

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Electrical Drive Control		
Lecturer (for lectures)		Antić S. Dragan, Mitić B. Darko		
Lecturer/associate (for exercises)		Nikolić S. Saša, Danković B. Nikola		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Introduction to the different types of controllers, control of electric drives coordinates, structures of controlled electrical drive, design methods of controlled electrical drives.			
Course outcomes	Knowledge about the types of controllers and their application (current, torque, speed and position control), design (method of poles placement, method of symmetric and technical optimum), frequency control of induction motor, vector control.			
Course outline				
Theoretical teaching	Definition, significance, application and types of regulated electric drives. Dynamical models of DC motors, asynchronous and synchronous motors. Dynamical model of electrical drive. Regulation of electrical drive coordinates (torque, current, speed, position). Typical structures of the regulated electrical drive. Control of asynchronous motor. Frequency control of asynchronous motor. FOC principle. Controller design methods for electrical drives. Classical methods. Modern methods. Electrical drives control using linear controllers and phase compensators. Design of compensators and linear controllers in the frequency domain, as well as using the methods of pole-placement method, zero-pole canceling, technical and symmetrical optimum. Design of state feedback control. Design of observer. Digital implementation of control algorithms. Methods of numerical integration. Discrete-time equivalents of linear analog controllers and filters. Design of compensators in a discrete-time domain.			
Practical teaching (exercises, OFE, study and research work)	Modeling of electrical drive based on Hamilton's principle and Lagrange-Euler equations. Time responses of electrical drives. Z-transformation, inverse Z-transformation. Discrete transfer function. Discrete-time model of a system in state space. Stability of discrete-time control systems. Speed and position control of DC motors by using linear (PI, PD and PID) controllers and phase compensators. Choice of controller type and practical tuning of linear controller parameters. Control of asynchronous motor, Control of asynchronous motor with frequency regulator. Vector control of the asynchronous motor.			
Textbooks/references				
1	I. Boldea, S.A. Nasar: "Vector Control of AC Drives", CRC Press, 1992.			
2	W. Leonhard: "Control of Electrical Drives", Springer-Verlag, 1996.			
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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; Auditory exercises; Computer exercises; Consultations			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		10	Written exam	20
Exercises			Oral exam	30
Colloquia		40		
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Selected Chapters of High Voltage Substations		
Lecturer (for lectures)		Korunović M. Lidija		
Lecturer/associate (for exercises)		Stojanović S. Miodrag		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Introducing excitation systems, extinction of the field, and excitation control of synchronous generators. to the students. Introduction of the calculation method for time-dependent change of the fault current on the basis of complete expression, time-dependent change of the current during unbalanced faults and the conditions of equipment selection. Additionally, the influence of overhead lines and cables on fault current, as well as the reliability of networks and high voltage substations, are introduced to the students.			
Course outcomes	Students are enabled to perform calculation of fault current on the basis of the complete expression. Additionally, students are enabled to specify the influence of excitation current on fault current. Students know to determine the time-dependent change of fault current during unbalanced faults. They are also enabled to quantify the influence of lines on the reduction of grounding current during the fault. Students know to determine equivalent reliability parameters of networks and high voltage power substations.			
Course outline				
Theoretical teaching	Excitation systems of synchronous generators. Extinction of generator field. Basic definitions regarding systems for excitation control, mathematical models. Complete expression of fault current. The influence of excitation control on fault current. Unbalanced faults and symmetrical components - corresponding equations. Unbalanced short-circuits at generator busbars. Critical conditions for equipment testing - operation condition of the system, fault type, fault location and critical schema of high voltage substation. Overhead lines as the elements of grounding system. Cables as the elements of grounding system. Reliability of networks and high voltage substations. Unrecoverable systems. Recoverable systems. Reliability of electric power networks. Reliability of high voltage substations.			
Practical teaching (exercises, OFE, study and research work)	Exercises include the solution of computational tasks in the areas of theoretical lectures, and the solution of illustrative examples on the computer.			
Textbooks/references				
1	John D. McDonald (Editor), Electric Power Substations Engineering, third edition, CRC Press, Taylor & Francis Group, Boca Raton, 2012.			
2	Terry Krieg and John Finn (Editors), Substations, CIGRE Green Books, Springer Cham, 2018.			
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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	Theoretical teaching includes the classic lectures and the lectures in electronic form. Exercises include the solution of computational tasks on the board and using the projector.			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures			Written exam	25
Exercises			Oral exam	25
Colloquia		50		
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Electromagnetic Compatibility in Power 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	None			
Course objectives	Introducing students to the basic principles and techniques of achieving electromagnetic compatibility (EMC) of devices and systems, testing equipment in EMC laboratories, EMC requirements, standards and directives important for engineers working in the field of electrical power engineering.			
Course outcomes	Students' ability to apply electromagnetic compatibility (EMC) standards, testing procedures in the EMC laboratory, EMC principles and techniques in the field of electrical power engineering.			
Course outline				
Theoretical teaching	Sources of electromagnetic interference and types of coupling. Electromagnetic compatibility (EMC) requirements, standards and directives. EMC laboratory equipment. Faraday cage, reverberation chamber, anechoic and semi-anechoic chamber, TEM and GTEM cell. Absorption and reflection of plane waves and penetration depth. Principles and techniques of design in accordance with EMC requirements. Selection of configurations and components. Non-ideal behavior of passive elements. Separation. Shielding. Grounding. Filtering. Chokes. Improving the quality of electrical energy. Electrostatic discharges (ESD) and methods for solving problems. EMC interference and requirements in electrical power systems.			
Practical teaching (exercises, OFE, study and research work)	Practical exercises and a visit to the EMC laboratory.			
Textbooks/references				
1	Ott H. W., "Electromagnetic compatibility engineering," John Wiley & Sons, 2009.			
2	Williams T., "Electromagnetic compatibility for product designers," Newnes, 2016.			
3	Keiser K., "Electromagnetic compatibility handbook," CRC Press, 2004.			
4	Ametani A., Nagaoka N., Baba Y., Ohno T., "Power System Transients", CRC Press, Teylor&Francis Group, 2013.			
5	Paul C., "Introduction to Electromagnetic Compatibility", Wiley, 2006.			
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				

