



RTU Course "Theory of Electronic Converters of Electrical Energy"

11103 Department of Industrial Electronics and Electrical Technologies

General data

Code	EEP584
Course title	Theory of Electronic Converters of Electrical Energy
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	Ivars Raņķis
Academic staff	Inna Buņina Jānis Zaķis
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN
Annotation	General theory of energy conversion. Rectifiers and line-frequency controlled inverters. Autonomous inverters. Current-source, voltage-source and resonance mode inverters. Modulation methods. BUCK and BOOST converters. Frequency converters with high-frequency links. Matrix type converters. Cycloconverters.
Goals and objectives of the course in terms of competences and skills	Provide enhanced learning of operation principles of power converters, processes at its operation as also methods of its calculation and modeling
Structure and tasks of independent studies	10 home tasks on calculation of different converters, 5 laboratory works on modeling of converters in Virtuallab computer space
Recommended literature	I.Raņķis Energoelektronika. Rīga:RTU, 2002, 142 lpp N.Mohan, T.Undeland, W.Robbins Power Electronics. NY: John Wiley &sons, 2002, 667 p I.Raņķis, I.Buņina Energoelektronika. - Rīga:RTU, 2007, 187 lpp.
Course prerequisites	Power electronics

Course outline

Theme	Hours
Evaluation and measurement of electrical signals in power converters	2
Parameters of reactive elements in periodical processes of power converters	2
AC-DC uncontrolled and controlled conversion, influence on AC network	4
Differential equations of processes in power converters and its solutions	4
Reversibility principle of AC-DC controlled rectifiers and its realization, limitations	4
Power factor, harmonic distortions of AC network current	4
Control systems for AC-DC rectifiers, automated its regulation, computer modeling	4
Cycloconverters, AC regulators, its application, influence on network and load, optimization	4
DC pulse regulators, schemes, differential equations, parameters of supply source and load	6
Filters, its optimization, calculation of reactor's electro-magnetic parameters	6
Reversible pulse regulator, control, application, sinus modulation, parameters, modeling	6
Single-phase and 3ph voltage source inverters, sinus modulation of load current, control, modeling	4
Current source inverters CSI, its parameters, schemes, control, connections, modeling	4
Comparison of the VSI and CSI	2
An active rectifiers, applications, functions, control, parameters, modeling	4
Multi-level and matrix converters, realization, control, influence on load and network	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
To be able manage mathematical description of converters operation and calculation of processes	Defended calculation works
To be able manage calculations of operation parameters of different converters in the stationary regime	Defended calculation works
To be able realize computer models of converters and provide computer modeling	Defended calculation works with presentation of computer modeling results for different converters

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.0	2.0	0.0	2.0		*	