RTU Course "Commutated Converters"

11103 Industriālās elektronikas un elektrotehnol.katedra

General data

Code	EEP574
Course title	Commutated Converters
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
Volume of the course: parts and credits points	2 parts, 5.0 Credit Points, 7.5 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Transistor switches, control drivers, thyristors switches, control schemes, forming of transient process, commutation of DC, DC-pulse regulators, current-source and voltage-source inverters, control systems, action with electrical motors, programmable numerical control.
Goals and objectives of the course in terms of competences and skills	The goal is to obtain knowledge and skills in the field of modern semiconductor power electronic converters, to consolidate previous knowledge in power electronics. The tasks are to master modern schemes, to be able to model them, calculate their parameters, to analyse their mutualoperation, to be able to apply them in the manufacture processes and other objects automatization.
Structure and tasks of independent studies	The sudents are to solve 5 (five) home tasks on different topologies of commutated converters. Therefore, at home they are expected to investigate the operation of computer models of the considered schemes in Virtuallab environment. Furthermore, at home it is necessary to obtain skills in working with simulating program PSIM.
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
Course prerequisites	It is necessary to know the calculation methods for electric engineering tasks, principles of electronic objects development, systems of power electronics.

Course outline

Theme	Hours
Operation of transistors in switch regime	4
Operation of thyristors in switch regime	4
BUCK pulse regulators	4
Laboratory work - Investigation of thyristor pulse regulator	4
Laboratory work - Investigation of BUCK pulse regulator in computer program Virtuallab	4
BOOST pulse regulators	4
Laboratory work - Investigation of BOOST pulse regulator in computer program Virtullab	4
Reversive pulse regulator	4
Laboratory work - Investigation of reversive pulse regulator in Virtullab	4
Sine modulation of reversive pulse regulator	2
Autonomous voltage source inverter	4
Pulse-width regulation of autonomous voltage source inverter	2
Laboratory work - Investigation of single-ph. and three-ph. square type voltage inverter in Virtuallab	4
Sine modulated autonomous voltage source inverters	4
Laboratory work - Investigation of sine modulated single-ph. and three-ph. voltage source inverter in Virtullab	4
Power factor correctors	4
Laboratory work - Investigation of power factor corrector in Virtullab	4
Three-phase power factor corrector	4
Laboratory work - investigation of three-phase power factor corrector in Virtullab	4
Application of power factor corrector in technologic processes	4
Defendence of the works, achievement test	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Knowledge of operation regimes of commutated converters semiconductor switches	Ability to explain the operation of thyristor and transistor switches of the commutated semiconductor conveters

Knowledge of commutated converters schemes and their operation	Ability to give correct plots of the schemes and explain their operation
Knowledge of commutated converters computer model development	Ability to develop correct and complete computer model of different schemes and explain the functions and selection of their elements
Knowledge of appication of commutated converters in technologic processes	Ability to explain the obtained effect of commutated conveters application

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	4.5	2.0	0.0	1.0		*	
2.	2.0	3.0	1.0	0.0	1.0		*	