Specification for the book of courses

Study program		Electrical Power Engineering Electronics and Embedded Systems		
Type and level of studies		Master Academic Studies		
The name of the course		Electronic Control Circuits for Converters		
Lecturer (for lectures)		Mančić D. Dragan, Jovanović D. Igor		
Lecturer/associate (for exercises)		Jovanović D. Igor		
Lecturer/associate (for OFE)				
Number of ECTS		5	Course status (obligatory/elective)	Obligatory / Elective
Prerequisites	None			
Course objectives	Acquiring the fundamental knowledge about the control principles for power converters, methods of their realisation and practical application.			
Course outcomes	Theoretical knowledge on the control of power converters. Mastering the techniques of development, realisation and application of the various control methods for power converters.			
Course outline				
Theoretical teaching	Driver circuits for power electronic components (thyristor, bipolar transistor, MOSFET, IGBT, GTO). Control circuits with phase control. Control circuits for AC voltage controllers. Control circuits for rectifiers. Control circuits for choppers. Control circuits for inverters. Control circuits for cycloconverters. Professional systems in power electronics. Electromagnetic compatibility of power electronic devices.			
Practical teaching (exercises, OFE, study and research work)	Drivers. Control of rectifiers. Control of choppers. Control of inverters. Control of a system for speed regulation of an asynchronous motor.			
Textbooks/references				
	1	N.Mohan, T.M.Undeland, W.P.Robbins, "Power electronics: Converters, Applications, and Design", John Wiley & Sons., New York, 2007.		
	2	R.W.Erickson, D. Maksimovic, "Fundamentals of Power Electronics, Third Edition", Springer, 2020.		
	3	M.H.Rashid, "Power Electronics Handbook", Elsevier Science, 2017.		
	4	L.A.Kumar, A. Kalaiarasi, YUMaheswari, "Power Electronics with MATLAB", Cambridge University Press, Cambridge, 2018.		
	5	Lectures; Auditorial exercises; Laboratory exercises; Computer exercises; Consultations.		
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; Auditorial exercises; Computer exercises; Consultations.			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		10	Written exam	20
Exercises		15	Oral exam	20
Colloquia		20		
Projects		15		

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Lightning Protection		
Lecturer (for lectures)		Javor L. Vesna		
Lecturer/associate (for exercises)		Vučković D. Dragan		
Lecturer/associate (for OFE)				
Number of ECTS		5	Course status (obligatory/elective)	Elective
Prerequisites	None			
Course objectives	Acquiring basic knowledge in the field of lightning protection of elements of electrical power systems and facilities.			
Course outcomes	Acquired theoretical knowledge, as well as the ability to assess the needs and implement lightning protection measures for facilities and elements of electrical power systems.			
Course outline				
Theoretical teaching	Overvoltages in electrical power systems. Lightning discharges (LD) and typical parameters. Standard IEC 62305. Indirect and direct LDs. Modeling of incident wave, back-flash, surge, components and equipment in electrical power systems. Direct and inverse wave. Refraction and reflection coefficients. Petersen's rule. Network diagram method. Bergeron method. Lightning protection of objects. External and internal lightning protection installations. Protection measures and methods of: protected angle, rolling sphere, conductor network and Faraday cage. Surge arresters. Lightning protection of photovoltaic and wind power plants. Computer programs for simulation of lightning discharges and overvoltages propagation.			
Practical teaching (exercises, OFE, study and research work)	Practical teaching is implemented through computer exercises aimed at performing calculations of lightning overvoltages in electrical power systems, applying numerical methods and using computer programs.			
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	Betz H.-D., Schmidt K., Oettlinger W. P., Wirz M. "Lightning: principles, instruments and application," Springer, Dordrecht, NL, 2008.		
	5	Cooray V., "Lightning Protection," IET, 2010.		
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				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Electricity Market and Deregulation		
Lecturer (for lectures)		Stajić P. Zoran		
Lecturer/associate (for exercises)		Radić M. Milan		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Understanding the basic principles of the operation of regulated and deregulated electricity markets, as well as basic economic market models. Introduction to the ancillary services market (balancing market and non-frequency ancillary services market) and the concept of flexibility of power system users.			
Course outcomes	Upon completion of this course, students will be qualified to understand the modern organization and functioning of deregulated electricity markets in Europe, with particular emphasis on the electricity market structure in Serbia. A comprehensive understanding of all market participants and their respective roles will be acquired. Furthermore, students will be prepared to work on electricity exchanges, in control centers, with transmission system operators, aggregators, regulatory agencies, and to develop optimal market solutions for different time horizons.			
Course outline				
Theoretical teaching	Basic structure of a power utility. Causes and motivations behind deregulation. Principles of restructuring and deregulation. Techno-economic conditions of power utility operations and electricity market participants. Regulatory framework and the current state of deregulation in Serbia. Organization and functioning of the electricity market. Bilateral, centralized, balancing, and hybrid markets. Ancillary services market. Flexibility of power system users. Integration of renewable energy sources and the concept of aggregators. Operation and planning of virtual power plants. Electricity transit. Transmission network congestion. Fundamental regulatory models. Mathematical models and methods used for forecasting electricity generation and consumption.			
Practical teaching (exercises, OFE, study and research work)	Electricity market simulation. Demand curve, supply curve, demand elasticity, supply elasticity. PTDFs (Power Transfer Distribution Factors). Network congestion and congestion management. System reliability and ancillary services. Nodal pricing. ATC (Available Transmission Capacity). Simulation of a specific market model and optimization of market functions using appropriate software tools, based on predefined initial market model parameters.			
Textbooks/references				
1	H. L.Willis, L. Philips, Understanding Electric Utilities and Deregulation, Taylor & Francis, 2006.			
2	J. Momoh, L. Mili, Economic Market Design and Planning for Electric Power Systems, IEEE, John Wiley & Sons, 2010.			
3	D. Kirschen, G. Strbac, Fundamentals of Power System Economics, John Wiley and Sons, USA, 2004.			
4	J. Morales, Integrating Renewables in Electricity Markets, Springer 2014.			
5				
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, classroom exercises, seminar work, and consultations.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		20
Exercises		Oral exam		20
Colloquia				
Projects	50			

