RTU Course "Industrial Frequency Converters and Inverters"

11103 Industriālās elektronikas un elektrotehnol.katedra

General data

Code	EEP583
Course title	Industrial Frequency Converters and Inverters
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Post-graduate Studies
Course type	Academic
Field of study	Power and Electrical Engineering
Responsible instructor	Leonīds Ribickis
Academic staff	Oskars Krievs
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Possibility of distance learning	Not planned
Abstract	Historical overview of AC drive systems development. Mechanical and electrical characteristics of DC and AC drive systems with different speed control methods. Variable frequency AC drives, typical applications and characteristics. Inverters and frequency converters with pulse width modulation techniques. Scalar and vector-oriented control methods of frequency converters.
Goals and objectives of the course in terms of competences and skills	Provide knowledge on industrial frequency converters. Develop the ability to select and implement AC drive systems with frequency converters according to requirements of the technological process.
Structure and tasks of independent studies	Students have to carry out 4 practical laboratory exercises, as well as independently design and describe a pulse width modulation scheme of a voltage source inverter.
Recommended literature	L.Ribickis, J.Valeinis, Elektriskā piedziņa mehatronikas sistēmās, Rīga, 2008., 286 lpp. I.Raņķis Energoelektronika. Rīga:RTU, 2002, 142 lpp B.K. Bose, Power Electronics and Motor Drives - Advances and Trends, Elsevier 2006., 917p. N.Mohan, T.Undeland, W.Robbins Power Electronics. NY: John Wiley &sons, 2002, 667 p
Course prerequisites	Basic knowledge in power electronics and electric machinery.

Course outline

Theme	Hours
Introduction to the topics to be covered, literature and requirements.	1
Historical overview and classification of AC drive systems.	1
Mechanical and electrical characteristics of DC and AC drive systems with different speed control methods.	2
Variable frequency AC drives, typical applications and characteristics.	2
Classification and applications of AC voltage regulators, inverters and frequency converters.	2
Electromagnetic compatibility issues of modern frequency converters.	2
Common pulse width modulation techniques.	2
Scalar control methods of frequency converters.	2
Direct torque control and vector-oriented control methods of frequency converters.	2
Laboratory work No.1. Investigation of induction motor soft starters.	4
Laboratory work No.2. Investigation of typical functions of industrial frequency converters.	4
Laboratory work No.3. Investigation of regenerative mode operation of induction motors.	4
Laboratory work No.4. Investigation of voltage source converter pulse width modulation techniques.	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to apply induction motor soft starters.	Accomplished and defended lab. work No.1.
Knowledge about typical functions of industrial frequency converters and ability to implement them in practice.	Accomplished and defended lab. work No.2.
Ability to select and apply converters for utilizing the regenerative braking energy of induction drives.	Accomplished and defended lab. work No.3.
Knowledge on industrial inverter pulse width modulation techniques and ability to implement them in practice.	Accomplished and defended lab. work No.4.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	3.0	1.0	0.0	1.0		*	