

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		Grounding and Grounding Systems		
Lecturer (for lectures)		Cvetković N. Nenad, Tasić S. Dragan		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS	10	Course status (obligatory/elective)	Elective	
Prerequisites				
Course objectives		The aim of the course is to familiarize students with the characteristics and types of grounding and grounding systems, as well as with the methods for the calculation and analysis of the grounding systems' characteristics.		
Course outcomes		Students will be trained to perform the calculation and analysis of the characteristics of complex grounding systems using different numerical methods in the frame of personally realized or commercial program packages which provide possibility for simulation of grounding systems.		
Course outline				
Theoretical teaching		Stationary and quasi-stationary characteristics of grounding systems. Structure of the electromagnetic field and potential in the vicinity of the grounding in linear, isotropic, homogeneous and non-homogeneous soil structure. Calculation of unknown current distribution, leakage currents and integral characteristics of different grounding systems: grounding impedance, touch and step voltages. Derivation of the system of integral equations for the analysis of EM characteristics of grounding systems. Approximate methods for solving systems of integral equations: method of moments, point-matching method, average potential method, equivalent electrodes' method, the finite element method, the estimation method. Frequency characteristics of grounding systems. Overhead and cable lines as elements of grounding systems.		
Practical teaching (exercises, OFE, study and research)				
Textbooks/references				
1	E. B. Joffe, K-S. Lock, Grounds for Grounding: A Circuit to System Handbook, Wiley-IEEE Press, 2010			
2	E. D. Sunde, Earth Conduction Effects in Transmission Systems, Dover Publications, New York, 1968.			
3	B. B. Бургсдорф, А. И. Якобс, Electrical grounding devices, Энергоатомиздат, Moscow, 1987. [in Russian]			
4	J. Nahman, Neutral Grounding of Distribution Networks, Naučna knjiga, Belgrade, 1980. [in Serbian]			
5	A. P. Sakis Meliopoulos, Power System Grounding and Transients: An Introduction. Series: Electrical and Computer Engineering, CRC Press 1988			
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, consultations, research work.		
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		