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Asset Maintenance Management in Energy Distribution Networks		
Lecturer (for lectures)		Stajić P. Zoran		
Lecturer/associate (for exercises)		Radić M. Milan		
Lecturer/associate (for OFE)		Stajić P. Zoran		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Introducing students to the importance of a systematic approach to testing, servicing and maintaining electrical equipment in electrical distribution networks, with the aim of its reliable functioning throughout its entire life cycle, relevant standards in this area, different maintenance strategies and their advantages and disadvantages. Introducing students to the advantages provided by different decision support systems in this area.			
Course outcomes	Students will be introduced to the real situation and technical problems that arise in the maintenance of electrical equipment in electrical distribution networks, as well as the relevant SRPS/EN/IEC standards in this field and the importance of their practical application. They are also will be familiar with the advantages offered by various decision support systems in this field and the methods of their design. They can choose the most efficient and effective maintenance strategy in a specific situation.			
Course outline				
Theoretical teaching	Management of fixed assets in power distribution networks. Definition and concept of maintenance of electrical power equipment. Organization of maintenance work. SRPS/EN/IEC standards in the field of maintenance. Reliability indicators of power equipment elements. Planning the procurement of strategic backup equipment. Information systems for managing fixed assets. Databases on elements of installed power equipment. Practical problems encountered in asset management and ways to overcome them. Modern methods for determining the remaining life of power equipment. Decision support systems, modern technologies, and development trends in the field of asset maintenance. Maintenance in emergencies.			
Practical teaching (exercises, OFE, study and research work)	Practical work with databases on electrical power equipment elements and data from event lists recorded by real SCADA systems. Student research work consists of analyzing data from real SCADA systems, specific events that occurred in certain parts of the distribution network, analyses aimed at assessing the remaining service life of electrical power equipment elements, identifying critical elements, and providing recommendations for maintenance teams for preventive replacement of critical elements to enable smooth operation of the electrical power distribution system, with minimal power supply interruptions.			
Textbooks/references				
1	P. Myrda, Smart Grid Enabled Asset Management, EPRI, Paolo Alto, CA, 2009.			
2	J. M. T. Farinha, Asset Maintenance Engineering Methodologies, CRC Press, Taylor & Francis Group, 2018.			
3	Technical Brochure, Substation Servicing and Supervision Using Mobile Devices and Smart Sensing, WG B3.44, Cigre, 2020.			
4				
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Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods	Teaching and computational examples are performed by lecturing, on a board. Modern teaching methods are used in the lectures. In the auditory exercises, tasks are solved that follow the lectures and instruct students to independently solve problems from engineering practice. Part of the exercises are performed in the computer classroom on computer models of networks.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	5	Written exam		20
Exercises	15	Oral exam		20
Colloquia				
Projects	40			

Specification for the book of courses

Study program			Control Systems / Automatic Control Electrical Power Engineering Electron Devices and Microsystems Electronics and Embedded Systems	
Type and level of studies			Master Academic Studies	
The name of the course			Methods of mathematical optimization	
Lecturer (for lectures)			Marinković D. Slađana, Rančić Z. Lidija	
Lecturer/associate (for exercises)			Rajković P. Jovan	
Lecturer/associate (for OFE)				
Number of ECTS		5	Course status (obligatory/elective)	Obligatory / Elective
Prerequisites	None			
Course objectives	Mastering basic mathematical knowledge from optimization theory and getting acquainted with various optimization methods. Training for forming mathematical models of problems from practice and solving them.			
Course outcomes	Students' capability to apply acquired knowledge in the profession. Ability to recognize optimization problems from practice, define them, form mathematical models, select appropriate methods for their solution and apply methods using software tools.			
Course outline				
Theoretical teaching	Defining a general optimization problem. Theoretical foundations of optimization. Elements of convex analysis. Linear programming. Geometric interpretation of linear programming problems. Duality principle. Simplex method. One-dimensional optimizations. Unconstrained multidimensional optimizations. Search methods. Gradient methods. Constrained multidimensional optimizations. Kuhn-Tucker conditions. Method of Lagrange multipliers. Penalty function methods. Fundamentals of multiobjective optimization.			
Practical teaching (exercises, OFE, study and research work)	Solving tasks that follow the content presented in the theoretical classes. Implementation of optimization algorithms through software packages for symbolic computation. Through the preparation of homework assignments and the analysis of their solutions, the application of mathematical and software tools in the context of optimization is gradually mastered.			
Textbooks/references				
1	E.K.P. Chong, S.H. Zak, An Introduction to Optimization, John Wiley & Sons, 2001.			
2	X.S. Yang, Introduction to Mathematical Optimization, Cambridge International Science Publishing, 2008.			
3	M.J. Kochenderfer, T.A. Wheeler, Algorithms for Optimization, second edition, The MIT Press, 2025.			
4				
5				
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, computational exercises, computer exercises, project.			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures			Written exam	40
Exercises		10	Oral exam	10
Colloquia				
Projects		40		

