Faculty of Electrical Engineering / /

Course:				
Course ID	**Course status**	**Semester**	**ECTS credits**	**Lessons** (Lessons+Exercises+Laboratory)
12779	Mandatory	2	5	3+1+1
Programs				
Prerequisites	There are no prerequisites with other subjects.			
Aims	This course introduces students to the role, types, and characteristics of grounding systems for facilities and elements in the power system. Special attention is given to the design of protective, working, and lightning grounding. Additionally, various methods for measuring characteristic parameters of grounding systems are studied, along with the influence of different factors on the obtained values.			
Learning outcomes	Upon completion of this course, the student will be able to: 1. Understand the significance, location, role, and types of grounding systems. 2. Explain the impact of soil characteristics on grounding systems. 3. Describe the effects of currents on the human body. 4. Implement acquired knowledge in the design and implementation of protective grounding for high-voltage distribution facilities. 5. Explain methods for measuring characteristic parameters of grounding systems. 6. Apply different grounding models in both steady-state and transient regimes. 7. Design and analyze lightning protection and grounding systems. 8. Explain and analyze grounding systems for overhead transmission line poles.			
Lecturer / Teaching assistant	Vladan Radulović, PhD - professor, Miloš Jelovac, MSc - assistant			
Methodology	Lectures, computational exercises			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	Definitions and classifications of grounding systems. Design of grounding systems.			
I week exercises	Selection of grounding type. Defining initial conditions for the calculation of grounding systems			
II week lectures	Soil characteristics.			
II week exercises	Analysis of the effects of soil characteristics on the value of ground specific resistance.			
III week lectures	Impact of currents on the human body.			
III week exercises	Calculation of permissible current values through the human body.			
IV week lectures	Determination of permissible touch and step voltages.			
IV week exercises	Calculation of permissible touch and step voltages according to IEEE standards.			
V week lectures	Design of protective grounding in high voltage substations.			
V week exercises	Design of protective grounding in high voltage substations.			
VI week lectures	Calculation of grounding resistance for a simple geometry grounding system.			
VI week exercises	Calculation of grounding resistance for a simple geometry grounding system.			
VII week lectures	Calculation of the resistance of mesh grounding systems.			
VII week exercises	Calculation of the resistance of mesh grounding systems.			
VIII week lectures	Characteristics of grounding systems in multi-layered soil.			
VIII week exercises	Determination of characteristic parameters of grounding systems in multi-layered soil.			
IX week lectures	Distribution of fault current in the grounding system.			
IX week exercises	Calculation of fault current in the grounding system.			
X week lectures	Determination of the reduction factor in the case of overhead power lines.			
X week exercises	Calculation of the reduction factor for overhead power lines.			
XI week lectures	Determination of the reduction factor in the case of cable lines.			
XI week exercises	Calculation of the reduction factor for cable lines.			
XII week lectures	Exposed ground potential rise.			
XII week exercises	Calculation of exposed potential rise.			

XIII week lectures	Measurement of characteristic parameters of grounding systems.
XIII week exercises	Analysis and interpretation of measurements of characteristic parameters of grounding systems.
XIV week lectures	Power grounding. Grounding of transmission line towers.
XIV week exercises	Determination of characteristic parameters of power grounding and grounding of transmission line towers.
XV week lectures	Transient characteristics of grounding systems.
XV week exercises	Calculation of transient characteristics of grounding systems.
Student workload	

Per week	**Per semester**
5 credits x 40/30=6 hours and 40 minuts 3 sat(a) theoretical classes 1 sat(a) practical classes 1 excercises **1 hour(s) i 40 minuts** of independent work, including consultations	Classes and final exam: **6 hour(s) i 40 minuts x 16 =106 hour(s) i 40 minuts** Necessary preparation before the beginning of the semester (administration, registration, certification): **6 hour(s) i 40 minuts x 2 =13 hour(s) i 20 minuts** Total workload for the subject: **5 x 30=150 hour(s)** Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) **30 hour(s) i 0 minuts** Workload structure: **106 hour(s) i 40 minuts (cources), 13 hour(s) i 20 minuts (preparation), 30 hour(s) i 0 minuts (additional work)**
Student obligations	Students are required to attend classes and complete seminar papers/exams.
Consultations	Every working day.
Literature	1. Prezentacije sa nastave 2. J. Nahman: „Uzemljenje neutralne tačke distributivnih mreža“, Naučna knjiga, Beograd, 1980. 3. A.Muharemović, V. Madžarević, I. Džananović, A. Muharemović, M.Ramić: „Uzemljenje (Projektiranje i mjerenja, Zakonska regulativa)“, Univerzitet u Tuzli, Fakultet elektrotehnike, jun 2011
Examination methods	Seminar paper/colloquium - 50 points. Final exam - 50 points.
Special remarks	No.
Comment	If necessary, classes can be conducted in English.

Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points