

Course Unit	Control of Electrical Drives		Field of study	Electronics and Instrumentation	
Master in	Industrial Engineering - Electrical Engineering		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	2	Level	2-2
Type	Semestral	Semester	1	ECTS credits	6.0
			Code	9572-355-2101-00-22	
Workload (hours)	162	Contact hours	T 15	TP 15	PL 15
			TC -	S -	E -
			OT 15	O -	

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. Describe the scope of scalar and vector control of electrical drives based on the induction motor and permanent magnet synchronous motor, in real context;
2. Describe the operation and the advantages and disadvantages of SE based on DC and AC (induction and synchronous permanent magnet) motors;
3. Solve real community problems by using frequency converters and other components of electrical drives.
4. Improve some 21st century skills (teamwork, communication, critical thinking, problem-solving, self-directed learning and self-evaluation) in the context of a project proposed by the community.

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

Study AC and DC electrical drives in modern variable speed applications based on DC and AC (induction and synchronous permanent magnet) motors. Industrial electrical drives and electrical propulsion systems: practical applications with commercial equipments - installation and commissioning. Operation with standard frequency converters in real specific applications with skills for general applications.

Course contents (extended version)

1. Study of modern adjustable speed drives (electrical drives):
 - Control schemes of the separately excited DC motor;
 - Scalar and vector control schemes of AC motors;
2. Study of some equipment available on the market:
 - Installation and commissioning;
 - Practical applications with an industrial frequency converter and an electric propulsion system.
3. Realization of projects proposed by a the community:
 - PV water pump systems based on conventional frequency converters and conventional pumps.

Recommended reading

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

Teaching and learning methods

Learning outcomes 1 and 2: Learning based on driving questions, teamwork, discussion and sharing of learnings. Learning outcomes 3 and 4: Project Based Learning with experimental component, teamwork, discussion and sharing of learnings.

Assessment methods

1. Peer assessment - (Regular, Student Worker) (Final)
 - Work Discussion - 50% (Evaluation of the "driving questions" and presentations.)
 - Experimental Work - 50% (Evaluation of the 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

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11-10-2022	16-10-2022	17-10-2022	24-10-2022