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Computer Based Industrial Measurement Systems		
Lecturer (for lectures)		Denić B. Dragan, Jovanović R. Jelena		
Lecturer/associate (for exercises)		Miljković S. Goran		
Lecturer/associate (for OFE)		Jocić V. Aleksandar		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	The objective of the course is to provide an introduction to modern industrial systems based on the use of computers. It aims to equip students with the necessary knowledge about connecting conventional and intelligent sensors to computers, implementing virtual instruments and exploring the possibilities of connecting such measurement systems to the Internet.			
Course outcomes	The students will be trained to design and apply electronic circuits for measurement signal processing and for connecting sensors to a computer. Based on their knowledge of the fundamentals of the LabVIEW programming language, they will be trained to use modern interface circuits to connect sensors and implement some basic examples of virtual instruments. They will be capable of defining key characteristics and working with modern computer-based industrial measurement systems.			
Course outline				
Theoretical teaching	Introduction to computer-based measurement and information systems. Single-channel and multi-channel measurement systems. Multiplexing of measurement signals. Sensors and transducers in modern industrial systems. Development trends. Integrated and smart sensors. Intelligent measurement modules. Sensor interfacing and signal processing circuits. Two-wire transmitters. Standard communication interfaces. Measurement devices for use in explosive environments. Grounding and shielding. Distributed measurement and information systems and Internet connectivity. Virtual instrumentation and LabVIEW software. Industrial telemetry systems. Fundamentals of test engineering.			
Practical teaching (exercises, OFE, study and research work)	Introduction to the basics of the LabVIEW programming language. As part of the study research project, simpler virtual instruments will be developed.			
Textbooks/references				
1	Richard Zurawski, "The Industrial Information Technology Handbook", CRC Press, 2005.			
2	David C. Swanson, "Signal Processing for Intelligent Sensor Systems with MATLAB", CRC Press, 2012.			
3	W. Nawrocki, „Measurement systems and sensors“, Artech House, 2005.			
4	Ronald W. Larsen, "LabVIEW for Engineers", Prentice Hall, 2011.			
5	M. Bhuyan, "Intelligent instrumentation, principles and applications", CRC Press, 2011.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods	Lectures are delivered using modern presentation tools or with the use of free course materials in the form of a script provided to all students. Computational and laboratory exercises are conducted in a computer-equipped laboratory.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	5	Written exam		20
Exercises	30	Oral exam		15
Colloquia	30			
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Operation of Electric Power Networks		
Lecturer (for lectures)		Korunović M. Lidija		
Lecturer/associate (for exercises)		Krstić N. Nikola		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Obligatory	
Prerequisites	None			
Course objectives	Introducing the basic terms regarding operation of electric power networks to the students. Consideration of the parameters of daily load curves. Introducing the term of static state estimation and the way of identification of unknown state variables. Introducing the term of security and economic aspects of operation of electric power networks. Consideration of load variations during the year and daily load curve forecasting. Introducing the terms tariffs and tariff systems for calculations of purchase and sale of electricity, and changes in distribution of electric energy.			
Course outcomes	Students are habilitated to perform state estimation of electric power systems and load flow calculation in different abnormal operating regimes of these networks. Additionally, they are habilitated to solve the problems of economic dispatch of electric power systems.			
Course outline				
Theoretical teaching	Daily load curve. Static state estimation. Security of electric power networks. Operating regimes and security. Static security of electrical interconnections. Economic aspects of operation of electric power networks. Economic dispatch. Optimal power flow. Load variations during the year and daily load curve forecasting. Tariffs and tariff systems for calculations of purchase and sale of electricity. The changes in electricity distribution.			
Practical teaching (exercises, OFE, study and research work)	Exercises include solution of computational tasks in the areas of theoretical lectures. The tasks are illustrative examples for the solution of problems that habilitate students to solve engineering problems individually.			
Textbooks/references				
1	A. Gomez-Exposito, A. J. Conejo, C. Canizares, Electric Energy Systems - Analysis and Operation, CRC Press, Taylor & Francis Group, Boca Raton, 2009.			
2	A. J. Conejo, J. Baringo, Power System Operations, Springer Cham, 2018.			
3				
4				
5				
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	Theoretical teaching includes classic lectures and the lectures in electronic form. Exercises include the solution of computational tasks on the board.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		25
Exercises		Oral exam		25
Colloquia	50			
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Control of Power Converters and Drives		
Lecturer (for lectures)		Petronijević P. Milutin		
Lecturer/associate (for exercises)		Filipović R. Filip, Banković G. Bojan		
Lecturer/associate (for OFE)		Filipović R. Filip, Radić M. Milan, Banković G. Bojan		
Number of ECTS		6	Course status (obligatory/elective)	Obligatory
Prerequisites		None		
Course objectives		Acquiring knowledge about control techniques for modern power electronics converters, regulated electromotor drives, calculation of parameters and verification of results on real devices. Synthesis of knowledge and application on specific examples of the use of converters in drives with DC and AC drives.		
Course outcomes		Mastering modern methods of controlling converters and drives with applications in industry. Ability of students to choose control methods depending on the characteristics of the drive and the requirements. Understanding the basic principles of control and analysis of drives with different categories of sensors.		
Course outline				
Theoretical teaching		Modeling of basic components of regulated drives: digital control circuits, sensors, actuators, motors. Control in electromotor drives - principles, methods, hardware. Control and regulation circuits for drives with DC motors. Principles and performance of pulse-width modulation techniques. Space vector modulation. Control of drives with asynchronous motors: scalar, vector and direct torque control. Regulation of permanent magnet motors. Sensorless control of drives. Estimation of speed, torque and flux. Control of converters for renewable energy sources.		
Practical teaching (exercises, OFE, study and research work)		Calculation exercises: solving problems related to lectures and laboratory exercises. Laboratory exercises: Simulation and analysis of drive performance with DC and AC motors. Analysis of vector-controlled drives using Matlab. Experimental verification of drive characteristics with vector and direct torque control. Verification of operating characteristics of drives without speed sensors.		
Textbooks/references				
1		W. Leonhard, Control of electrical drives. 2001. doi: 10.1007/978-3-642-56649-3.		
2		F. Giri, AC Electric Motors Control. 2013. doi: 10.1002/9781118574263.		
3		S. N. Vukosavić, Digital control of electrical drives. 2007. doi: 10.1007/978-0-387-48598-0.		
4		W. Shepherd, L. N. Hulley, D. T. W. Liang, Power Electronics and Motor Control, CRC Press, 2004		
5				
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		Lectures are conducted using supporting materials: slides, animations, and simulations. Computational exercises illustrate the lessons from the lecture through numerical examples. The first part of the laboratory exercises are simulations of drives and converters using Matlab/Simulink. The second part of the exercises is using laboratory models of drives to test and verify the performance of the designed current (torque), speed and position controllers.		
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		5	Written exam	20
Exercises		15	Oral exam	20
Colloquia		40		
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Studies		
The name of the course		Professional Practice		
Lecturer (for lectures)				
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		3	Course status (obligatory/elective)	Obligatory
Prerequisites				
Course objectives	Familiarization with the work process in the company where the professional internship is conducted, its objectives, and organizational units. Getting to know the team and the project the student will join as part of their internship, selected in accordance with the study elective area (module) chosen by the student. Understanding the company's workflow, business processes, awareness of work-related risks, participation in design, documentation preparation, or quality control, in accordance with the workflow and possibilities of the work environment.			
Course outcomes	Enhancing the student's ability to enter the workforce upon graduation. Developing responsibility, a professional approach to work, and communication skills within a team. Supplementing the theoretical knowledge acquired through the study program with practical insights into the issues studied within the chosen field. Using the experience of professionals employed at the institution where the internship takes place to expand practical knowledge and increase student motivation. Gaining a clear understanding of how the knowledge and skills acquired through the study program can be applied in practice.			
Course outline				
Theoretical teaching				
Practical teaching (exercises, OFE, study and research work)	The content of the professional internship is fully aligned with the goals of the internship. The student becomes familiar with the company's structure and its business objectives, aligns their engagement with the chosen field of study, and duly fulfills work obligations in accordance with the duties of employees within the company. The student describes their own involvement during the internship and provides a critical reflection on their experience, as well as the knowledge and skills acquired during the practice.			
Textbooks/references				
1				
2				
3				
4				
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
				6
Teaching methods	The student generally independently chooses a company from the public, private, or state sector in which to complete the professional internship. The internship can also be completed abroad, in which case the student additionally improves their foreign language skills. Upon the student's proposal, the head of the elective area (module) approves the internship at the desired institution, based on which a written referral is issued for the person responsible for supervising the internship at that institution. Upon completion of the internship, and based on the student's report and a confirmation signed and stamped by the responsible person at the company, the student is awarded 3 ECTS credits for the completed professional practice.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		
Exercises	70	Oral exam		30
Colloquia				
Projects				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Power Converters for Renewable Energy Sources		
Lecturer (for lectures)		Petronijević P. Milutin		
Lecturer/associate (for exercises)		Filipović R. Filip		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Acquiring basic knowledge regarding converters for renewable energy sources: selection of switching and passive components, design and implementation of control circuits.			
Course outcomes	Students should master the knowledge necessary for the design of converter sources for renewable energy sources and their integration into distribution networks. Ability to independently use software tools for component calculations and control programming.			
Course outline				
Theoretical teaching	Converter modeling: averaged models, linearization, detailed switching models. Pulse width modulation, space vector modulation. Selection of passive converter components. Measurement and acquisition of currents and voltages. Finding the maximum power point. Cascade regulation structure of primary regulators. Current control loops: control in a synchronous reference system, proportional-resonant controllers. Synchronization with the grid. Voltage and power control. Secondary and tertiary control. Grid and isolated operating modes.			
Practical teaching (exercises, OFE, study and research work)	Computational exercises: converter transfer functions for designing individual regulators; illustrative examples of calculating regulator parameters, passive components. Performance evaluation of control subsystems. Preparing students for solving the practical part of the exam, writing a seminar paper and independently solving the assigned problem.			
Textbooks/references				
1	S. N. Vukosavic, "Grid-side converters design and control: Interfacing Between the AC Grid and Renewable Power Source", Springer, 2018.			
2	M. Kazmierkowski, R. Krishnan, F. Blaabjerg, "Control in Power Electronics: Selected Problems", Academic Press, 2002.			
3	Remus Teodorescu, Marco Liserre, Pedro Rodríguez, "Grid Converters for Photovoltaic and Wind Power Systems," Wiley, 2011.			
4	Suntio, Teuvo, Tuomas Messo, and Joonas Puukko. Power electronic converters: dynamics and control in conventional and renewable energy applications. John Wiley & Sons, 2017.			
5				
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 using presentations, illustrative examples of designing individual converter components. Computational exercises cover in detail examples of calculations and practical implementations. Through seminar papers and independent work of students in teams, individual, concrete problems from the subject area are solved.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		
Exercises		Oral exam		40
Colloquia				
Projects	60			

