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	2020/2021	Year of study	2
Level	2-2	ECTS credits	6.0
Type	Semestral	Semester	1
Code	9572-355-2101-00-20		

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

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tuturial; 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 or 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 comunity.

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 eletrical drives and electrical propulsion systems: practical applications with comercial 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 comunity:
   - PV water pump systems based on conventional frequency converters and conventional pumps.

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. 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. Continuous assessment - (Regular, Student Worker) (Final, Supplementary)
   - Portfolio - 100% (Peer evaluation based on previously defined methodology and assessment criteria: 100%)
2. Final exam - (Regular, Student Worker) (Supplementary, Special)
   - Final Written Exam - 100% (Written component - 40%; Laboratory practical component - 60%)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Américo Vicente Teixeira Leite	José Luís Sousa de Magalhaes Lima	José Alexandre de Carvalho Gonçalves	Paulo Alexandre Vara Alves
19-11-2020	19-11-2020	20-11-2020	23-11-2020