Specification for the book of courses

Study program	Electrical Power Engineering		
Module	Electrical Power Engineering		
Type and level of studies	Master studies		
The name of the course	Electrical Drive Control		
Lecturer (for lectures)	Antić S. Dragan, Mitić B. Darko		
Lecturer/associate (for exercises)	Danković B. Nikola		
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Elective
Prerequisites			
Course objectives	Introduction to the different types of controllers, control of electric drives coordinates, structures of controlled electrical drive, design methods of controlled electrical drives.		
Course outcomes	Knowledge about the types of controllers and their application (current, torque, speed and position control), design (method of poles placement, method of symmetric and technical optimum), frequency control of induction motor, vector control.		
Course outline			
Theoretical teaching	Definition, significance, application and types of regulated electric drives. Dynamical models of DC motors, asynchronous and synchronous motors. Dynamical mdel of elctrical drive. Regulation of electric drive coordinates (torque, current, speed, position). Typical structures of the regulated electrical drive. Control of asynchronous motor. Frequency control of asynchronous motor. FOC principle. Controller design methods for electrical drives. Classical methods. Modern methods. Regulation of electromotor drives using linear regulators and phase compensators. Design of compensators and linear regulators in the frequency domain, as well as using the methods of pole-placement method, zero-pole canceling, technical and symmetric optimum. Design of state feedback control. Design of observer. Digital implementation of control algorithms. Methods of numerical integration. Discrete-time equivalents of linear analog controllers and filters. Design of compensators in a discrete-time domain.		
Practical teaching (exercises, OFE, study and research work)	Modeling of electrical drive based on Hamilton's principle and Lagrange-Euler equations. Time responses of electrical drives. Z-transformation, inverse Z-transformation. Discrete transfer function. Discrete-time model of a system in state space. Stability of discrete-time control systems. Speed and position control of DC motors by using linear (PI, PD and PID) regulators and phase compensators. Choice of controller type and practical tuning of linear controller parameters. Control of asynchronous motor, Control of asynchronous motor with frequency regulator. Vector control of the asynchronous motor.		
Textbooks/references			
1	V. Vučković, “Electrical Drives“, Akademska misao, 2002. (in Serbian)		
2	I. Boldea, S.A. Nasar: “Vector Control of AC Drives“, CRC Press, 1992.		
3	W. Leonhard: “Control of Electrical Drives“, Springer-Verlag, 1996.		
4	M.R. Stojić, DigitalControl Systems, Академска мисао, Београд, 2004. (in Serbian)		
5	Dragan Antić, Darko Mitić, Zoran Jovanović, "Electrical drive control - workbook", Faculty of Electronic Engineering, Niš, 2010. (in Serbian)		

Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	0		
Teaching methods	Lectures; Auditory exercises; Computer exercises; Consultations			

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	20
Exercises		**Oral exam**	20
Colloquia	60		
Projects			