

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Control Systems		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		Electrical Drives		
Lecturer (for lectures)		Mitrović N. Nebojša		
Lecturer/associate (for exercises)		Kostić Z. Vojkan		
Lecturer/associate (for OFE)		Banković G. Bojan		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites				
Introducing students to the role and importance of electric drives, types, structures and methods of analysis of steady state and dynamic characteristics in terms of practical application. Introducing students to controlled electrical drives, control structures and methods of analysis.				
Course objectives				
Knowledge of basic principles of operation and structure of electric motors. Ability to examine the complex electromechanical system through the functional connection of the power converter, electrical machine and load. Knowledge of static and dynamic characteristics of the drive. Knowledge of modern control strategies and their application in controlled drives.				
Course outcomes				
Knowledge of basic principles of operation and structure of electric motors. Ability to examine the complex electromechanical system through the functional connection of the power converter, electrical machine and load. Knowledge of static and dynamic characteristics of the drive. Knowledge of modern control strategies and their application in controlled drives.				
Course outline				
Selection of an electric motor by means of equivalent methods. Drive characteristics with DC motors. Mathematical models, steady state characteristics, equivalent scheme. Electrical braking. Methods for analysis of dynamic states. State space method. Transfer function. Combined control: flux and voltage variation. Application of DC converters. Drives with induction motors and synchronous permanent magnet motors. Basic equations. The influence of voltage and frequency variation. Electrical braking. Steady state characteristics. Application of the inverter. Control methods. Coordinate transformations and their applications in induction and synchronous machines. Dynamic equivalent scheme. Identification and estimation of drive parameters. The influence of the actuator on the dynamics of the drive. Voltage and current supply. Scalar and vector control methods. Configuration of regulated drives.				
Theoretical teaching				
In laboratory experiments on real machines is implemented practical training which includes: - Drives with DC motors (analysis of working regime, control methods, braking regime). - Drive with induction and synchronous machines (analysis of working regime, control methods, braking regime). - The application of converters in DC and AC drives				
Practical teaching (exercises, OFE, study and research)				
Textbooks/references				
1	Vladan Vučković, "Electric Drives", Akademska misao, Belgrade, 1997. (In Serbian)			
2	B. Jeftenić, V. Vasić, ..., N. Mitrović, "Electrical Drives - Problem Solver", Akademska misao, Belgrade, 2003. (In Serbian)			
3	Jens Weindauer, Richard Messer, "Electrical drives", Public Publishieng, Erlangen, 2014.			
4	R. Krishnan, "Electric Motor Drives", Virginia Tech, Prantice Hall 2001			
5	P. C., Krause, ..., "Analysis of Electric Machinery and Drive Systems", IEEE Press 2002			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	1	0	0
Teaching methods				
Classes are conducted through lectures and exercises. Lectures use modern teaching methods. Auditory exercises with numerous example, refer students to independently solve problems from engineering practice. Part of the exercise is performed in the laboratory in order to obtain the steady state characteristics of drives.				
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	5	Written exam		30
Exercises	15	Oral exam		20
Colloquia	30			
Projects				