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Electrical Power Engineering Project Design		
Lecturer (for lectures)		Petronijević P. Milutin, Kostić Z. Vojkan		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)		Filipović R. Filip, Stojanović S. Miodrag		
Number of ECTS		5	Course status (obligatory/elective)	Elective
Prerequisites		None		
Course objectives		Introducing students to the regulations and procedures for preparing project documentation in modern electric power industry. Acquiring knowledge regarding planning, implementation and coordination of individual project phases.		
Course outcomes		Upon successful completion of the course, students should have advanced knowledge regarding the formation of project documentation, be able to independently plan the phases of electrical work on a project, and have basic knowledge of coordination with other stakeholders during project implementation.		
Course outline				
Theoretical teaching		Regulations and technical regulations in the electric power industry. Content of technical documentation according to the class and purpose of the facility and according to the type of project. Projects of electric power installations as part of the technical documentation of the conceptual design, the project for the building permit and the project for the construction. Compliance of project documentation. Submission of documentation for the building permit. Bid formation and cost and time estimation technology. Work standards in the design and construction of power plants. Examples of textual, numerical and graphic project documentation. Planning of implementation phases and resource engagement. Organization of work execution. Construction site safety and personnel protection.		
Practical teaching (exercises, OFE, study and research work)		Practical classes take place throughout all phases of project documentation implementation using examples of electrical installation projects. Formation of project tasks. Formation of general project data. Development of a conceptual solution. Presentation of the solution to the user. Technical description of the project. Definition of general and technical conditions. Equipment calculation. Preparation of graphic documentation - situation, installation plans, single-pole schemes, equipment layout. Material specification, quantity survey and work estimate. Occupational safety annex and unification into a single project.		
Textbooks/references				
1		Schneider Electric, "Electrical Installation Guide, IEC Standards", 2018		
2		ABB, "Electrical Installation Handbook - Protection, control and electrical devices", Sixth edition, Bergamo Italy, 2010		
3		J. Schaufelberger and L. Holm, Management of construction projects: A Constructor's Perspective. 2017.		
4		Weidauer, Jens, and Richard Messer. Electrical Drives: Principles, Planning, Applications, Solutions. John Wiley & Sons, 2014.		
5		S. M. Levy, Project Management in Construction, Seventh Edition. McGraw-Hill Education, 2017.		
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	0	2	0	0
Teaching methods		Theoretical teaching is implemented with the help of presentations, examples of practical solutions and displays of project documentation. As part of the practical part of the exam, students will develop project documentation for an electrical power project according to all the rules of the profession, using modern software tools for calculations, creating graphic documentation and documenting all phases of the project.		
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures		5	Written exam	
Exercises		15	Oral exam	40
Colloquia				
Projects		40		

