

## **GENERAL INFORMATION**

| Data of the subject |  |  |  |  |
|---------------------|--|--|--|--|
| Subject name        | Fundamentals and Applications of Electric Drives                                       |  |  |  |
| Subject code        | DIE-GITI-439   |  |  |  |
| Mainprogram         | Bachelor's Degree in Engineering for Industrial Technologies                           |  |  |  |
| Involved programs   | Grado en Ingeniería en Tecnologías Industriales [Fourth year]                          |  |  |  |
| Level               | Reglada Grado Europeo  |  |  |  |
| Quarter             | Semestral  |  |  |  |
| Credits             | 3,0 ECTS   |  |  |  |
| Туре                | Optativa (Grado)   |  |  |  |
| Department          | Department of Electrical Engineering   |  |  |  |
| Coordinator         | Ignacio Egido  |  |  |  |
| Schedule            | Find it at the official website (http://horarios.comillas.edu/ICAIGrado1Sem/Horarios/) |  |  |  |
| Office hours        | Please contact the professor   |  |  |  |

| Teacher Information |                                      |  |  |  |
|---------------------|--------------------------------------|--|--|--|
| Teacher             |                                      |  |  |  |
| Name                | Fidel Fernández Bernal               |  |  |  |
| Department          | Department of Electrical Engineering |  |  |  |
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| Teacher             |                                      |  |  |  |
| Name                | Ignacio Egido Cortés                 |  |  |  |
| Department          | Department of Electrical Engineering |  |  |  |
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| Phone               | 4282                                 |  |  |  |

## **DESCRIPTION OF THE SUBJECT**

### **Contextualization of the subject**

## Prerequisites

Electrical machines.

Modelling and control of dynamic systems



Lab session: electrical safety, measurement equipment.

# **Course contents**

| ents       |   |  |
|------------|---|--|
| 1. Introdu | uction to electrical drives                     |  |
| 2. Dynam   | Dynamic modeling of mechanical rotating systems |  |
| o          | Dynamic equation of rotating systems            |  |
| o          | Gears and pulleys                               |  |
| 0          | Per unit computation in rotating systems        |  |
| 3. V/f cor | ntrol of electrical drives:                     |  |
| 0          | Introduction                                    |  |
| 0          | Basic principles of electrical machines         |  |
| 0          | Constant flux control                           |  |
| o          | Operational limits                              |  |
| o          | Smooth start-up of an electrical machine        |  |
| 4. Introdu | action to power electronics                     |  |
| 0          | AC/CD conversion. Rectifier                     |  |
| 0          | DC/AC conversion. Inverter                      |  |
| o          | Three-phase PWM principles                      |  |
| o          | PWM and induction motor. Harmonics and limits   |  |

# **EVALUATION AND CRITERIA**

| Evaluation activities                                     | Evaluation criteria  | Weight |
|---|--|--------|
| Mid-term exam + final exam                                | Theory understanding and application to solving exercises. Analysis of the results | 80     |
| Short questions in class and/or presentation of exercises | Theory understanding and application to solving exercises                          | 10     |
| Lab session   | Work in groups, analysis of the measurements and results                           | 10     |

#### Grading

Regular assessment:

- Assessment from class lectures accounts for 90%: first exam (20%), second exam (70%) and short questions in class (10%).
- Lab session accounts for 10%.
- A grade of five is compulsory in both the grade obtained from class content derived from lectures as well as the lab grade in order



to pass the subject.

#### Retakes:

The student has two periods of final evaluation during one academic year. The first one will be carried out at the end of the course (end of the semester). If the subject is not passed, obtaining five or more points, the student has another opportunity for final evaluation at the end of the academic year. The dates of evaluation periods will be announced on the web page. The new grade will be obtained as follows:

- Assessment from class lectures accounts for 90%: retake exam (90%) and short questions in class (10%).
- Lab session accounts for 10%.
- A grade of five is compulsory in both the grade obtained from class content derived from lectures as well as the lab grade in order to pass the subject.

Course rules :

- Class attendance is mandatory according to Article 93 of the General Regulations (Reglamento General) of Comillas Pontifical University and Article 6 of the Academic Rules (Normas Académicas) of the ICAI School of Engineering. Not complying with this requirement may have the following consequences: students who fail to attend more than 15% of the lectures may be denied the right to do the final exam (and even the retake exam)
- Students who commit an irregularity in any graded activity will receive a zero mark in the activity, and the disciplinary procedure will follow (cf. Article 168 of the General Regulations (Reglamento General) of Comillas Pontifical University).

| Activities  | Date of realization | Delivery date |
|-------------|---------------------|---------------|
| Chapter 1   | Week 1              |               |
| Chapter 2   | Week 2 to 5         |               |
| Chapter 3   | Week 6 to 11        |               |
| Chapter 4   | Week 12 to 13       |               |
| Lab session | Week 14             |               |

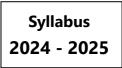
#### WORK PLAN AND SCHEDULE

## **BIBLIOGRAPHY AND RESOURCES**

#### **Basic References**

- Novotny D. W., Lipo T. A., Electric Motor Controls, Oxford University Press, 1996.
- Sang-Hoon Kim, Electric Motor Control, Elsevier, 2017.
- Krause P.C., Wasynczuk O., Sudhoff S. D., Analysis of electric machinery, IEEE Press, 1995.





In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data <u>that you have accepted on your registration form</u> by entering this website and clicking on "download"

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