

Academic Year/course: 2021/22

## 29619 - Electrical Machines I

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 29619 - Máquinas eléctricas I

**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

### 2. Learning goals

### 3. Assessment (1st and 2nd call)

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. 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 with the resolution of problems - types.

On the other hand, laboratory meetings will be realized in limited groups where the student will work as a member of a group of two or three students. 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 laboratory practices, there is claimed that the student 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 student will have to solve a few tutored exercises for the teacher.

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

#### 4.2. Learning tasks

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

Lectures (45 hours). 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 student will have educational material prepared by the professorship, and available in the Digital Educational Ring (<https://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.).

Lectures, practice sessions, solving-problems sessions and the meetings practices in the laboratory are given according to the schedule established by the centre (available schedules on his web page).

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

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

Laboratory practices (15 hours). The student will have a notebook of practices, available in the Digital Educational Ring (<https://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.

Tutored Works (18 hours). During the first weeks of course, on having finished every topic, one will propose to the students 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 (<https://moodle.unizar.es/>).

Autonomous work and study (67 hours), distributed throughout 15 weeks 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.

Tests of evaluation (5 hours). Besides having a rating function, the evaluation also is a tool of learning with which the student verifies the degree of comprehension and assimilation of knowledge and skills obtained.

### 4.3. Syllabus

The program of the subject divides into 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. The balance sheet of powers. Mechanical characteristic. The take-off of the asynchronous engine. Speed regulation of the asynchronous engine.

### 4.4. Course planning and calendar

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

The program of the subject divides into three principal blocks, in which concepts develop on " Electrical Machines ". So much so, 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. The balance sheet of powers. Mechanical characteristic. The take-off of the asynchronous engine. Speed regulation of the asynchronous engine.

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

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

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

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=29619&Identificador=13331>