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Powerline Telecommunications		
Lecturer (for lectures)		Milošević D. Nenad		
Lecturer/associate (for exercises)		Milošević D. Nenad		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	The course aims to provide students with a thorough understanding of telecommunications systems, with a particular focus on power line communication (PLC). Through signal analysis, digitalization, network architecture, and MAC protocols, students will develop the skills necessary to evaluate the performance of PLC networks, apply modulation techniques, and optimize communication processes.			
Course outcomes	Upon completion of this course, students will be able to understand the basic concepts of telecommunications and digital signal processing, including power line communications (PLC). They will master the access technologies and architecture of PLC systems, including their topology, transmission channel characteristics, and the impact of interference on network performance. They will understand and apply modulation techniques, error handling mechanisms, and MAC layer concepts, as well as multiple access strategies and traffic control. In addition, they will be able to analyze and compare different reservation MAC protocols and signaling protocols for PLC systems, evaluating their effectiveness depending on the application.			
Course outline				
Theoretical teaching	Introduction to telecommunications. Signal analysis. Signal digitization procedures. Power line communications (PLC). Access technologies. PLC systems. Specific problems in the performance of PLC networks. Characteristics of PLC networks. Network topology. PLC transmission channel properties. Characterization of interference. Implementation of PLC access systems. PLC system architecture. Modulation techniques for PLC systems. Error handling. PLC MAC layer. MAC layer structure. Multiple access. Traffic control. Determining the performance of reservation MAC protocols. Reservation MAC protocols for PLC. MAC protocols for signaling. Protocol comparison.			
Practical teaching (exercises, OFE, study and research work)	Auditory exercises are performed from all thematic units.			
Textbooks/references				
1	Halid Hrasnica, Abdelfatteh Haidine and Ralf Lehnert: Broadband Powerline Communications Networks-Network Design, John Wiley & Sons Ltd, 2004.			
2	J. Anatory,N. Theethayi :Broadband Power-line Communication Systems, WIT Press, 2010.			
3				
4				
5				
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 are given on the whiteboard. Auditory exercises. Presentation of seminar papers.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		
Exercises		Oral exam		30
Colloquia	20			
Projects	40			

Specification for the book of courses

Study program		Electrical Power Engineering Electronics and Embedded Systems		
Type and level of studies		Master Academic Studies		
The name of the course		Photovoltaic Systems		
Lecturer (for lectures)		Petronijević P. Milutin, Jovanović D. Igor		
Lecturer/associate (for exercises)		Jovanović D. Igor, Filipović R. Filip		
Lecturer/associate (for OFE)		Jovanović D. Igor, Filipović R. Filip		
Number of ECTS		5	Course status (obligatory/elective)	Obligatory / Elective
Prerequisites		None		
Course objectives		Acquiring knowledge about the concepts and elements of photovoltaic energy conversion systems. Familiarization with the specific structure of energy converters for this purpose, with the basic characteristics and functions of measuring, control and protection circuits.		
Course outcomes		Theoretical and practical knowledge of photovoltaic systems and associated control, monitoring and measurement systems; mastery of the techniques of design, implementation and application of photovoltaic on-grid and off-grid systems; assessment of the cost-effectiveness of the system.		
Course outline				
Theoretical teaching		Types and characteristics of solar panels. Estimation of expected energy using a solar calculator and selection of basic system components. Algorithms and devices for tracking the maximum power point. Inverters for photovoltaic systems. Hybrid systems. Principles of system design and accompanying control, protection, measurement and monitoring equipment. Selection of protection and switching devices in photovoltaic systems. Safety functions: detection of network outages, protection against overloading. Selection of lightning protection devices. Techno-economic analysis of the investment. Optimization of hybrid systems. Compliance with the conditions for connection to the distribution network. Content of the project documentation of the photovoltaic system.		
Practical teaching (exercises, OFE, study and research work)		Computational exercises: Analysis of the operation of DC-DC converters of various configurations. Modeling a photovoltaic panel with a maximum power point tracking circuit. Implementation of an algorithm for maximum power point tracking. Determination of DC-DC converter parameters when supplying power to consumers via a photovoltaic module with and without maximum power point tracking. Determination of the number of photovoltaic modules in a series. Calculation of expected electricity production and capacity factor of a photovoltaic system. Selection of conductor cross-section in a DC circuit. Selection of protective devices in a DC circuit. Selection of conductor cross-section in an AC circuit. Selection of protective devices in an AC circuit. Selection of switching devices and devices for protection against atmospheric discharge. Calculation of compliance with prescribed technical conditions by the distribution system operator. Laboratory exercises accompany the lectures and, through the use of specific simulation software, illustrate all the steps in designing a solar power plant: calculation of energy yield, selection of equipment on the DC side, selection of inverters, selection of switching and protective equipment on the AC side, techno-economic analysis of the profitability of a solar power plant.		
Textbooks/references				
1	P. Gevorkian, Large-Scale Solar Power System Design (GreenSource Books) : An engineering guide for Grid-Connected Solar Power Generation: An Engineering Guide for Grid-Connected Solar Power Generation. Mcgraw-hill, 2011.			
2	M. Boxwell, Solar electricity handbook: A Simple Practical Guide to Solar Energy : how to Design and Install Photovoltaic Solar Electric Systems. 2015.			
3	A. Keyhani, "Design of Smart Power Grid Renewable Energy Systems", Wiley, 2019.			
4	Schneider Electric, ""Electrical Installation Guide, IEC Standards"", 2018"			
5	Seip, Günter G., and Werner Sturm, eds. Electrical installations handbook. Erlangen: Publicis MCD Verlag, 2000.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	1	1	0	0
Teaching methods	Lectures are conducted using slides, animations and simulations. Numerical exercises include solving examples to illustrate lectures and solve specific engineering problems. Exercises are conducted in the laboratory - simulations in SYSTEM ADVISOR MODEL software. Student seminar paper.			
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points

Activity during lectures	5	Written exam	20
Exercises	15	Oral exam	20
Colloquia	20		
Projects	20		

