RTU Course "Introduction to Electrical Drives"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	EEP351
Course title	Introduction to Electrical Drives
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Leonīds Ribickis
Academic staff	Anastasija Žiravecka
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	Notion of electric drive, history, calssification. Mechanical characteristics of operation machines and motors. Electro-mechanical characteristics of DC and AC motors. Influence of parameters. Speed control in electric drive. Transient processes, calculation power indices, selection of motors.
Goals and objectives of the course in terms of competences and skills	The aim of the course is to study mechanics of electric drive systems, influence of parameters on the characteristics of electric drive, methods of speed control, methods of transient processes calculations, calculations of power indices of the drives and aproach to the selection of motors for different regimes of electric drive operation. The students are required to describe and analyse systems of electric drives and to calculate and evaluate the influence of transient processes on the operation of electric drive.
Structure and tasks of independent studies	Independent work for the mastering of lectures material. Preparation for test works. Before each practical work the students are expected to prepare its theoretical basics overview; after they complete the final review and defend it.
Recommended literature	1. L. Ribickis, J. Valeinis. Elektriskā piedziņa mehatronikas sistēmās. RTU izdevniecība, 2008. 286 lpp. 2. I. Boldea, S. A. Nasar. Electric Drives. CRC Press, 1999. 411 lpp. 3. N. Mohan. Electric Drives an Integrative Approach. MNPERE Minneapolis, 2001. 424 lpp. 4. Н. Ф. Ильинский. Основы электропривода. МЭИ, 2007. 221 с.
Course prerequisites	Theoretical basics of electrical engineering, Mathematics, Electric machines.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction and history of electrical drive	1	0	0	0
Mechanics of elelctrical drive	1	0	0	0
Mechanical characteristics and parameters of the DC drives	1	0	0	0
Mechanical characteristics and parameters AC drives	1	0	0	0
Mechanical characteristics and parameter influence synchronous of special-type drives	1	0	0	0
Methods of speed adjusting for DC drives	1	0	0	0
Methods of speed adjusting for Three-phase AC drives	1	0	0	0
Methods of speed adjusting for special-type drives	1	0	0	0
Calculation of electro-mechanical transient processes in DC drives	1	0	0	0
Calculation of electro-mechanical transient processes in AC drives	1	0	0	0
Dynamical characteristics and parameter calculation for Robot drives	1	0	0	0
Power indices of electrical drives for robot systems	1	0	0	0
Calculation of energy losses in electrical drive systems	1	0	0	0
Operation regimes of electrical drives and selection of power	1	0	0	0
Control systems of electrical drives	2	0	0	0
1. Practical work. Machanical characteristics of DC motor with independent excitation.	4	0	0	0
2. Practical work. Machanical characteristics of induction motors.	4	0	0	0
3. Practical work. Speed control of asynchronous drive by means of frequency converters.	4	0	0	0
4. Practical work. Speed control of DC motor drive by means of controlled rectifier.	4	0	0	0
Total:	32	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able to describe electrical drive types, parametric influence on mechanical and electromechanical characteristics.	Test in which student must prove his ability to describe different modes of electrical drives and its schemes parameters influence on characteristics of drives. Passed an exam.

To be able calculate mechanical and electromechanical characteristics of DC and AC electrical drives	Test in which student must prove his ability to calculate mechanical and electromechanical characteristics of DC and AC electrical drives. Passed an exam.
To be able calculate transient processes in DC and AC electrical drives	Test in which student must prove his ability to calculate transient processes in DC and AC electrical drives. Passed an exam.
To be able calculate power losses in DC and AC electrical drives	Test in which student must prove his ability to calculate power losses in DC and AC electrical drives. Passed an exam.
To be able choose electrical motors for different operation cases of electrical drives in different technological processes	Test in which student must prove his ability to choose electrical motors for different operation cases of electrical drives in different technological processes. Passed an exam.
To be able describe typical speed control methods of electrical drives.	Test in which student must prove ability to explain speed control method principles of electrical drives. Passed an exam.

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	1.0	1.0	0.0		*	