

Specification for the book of courses

Study program		Electrical Engineering and Computer Science		
Module		Electrical Power Engineering		
Type and level of studies		Undergraduate Academic Studies		
The name of the course		High Voltage Engineering		
Lecturer (for lectures)		Javor L. Vesna		
Lecturer/associate (for exercises)		Javor L. Vesna		
Lecturer/associate (for OFE)				
Number of ECTS		5	Course status (obligatory/elective)	Elective
Prerequisites	No			
Course objectives	Analysis of overvoltages in electric power systems, electrical discharges in gaseous, liquid and solid insulators. Explanation of the insulation coordination procedures and generating high voltages in order to test the electrical equipment.			
Course outcomes	Students learn about overvoltages in power systems, electrical discharges in insulators, the procedure of insulation coordination and generating high voltages in order to test electrical power equipment.			
Course outline				
Theoretical teaching	The topics in high voltage engineering. Advantages of applying high voltage and possible hazards. Causes and types of overvoltages in electric power systems (EPS). Types of insulation. Methods of charging and discharging in gaseous insulators and types of electrical discharges. Electrons' avalanche. Townsend's theory. Paschen's law. The theory of streamers. Electric breakdown in sulfur-hexafluoride (SF6). Corona and losses on power lines. Dielectric losses. Electric arc. Extinction and modeling of electric arc in SF6 switches. GIS substations. Electrical discharges in liquid and solid insulators and characteristic parameters. Very fast overvoltages in EPS. Lightning overvoltages in EPS. Lightning discharge current according to the IEC 62305 standard. Standard waveforms of overvoltages. Switching overvoltages in EPS. Temporary overvoltages in EPS. Surge arresters (types, characteristic parameters, selection method and installation). Types of high-voltage generators and applications. Direct current, alternating current and impulse high-voltage generators. Preventive and corrective maintenance of electrical power equipment. Partial discharges and measurement methods. Statistical approach to insulation coordination.			
Practical teaching (exercises, OFE, study and research)	Practical lectures are realized through computational exercises which enable a better understanding of theoretical lectures.			
Textbooks/references				
1	Kuffel E., Zaengl W. S., Kuffel J., "High-voltage engineering: fundamentals," Newnes, 2000.			
2	Abdel-Salam M., "High-voltage engineering: theory and practice," Taylor&Francis, CRC Press, 2018.			
3	Ryan H. M., "High-voltage engineering and testing," IET, 2013.			
4	Arora R., Mosch W., "High-voltage and electrical insulation engineering," Wiley, 2011.			
5	Hauschild W., Lemke E., "High-voltage test and measuring techniques," Springer, 2014.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	2	0	0	0
Teaching methods	Lectures, exercises and consultations.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		20
Exercises	10	Oral exam		20
Colloquia	40			
Projects				