Course Unit	Electric Propulsion Systems			Field of study	Energy
Master in	Renewable Energy and Energetic Efficiency			School	School of Technology and Management
Academic Year	2023/2024	Year of study	2	Level	2-2
ECTS credits	6.0				
Type	Semestral	Semester	1	Code	6793-475-2103-00-23

Workload (hours)	162	Contact hours	T	TP	PL	TC	S	E	OT	O
			15	15	30	-	-	-	-	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Américo Vicente Teixeira Leite

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Understand the operation of power electronic converters most used in industrial drives, in electric vehicles and in the main renewable energy sources;
2. Identify solutions, based on the available technologies in the market, to challenges in a real context;
3. Perform the parameterization and the commissioning of commercial systems, in real applications, or by emulating them.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Understand the operation and fundamental equations of electrical machines;
2. Understand the operation and basic control techniques of power converters;
3. Understand the fundamental concepts of the linear control.

Course contents

Applications of power electronic control converters widely used in industrial drives, electric vehicles and the main renewable energy sources. Application of solutions, based on technologies available on the market, to challenges in a real context. Parameterization and commissioning of commercial systems, in real context applications or by emulating it.

Course contents (extended version)

1. Fundamentals of the most used electrical machines;
2. Fundamentals of the main power electronic converters;
3. Fundamentals of control systems;
4. Modelling of electrical machines and power electronic converters;
5. Fundamentals of electrical/electronic system modelling using pq theory;
6. Introduction to scalar and vector control of power electronic converters;
7. Parameterisation and commissioning of some commercial equipment, emulating real context situations;
8. Applications of power control in commercial equipment.

Recommended reading

1. Electric Drives - An Integrative Approach, Ned Mohan, MNPERE, 2003;
2. Advanced Electric Drives - Analysis, Control and Modeling Using Simulink, Ned Mohan, MNPERE, 2001;
3. Power Electronics - Converters, Applications and Design, N. Mohan, T. Undeland, W. Robbins, John Wiley and Sons, 2003;
4. Videos, technical manuscripts and users' guides of commercial equipment.

Teaching and learning methods

Teamwork, guided and monitored by the teacher; Tutorial sessions given by the teacher; Realization of a challenge in real context, or in a laboratory context, emulating a given real context; Regular presentations of the results that are being achieved for discussion and sharing between teams.

Assessment methods

1. Peer assessment - (Regular, Student Worker) (Final)
   - Work Discussion - 50% (Evaluation of the "drinving questions" and presentations.)
   - Experimental Work - 50% (Evaluation of experimental activities and presentations. The teacher assigns the overall average.)
2. Final exam - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100% (Written component - 50%; Experimental component - 50%)

Language of instruction

English

Electronic validation

Américo Vicente Teixeira Leite	José Luís Sousa de Magalhaes Lima	Luís Manuel Frolen Ribeiro	José Carlos Rufino Amaro
13-10-2023	14-10-2023	18-10-2023	31-10-2023