

## 29619 - Electrical Machines I

### Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	430 - Bachelor's Degree in Electrical Engineering
ECTS	6.0
Year	2
Semester	Second semester
Subject Type	Compulsory
Module	---

### **1.General information**

#### **1.1.Introduction**

#### **1.2.Recommendations to take this course**

#### **1.3.Context and importance of this course in the degree**

#### **1.4.Activities and key dates**

### **2.Learning goals**

#### **2.1.Learning goals**

#### **2.2.Importance of learning goals**

### **3.Aims of the course and competences**

#### **3.1.Aims of the course**

#### **3.2.Competences**

### **4.Assessment (1st and 2nd call)**

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

### **5.Methodology, learning tasks, syllabus and resources**

#### **5.1.Methodological overview**

The learning process that has been designed for this subject is based on the following thing: The learning process has appeared to promote the continued work of the student and centres on the theoretical basic aspects to be able to understand, analyze and apply this knowledge to the resolution of royal problems.

For the development of the subject, on one hand theoretical meetings will be given by the complete group, in which the theoretical foundations of the subject will be exposed in the shape of magisterial class and will complement each other

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with the resolution of problems - types.

On the other hand laborator meetings will be realized in limited groups where the pupil will work as member of a group of two or three pupils. The purpose of the practices is to apply the knowledge acquired in the theoretical meetings, affecting in assemblies of circuits, in electrical measures and in the hookup and use of electrical machines. With the laborator practices there is claimed that the pupil knows devices and electrical machines, which manual skill acquires, and that it reinforces the theoretical acquired knowledge.

Parallel, during the first weeks of the four-month period, the pupil will have to solve a few exercises tutelados for the teacher.

Also there will be realized diverse written tests of control, distributed along the school period.

### 5.2.Learning tasks

**The program that offers itself the student to help him to achieve the foreseen results understands the following activities:**

Classes attend them (45 hours attend them). On the one hand, there will be realized meetings of exhibition and explanation of theoretical contents, related to the different types of electrical machines (constructive parts, beginning of functioning, hookup, etc.). The pupil will have educational material prepared by the professorship, and available in the Digital Educational Ring (<http://moodle.unizar.es/>), that helps him to the follow-up of the theoretical classes. On the other hand, and of coordinated form, there will develop problems and practical cases related to the theoretical exhibitions (calculation of circuits, selection of electrical machines, etc.).

The magisterial classes and of problems and the meetings practices in the laboratory they are given according to schedule established by the center (available schedules in his web page).

Every teacher will report of his schedule of attention of tutorship.

The rest of activities will be planned depending on the number of pupils and will be announced by the sufficient anticipation. It will be able to consult in the Digital Educational Ring (<http://moodle.unizar.es/>).

Laborator practices (15 hours attend them). The pupil will have a notebook of practices, available in the Digital Educational Ring (<http://moodle.unizar.es/>) with the scripts of every practice, which they will have to be read before to every session, and in that to realize annotations on the realized activities.

Works tutelados (18 hours do not attend them). During the first weeks of course, on having finished every topic, one will propose to the pupils the resolution of problems and practical cases proposed by the teacher, similar to solved in the classroom. The terms of reference of such works will be available in the Digital Educational Ring (<http://moodle.unizar.es/>).

Individual study (67 hours do not attend them), distributed throughout 15 weeks of duration of the course. The continued work of the student will be promoted, by means of the homogeneous distribution along the four-month period of the diverse activities of learning.

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Tests of evaluation (5 hours attend them). Beside having a function calificadora, the evaluation also is a tool of learning with which the pupil verifies the degree of comprehension and assimilation of knowledge and skills obtained.

### 5.3.Syllabus

The program of the subject divides in three principal blocks, in which concepts develop on " Electrical Machines ".

- **Transformers:** Introduction. Ideal transformer. Constructive aspects. Royal transformer. Reduction of 2<sup>o</sup> to the 1<sup>o</sup>. Equivalent circuit. Performance. Three-phase banks. Three-phase transformers. Hourly indexes. Transformers in parallel. Autotransformers. Transformers of measure and protection.
- **Asynchronous machines :** Introduction. Constructive aspects, rotor of cage and wound rotor. Magnetic gyratory fields produced by a single-phase and three-phase system. Beginning of functioning like engine, brake, generator. Equivalent circuit. Balance sheet of powers. Mechanical characteristic. Take-off of the asynchronous engine. Speed regulation of the asynchronous engine.

### 5.4.Course planning and calendar

#### Calendar of meetings attend them and presentation of works.

The program of the subject divides in three principal blocks, in which concepts develop on " Electrical Machines ". Por so much, the agenda is distributed of the following way.

#### Transformers:

Introduction. Ideal transformer. Constructive aspects. Royal transformer. Reduction of 2<sup>o</sup> to the 1<sup>o</sup>. Equivalent circuit. Performance. Three-phase banks. Three-phase transformers. Hourly indexes. Transformers in parallel. Autotransformers. Transformers of measure and protection.

#### Asynchronous machines:

Introduction. Constructive aspects, rotor of cage and wound rotor. Magnetic gyratory fields produced by a single-phase and three-phase system. Beginning of functioning like engine, brake, generator. Equivalent circuit. Balance sheet of powers. Mechanical characteristic. Take-off of the asynchronous engine. Speed regulation of the asynchronous engine.

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The rest of activities will be planned depending on the number of pupils and will be announced by the sufficient anticipation. It will be able to consult in the Digital Educational Ring (<http://moodle.unizar.es/>).

### 5.5.Bibliography and recommended resources

[BB: Bibliografía básica / BC: Bibliografía complementaria]

- [BB] Carod Pérez, Eva Sara. Máquinas eléctricas [Texto impreso] Eva S. Carod, José A. Domínguez, M<sup>a</sup> Jesús Velilla . Zaragoza Copy Center [2007]

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- [BB] Máquinas eléctricas [Texto impreso] : máquinas de corriente continua, transformadores y máquinas de corriente alterna P. Abad ... [et al.] ; coordinador, J.F. Sanz . Zaragoza Copy Center [2008]
- [BC] Chapman, Stephen J.. Máquinas eléctricas / Stephen J. Chapman ; revisión técnica Carlos Rodríguez Pérez, Alfredo Santana Díaz . 5ª ed. México [etc.] : McGraw-Hill, cop. 2012
- [BC] Fitzgerald, Arthur Eugene.. Máquinas eléctricas / A. E. Fitzgerald, Charles Kingsley, Stephen D. Umans ; traducción, Jorge Yescas Milanés, Rodolfo Navarro Salas ; revisión técnica, Luis Mauro Ortega González . - 6ª ed. México [etc.] : McGraw-Hill/Interamericana, cop. 2004
- [BC] Fraile Mora, Jesús. Problemas de máquinas eléctricas / Jesús Fraile Mora, Jesús Fraile Ardanuy . 2ª ed. [Madrid] : Garceta, D.L. 2015
- [BC] Fraile Mora, Jesús. Problemas de máquinas eléctricas / Jesús Fraile Mora, Jesús Fraile Ardanuy . 2ª ed. [Madrid] : Garceta, D.L. 2015
- [BC] Ras Oliva, Enrique. Transformadores de potencia, de medida y de protección / Enrique Ras Oliva . - 7ª ed. renov. Barcelona : Marcombo, cop. 1994

### Listado de URL

- - Apuntes de la asignatura- Colección de enunciados de problemas- Cuaderno de prácticas de laboratorio [<http://moodle.unizar.es/>]