Syllabus
2022 - 2023

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
Type	Optional
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	
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Teacher	
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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

Contents

1. Introduction to electrical drives
2. Dynamic modeling of mechanical rotating systems
    - Dynamic equation of rotating systems
    - Gears and pulleys
    - Per unit computation in rotating systems
3. V/f control of electrical drives:
    - Introduction
    - Basic principles of electrical machines
    - Constant flux control
    - Operational limits
    - Smooth start-up of an electrical machine
4. Introduction to power electronics
    - AC/CD conversion. Rectifier
    - DC/AC conversion. Inverter
    - Three-phase PWM principles
    - 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).

WORK PLAN AND SCHEDULE

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	

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.

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