

## SUBJECT TEACHING GUIDE

G590 - Electrical Machines

Degree in Energy Resources Engineering

Academic year 2021-2022

| 1. IDENTIFYING DATA              |  |                  |                    |                  |                    |
|----------------------------------|--|------------------|--------------------|------------------|--------------------|
| Degree                           | Degree in Energy Resources Engineering   |                  |                    | Type and Year    | Compulsory. Year 2 |
| Faculty                          | School of Mines and Energy Engineering   |                  |                    |                  |                    |
| Discipline                       | Subject Area: Fundamentals of Electrical Technology<br>Module: Training in Common with the Mining Branch |                  |                    |                  |                    |
| Course unit title and code       | G590 - Electrical Machines   |                  |                    |                  |                    |
| Number of ECTS credits allocated | 6  | Term             | Semester based (2) |                  |                    |
| Web                              |  |                  |                    |                  |                    |
| Language of instruction          | Spanish  | English Friendly | No                 | Mode of delivery | Face-to-face       |

|                  |  |  |  |  |  |
|------------------|--|--|--|--|--|
| Department       | DPTO. INGENIERIA ELECTRICA Y ENERGETICA  |  |  |  |  |
| Name of lecturer | RAQUEL MARTINEZ TORRE  |  |  |  |  |
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| Office           | E.P. de Ingeniería de Minas y Energía. Planta: + 1. DESPACHO RAQUEL MARTINEZ TORRE (132) |  |  |  |  |
| Other lecturers  | TOMAS GUINDULAIN ARGANDOÑA   |  |  |  |  |

### 3.1 LEARNING OUTCOMES

- The student will learn the different parts of the electrical machines according to different criteria : excitation types, types of energy conversion, etc.
- The student will learn how to design and to calculate the equivalent electric circuit of an electrical machine.
- The student will learn how to regulate the electrical machines (speed, torque, etc) in order to adapt them to any production process.
- The student will learn how to regulate the electrical machines in order to get savings and to increase their energy efficiency .

#### 4. OBJECTIVES

- Comprehension of the constitution of the static and rotating electrical machines and their operating principles.
- To learn the analysis techniques of electrical machines.
- To know how to maneuver and regulate the electrical machines.
- To know the different drives (electrical drives and based on power electronics) that allow the electrical machines regulation.

#### 6. COURSE ORGANIZATION

| CONTENTS |  |
|----------|--|
| 1        | SECTION I. Introduction to electrical machines<br>Laboratory practice. |
| 2        | SECTION II. Transformers<br>Laboratory practice                        |
| 3        | SECTION III. Power electronics systems.<br>Laboratory practice.        |
| 4        | SECTION IV. Asynchronous machines<br>Laboratory practice               |
| 5        | SECTION V. Synchronous machines<br>Laboratory practice                 |

## 7. ASSESSMENT METHODS AND CRITERIA

| Description                    | Type         | Final Eval. | Reassessn | %             |
|--------------------------------|--------------|-------------|-----------|---------------|
| Theoretical & practical exam 1 | Written exam | No          | Yes       | 30,00         |
| Theoretical & practical exam 2 | Written exam | No          | Yes       | 30,00         |
| Laboratory practices exam      | Written exam | Yes         | Yes       | 30,00         |
| Continuous evaluation          | Others       | No          | No        | 10,00         |
| <b>TOTAL</b>                   |              |             |           | <b>100,00</b> |

### Observations

Overall grade calculation:

a) If student obtains grades equal to or greater than the minimum grades established, the overall grade will be the weighted average of the grades reflected in 'Evaluation Methods' (Theoretical & practical exam 1, Theoretical & practical exam 2, Laboratory practices exam and Continuous evaluation).

The student will pass the subject when obtains the minimum established grades and the overall grade is equal to or greater than 5.

b) If student does not pass the minimum grades established, the overall grade will be obtained as the minimum value between 4.9 and the weighted average of the different grades.

- Grades equal to or greater than minimum grades established will be kept until the extraordinary exam.

- If the students miss more than 20 % of the laboratory lessons, they will be graded negatively in continuous evaluation. These students will have to pass an additional exam in the Laboratory.

- The laboratory practices may be carried out in the normal classroom and in the Laboratory during the schedule established. Usually, the laboratory practices will last 1 hour per week, but sometimes, it will last 2 hours. The establishment of the groups will be exclusive competence of the lecturer.

### Observations for part-time students

Part-time students, that miss more than 20 % of the laboratory lessons, will have to pass an additional exam in the Laboratory.

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

#### BIBLIOGRAFÍA

\* FRAILE MORA, J. "Máquinas Eléctricas". Ed. McGraw-Hill. Madrid. Teoría y Problemas

\* GURRUTXAGA, J. A. "Electrotecnia básica para ingenieros". Servicio de Publicaciones de la E.T.S.I. de Caminos, C. y P. de Santander.

\* RAS OLIVA, E. "Transformadores de potencia, medida y protección". Ed. Marcombo. Barcelona.

\* CORTES CHERTA, M. "Curso moderno de máquinas eléctricas rotativas". Tomos 1 y 3. Editores Técnicos Asociados. Barcelona.