

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		Computation of Lightning Overvoltages		
Lecturer (for lectures)		Javor L. Vesna		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		10	Course status (obligatory/elective)	Elective
Prerequisites		Knowledge of transmission line theory and electromagnetic fields theory		
Course objectives		Study of different models of lightning electromagnetic fields and the impact of the finite conductivity of the ground. Determination of lightning overvoltages on lines using modified telegrapher equations.		
Course outcomes		Contributions to the improvement of modeling of lightning overvoltages on lines. Realization of subroutines for implementation in computer programs for simulation of lightning overvoltages.		
Course outline				
Theoretical teaching		Modeling of lightning electromagnetic fields. Modified telegraphers' equations that include the influence of the external electromagnetic field. Taylor-Satterwhite-Harrison model. Agrawal-Price-Gurbaxani model. Rachidi model. Modeling losses and impacts of the finite conductivity of the ground. Baum-Liu-Tesche equations. Overvoltages propagation on overhead lines. Overvoltages propagation on underground lines. Electrodynamic correction of the equations of classical transmission line theory. Solving equations in the time domain by the Finite Difference Method. Solving the equations for the propagation of electromagnetic waves on lines in the frequency domain. Computer programs for simulation of lightning overvoltages in power systems.		
Practical teaching (exercises, OFE, study and research)		Practical lectures are realized using computer programs for the computation of lightning electromagnetic fields and overvoltages in electric power systems.		
Textbooks/references				
1		Rakov V. A., Uman M. A. "Lightning physics and effects", Cambridge Univ. Press, UK, University Press, 2005.		
2		Rachidi F., Tkachenko S., "Electromagnetic Field Interaction with Transmission Lines", WIT Press, 2008.		
3		Javor V., "Lightning electromagnetic field," (in both Serbian and English), Andrejević Endowment, Belgrade, 2011.		
4		Stojković Z., "Computer aided design in power engineering," (in Serbian), Academic Mind, Belgrade, 2002.		
5		Betz H.-D., Schmidt K., Oettlinger W.P, Wirz M. "Lightning: principles, instruments and application", Springer, Dordrecht, NL, 2008.		
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		Lectures, consultations and exercises on the computer.		
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		