous assessment tests are related to the following topics:

Las pruebas escritas de evaluación continua estarán relacionadas con los temas siguientes:

— **Written assessment test 1** : Topics 1, 2, 3, y 4.

— **Written assessment test 2** : Topics 5, 6, 7 y 8.

The issues on which the work will be developed will be proposed in the third week, carrying out delivery and exposure before the last two weeks teaching in the course of the signature dates will be specified.

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The most significant dates in the system of continuous assessment are contained in the following indicative timetable and may vary depending on the development, subject to the academic calendar lesson activity.

Activity	Weekly school													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Test 1								X						
Test 2														
Work			P											

P: proposed works E: delivery works

5.5.Bibliography and recomended resources

Bibliography:

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- Sanz Feito, Javier. Máquinas eléctricas / Javier Sanz Feito Madrid [etc.] : Prentice Hall, D.L. 2002.

Resources and materials used in the development of the subject are reflected in the following table:

Material	Format
Topic theory notes Topic problems	Paper/repository
Topic theory notes Topic presentationso Topic problems Related links	Digital/Moodle E-Mail
Circuit simulation software	Pc's laboratorio
Technical manuals	Paper/repository Digital/Moodle
Multimeters ammeters Voltmeters Power Meters Frequency Transformers. Rectifiers Oscilloscopes Single and three phase loads Engines	

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Electrical switchgear	