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Modelling of Electrical Machines and Drives		
Lecturer (for lectures)		Mitrović N. Nebojša, Stajić P. Zoran		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)		Kostić Z. Vojkan, Banković G. Bojan		
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	The objective of this course is to acquire knowledge about the dynamic modeling of induction and synchronous drives under different power supply conditions, including power converters.			
Course outcomes	Upon completion of this course, the student will be able to: - Demonstrate knowledge and understanding of the circuit modeling approach for electrical machines and basic transformations. - Analyze, design, and implement complex electrical drives with different types of electrical machines. - Evaluate the applicability of electrical drives in various configurations and select the optimal control strategy to meet user requirements.			
Course outline				
Theoretical teaching	General terms and definitions related to the dynamics of electric motor drives. Electric motor drive as a dynamic system. Methods for forming a mathematical model. Simulation methods. Simulation software. Coordinate transformations. Mathematical models of synchronous and induction machines. Transformed model with linear magnetization characteristics. Models with currents and fluxes as state variables. Mixed model. Examples of certain dynamic states: direct start on the network, motor reconnection. Periodic load. Reversal. Soft start of the motor. Converter modeling. Voltage converters for induction and synchronous motor drives. Current PWM converters. Vector control and direct torque control of induction and synchronous motors. Mathematical models. Implementation. Vector control of synchronous motors with permanent magnets.			
Practical teaching (exercises, OFE, study and research work)	Laboratory experiments on real machines provide practical training, which includes: - Drives with induction and synchronous machines (verification of simulation models and analysis of operating regimes). - Application of converters in AC drives.			
Textbooks/references				
1	Paul Krause, Oleg Wasynczuk, Scott Sudhoff, Steven Pekarek, "Analysis of Electric Machinery and Drive Systems", Institute of Electrical and Electronics Engineers, 2013.			
2	Werner Leonhard, "Control of Electrical Drives", Springer, 2001.			
3	Mohammed Fazlur Rahman, Sanjeet K. Dwivedi, "Modeling, Simulation and Control of Electrical Drives", IET, 2019.			
4	R. Krishnan, "Electric Motor Drives", Virginia Tech, Prantice Hall 2001.			
5	Piotr Watch, "Dynamics and Control of Electrical Drives", Springer, 2011.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	0	2	0	0
Teaching methods	Classes are conducted through lectures and practical exercises. Lectures employ modern teaching methods, while the exercises focus on analyzing the development of electrical drive models using MATLAB and Simulink, as well as experimentally verifying the simulation results in the laboratory.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	5	Written exam		20
Exercises		Oral exam		30
Colloquia	15			
Projects	30			

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Selected Chapters of Power Systems Analysis		
Lecturer (for lectures)		Tasić S. Dragan, Klimenta O. Dardan		
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)		Stojanović S. Miodrag		
Number of ECTS		5	Course status (obligatory/elective)	Elective
Prerequisites	None			
Course objectives	Objective of the course is that students learn the modern methods for calculating steady states and also disturbed states in power systems.			
Course outcomes	After finishing this course, students should be able for solving and understanding complex physical steady state and disturbed state problems in power systems with an emphasis on computer applications.			
Course outline				
Theoretical teaching	Power flow calculation for unbalanced load. Fuzzy approach for power flow calculation. Short-circuit current calculations. Fault current distribution. Time flow of short-circuit currents. Distribution of the aperiodic component of short-circuit current throughout the network. Simultaneous faults. Multimachine system models for stability analysis at large disturbances. Numerical methods for transient stability analysis. Voltage stability.			
Practical teaching (exercises, OFE, study and research work)	Laboratory exercises on computers in the field of: power flow, short-circuits and power system stability.			
Textbooks/references				
1	F. Saccomanno, Electric Power Systems: Analysis and Control, Wiley-IEEE Press, 2003.			
2	N. Tleis, Power Systems Modelling and Fault Analysis – Theory and Practice, Elsevier Ltd., 2008.			
3	P.S. Kundur , Power System Stability and Control, McGraw Hill (2nd edition), 2022.			
4	J. C. Das, Power System Analysis: Short-Circuit Load Flow and Harmonics, CRC Press, 2017.			
5	Y. Tang, Voltage Stability Analysis of Power System, Springer, 2021.			
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
2	0	2	0	0
Teaching methods	Lectures, laboratory exercises.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures	10	Written exam		20
Exercises		Oral exam		20
Colloquia				
Projects	50			

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Special Electrical Instalations		
Lecturer (for lectures)		Kostić Z. Vojkan, Petronijević P. Milutin		
Lecturer/associate (for exercises)		Vučković D. Dragan		
Lecturer/associate (for OFE)				
Number of ECTS	5	Course status (obligatory/elective)	Elective	
Prerequisites	None			
Course objectives	Acquisition of basic knowledge of special electrical installations, with particular emphasis on the knowledge necessary for installing and maintaining various devices and equipment used in special electrical installations, as well as for preparing and interpreting technical documentation related to electrical installations in industrial facilities.			
Course outcomes	At the end of the course, students will be capable of independently executing, supervising, verifying, and maintaining special electrical installations. Additionally, students will be able to prepare and interpret technical documentation related to electrical installations in industrial facilities.			
Course outline				
Theoretical teaching	Technical regulations. Technical documentation. Technical directives for the fire protection of facilities. Backup power supply. Emergency power supply. Generators. Batteries. Electrical installations in potentially explosive atmospheres. Electrical installations in industrial facilities. Basic calculations. Conditions and requirements for the execution and use of electrical installations in industrial facilities. Technical protection measures against electric shock; overcurrent; overvoltage; voltage drop and voltage interruption; by disconnection, switching off and functional switching on and off of the electrical circuit; fire protection. Procedures and methods for inspecting and verifying the features, characteristics, and quality of special electrical installations.			
Practical teaching (exercises, OFE, study and research work)	Numerical exercises cover examples of wiring diagrams for various devices and equipment used in special electrical installations, calculation examples that are an integral part of the technical documentation for industrial facilities (calculation of the maximum instantaneous current, selection and verification of power cables, voltage drop calculation, short-circuit current calculations, selection and verification of protective devices for short-circuit current and overcurrent protection, calculation of protection against electric shock in case of indirect contact, earthing system calculation), and the project design of electrical installations for an industrial facility (category G building).			
Textbooks/references				
1	Günter G. Seip; "Electrical Installations Handbook"; Third Edition; John Wiley & Sons; 2000.			
2	Geoffrey Stokes; "Handbook of Electrical Installation Practice"; Fourth Edition; Blackwell Science; 2003.			
3	Steven J. Marrano, Craig DiLouie; "Electrical System Design & Specification Handbook for Industrial Facilities"; Fairmont Press; 1998.			
4				
5				
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 with application of demonstrative aids – slides and details of devices and equipment used in special electrical installations, as well as appropriate examples of technical documentation from engineering practice. Numerical exercises with example problems guide students in independently solving engineering practice problems. An additional form of exercise, the project design of electrical installations for an industrial facility (category G building), students independently complete, with consultations from the lecturer.			
Grade (maximum number of points 100)				
Pre-exam duties	Points	Final exam		Points
Activity during lectures		Written exam		25
Exercises		Oral exam		25
Colloquia	25			
Projects	25			

