Specification for the book of courses

Study program	Control Systems		
Module	Common		
Type and level of studies	Master studies		
The name of the course	Electrical Drive Control		
Lecturer (for lectures)	Mitić B. Darko, Nikolić S. Saša		
Lecturer/associate (for exercises)	Danković B. Nikola		
Lecturer/associate (for OFE)			
Number of ECTS	5	**Course status (obligatory/elective)**	Obligatory
Prerequisites			
Course objectives	Introduction to different types of controllers, control of electrical drive coordinates, structures of controlled electrical drive, design methods for electrical drive control.		
Course outcomes	Knowledge of controllers' types 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 electrical drives. Mechanics of electrical drives (ED). ED kinematics with examples. Generalized model of motor. The regimes of energy transformation. The coordinate transformations. Electromechanical characteristics of motor. DC motors, asynchronous and synchronous motors, step motors. Dynamic characteristics of electromechanical systems. Regulation of electrical drive coordinates (moment, current, speed, position). System: controlled power converter – electrical drive. Typical structures of controlled electrical drive. Methods for design of electrical drive control. Classical methods. Modern methods. Control of a DC motor using linear controllers. The selection of the type of linear controller and its parameters tuning. Control of asynchronous motor. Frequency control of asynchronous motor speed. The principle of field-oriented vector control. Design of identity observer. Control based on state space coordinates.		
Practical teaching (exercises, OFE, study and research work)	Modeling of ED using Hamilton's principle and Lagrange-Euler equations. Time responses of EDs. Regulation of DC motor position and speed using linear (PI, PD and PID) controllers. The selection of the type of linear controller and practical tuning of its parameters. Control of asynchronous motor. Frequency control of asynchronous motor speed. Asynchronous motor control based on PLC and frequency controllers. Vector control of asynchronous motors. Implementation of ED in the automotive industry. ABS, ESL, ESC, servo systems in modern vehicles.		
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	Dragan Antić, Darko Mitić, Zoran Jovanović, "Electrical drive control - workbook", Faculty of Electronic Engineering, Niš, 2010. (in Serbian)		
5			

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			