

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Common		
Type and level of studies		Doctoral studies		
The name of the course		Digital Control of Electrical Drives and Power Converters		
Lecturer (for lectures)		Petronijević P. Milutin		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		10	Course status (obligatory/elective)	Elective
Prerequisites	None			
Course objectives	The study of modern control methods for electric drives and converters based on digital signal processors. Study of conventional and advanced control techniques and analysis on the power quality effects on converter and motor operation.			
Course outcomes	Students will be able to independently analyze and design converters control method for applications in drives with DC and AC motors. Competence to solve the actual problems in the field of digital control of power converters and drives.			
Course outline				
Theoretical teaching	Digital signal processors in motor drives. Control circuits for AC and DC drives. Principles, types and classification of pulse width modulation (PWM) techniques. Space vector modulation. Matlab DSP and FPGA Toolbox. Optimization of control methods. Over-voltages and leakage currents. The influence of power disturbances on the power converter and motor operation. Active front-end rectifier and grid converter. Nonsymmetrical supply of power converters. Vector control of drives with induction motors. Digital control of current and speed. Control of permanent magnet motor drives. Estimation of electrical and non-electrical quantities.			
Practical teaching (exercises, OFE, study and research)	The part of teaching includes study and research work in the course area. It involves active studying of the basic scientific sources, computer simulations, and performing of experiment in laboratory with different types of converters and motors.			
Textbooks/references				
	1	S. N. Vukosavic, "Digital Control of Electrical Drives", Springer, 2007.		
	2	Vladan Vucković, Electric drives, University of Belgrade, 1997 (in Serbian)		
	3	M. P. Kazmierkowski, R. Krishnan, F. Blaabjerg, Control in Power Electronics – Selected Problems, Academic Press, 2003		
	4	D. Grahame Holmes, Thomas A. Lipo, "Pulse Width Modulation for Power Converters: Principles and Practice (IEEE Press Series on Power Engineering," IEEE, 2003.		
	5	N. Mitrović, V. Kostić, M. Petronijević, B. Jeftenić: "Implementation of torque and flux control algorithms for induction motor drives", Faculty of electronic Engineering, Niš, Serbia, 2009 (in Serbian).		
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
3	0	0	0	0
Teaching methods	Teaching includes lectures and consultations, as well as individual work with the students during study and research work. Student seminar work and/or scientific papers preparation and presentation.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		
Exercises		Oral exam		50
Colloquia				
Projects	50			