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Academic Studies		
The name of the course		Selected Topics in High Voltage Engineering		
Lecturer (for lectures)		Javor L. Vesna		
Lecturer/associate (for exercises)		Vučković D. Dragan		
Lecturer/associate (for OFE)				
Number of ECTS		5	Course status (obligatory/elective)	Elective
Prerequisites		None		
Course objectives		Study of the occurrence of high voltages, electrostatic discharges and methods for calculating electrostatic fields. Introducing students to protection measures against unwanted electrostatic discharges and applications of high voltage engineering in various fields.		
Course outcomes		Mastering complex methods for calculating electromagnetic fields based on simple examples from electrostatics. Theoretical knowledge of electrostatic discharge processes and practical applications of high voltage engineering in various fields. Protection measures against unwanted electrostatic discharges.		
Course outline				
Theoretical teaching		High voltage (HV) generation. Methods for solving electrostatic discharge (ESD) problems: Finite Difference Method (FDM), Method of Moments (MoM), Finite Elements Method (FEM). Triboelectric series. Ohm's and hyperbolic theory of electrostatic discharge. Relaxation time. HV generators. HV applications: filters, printers, xerography, painting, varnishing, spraying, materials separation and transport, defect detection, surface treatment, smoke detector, defibrillator, etc. Standard IEC 61000-4-2. ESD in flammable fluids. Types of electrostatic discharges. Protective measures: grounding, humidity control, ionization, antistatic preparation, increasing conductivity, discharge by induction and additional measures of ESD control. Monitoring, control, and ESD testing equipment.		
Practical teaching (exercises, OFE, study and research work)		Practical teaching is implemented through computational exercises that cover theoretical knowledge.		
Textbooks/references				
1		Haddad A., Warne D., "Advances in High Voltage Engineering," IET, 2007.		
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				

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Studies		
The name of the course		Master Thesis – Study and Research Work		
Lecturer (for lectures)				
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		6	Course status (obligatory/elective)	Obligatory
Prerequisites				
Course objectives		Application of fundamental theoretical-methodological, scientific-professional, and professionally-applicative knowledge and methods in solving specific problems. The student studies the problem, its structure and complexity, and based on conducted analyses, draws conclusions about possible ways to solve it. By studying the literature, the student becomes familiar with methods intended for solving similar tasks and with engineering practices used in their resolution.		
Course outcomes		Enabling students to independently apply previously acquired knowledge from various fields they have studied, in order to understand the structure of a given problem and conduct a systematic analysis to draw conclusions about possible directions for its resolution. Through independent use of literature, students expand their knowledge by studying various methods and papers related to similar issues. In this way, students develop the ability to conduct analyses and identify problems within the given subject matter. Through the practical application of acquired knowledge, students develop the ability to understand the role and position of engineers in the chosen field, the need for collaboration with other professions, and the importance of teamwork.		
Course outline				
Theoretical teaching		It is formed individually in accordance with the needs of the specific undergraduate or master's thesis, its complexity, and structure. The student, according to their interests and preferences, selects the area of study or a supervising professor from the list of faculty members in the study program, who then defines a specific task. The student studies professional literature, technical and scientific papers related to similar topics, performs analyses aimed at finding solutions to the given task, or conducts specific experiments in a laboratory. The study work also includes active monitoring of primary findings, organization and execution of experiments, numerical simulations and statistical data processing, as well as the preparation of a seminar paper within the narrower scientific-teaching field to which the topic of the independent research work belongs.		
Practical teaching (exercises, OFE, study and research work)				
Textbooks/references				
1				
2				
3				
4				
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
			12	
Teaching methods				
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		

Specification for the book of courses

Study program		Electrical Power Engineering		
Type and level of studies		Master Studies		
The name of the course		Master Thesis		
Lecturer (for lectures)				
Lecturer/associate (for exercises)				
Lecturer/associate (for OFE)				
Number of ECTS		15	Course status (obligatory/elective)	Obligatory
Prerequisites				
Course objectives		The purpose of preparing the Master's thesis is to unify, confirm, and practically apply the knowledge acquired during the Master's academic studies. The student is given the opportunity to demonstrate the ability to independently carry out a project, which can be practical, research-oriented, or theoretical-methodological in nature. The student also gains experience in presenting their work both in written form and through oral defense.		
Course outcomes		The ability to lead an independent project, the ability to formulate and analyze problems, critically review possible solutions, and survey literature in the given field. Application of acquired engineering and design knowledge and skills to problem-solving, taking into account complexity, costs, reliability, and efficiency of the solution. The ability to write the thesis in the prescribed format. The ability to clearly explain the completed project through an oral defense.		
Course outline				
Theoretical teaching		The Master's thesis represents an independent research, practical, or theoretical-methodological work of the student, aligned with the level of study, in which the student familiarizes themselves with a narrower field through a literature review and adopts the research or design methodology necessary for preparing the thesis. Through the preparation of the thesis, the student applies practical and theoretical knowledge acquired during their studies. The written thesis typically contains an introductory chapter, problem definition, review of the field and existing solutions, proposal and description of the solution, conclusion, and references. The public oral defense of the thesis is organized before a committee of three members, one of whom is the thesis mentor. During the oral defense, the candidate explains the results of their work and then answers questions from the committee members, thereby demonstrating the ability to orally present their project		
Practical teaching (exercises, OFE, study and research work)				
Textbooks/references				
1				
2				
3				
4				
5				
Number of classes of active education per week during semester/trimester/year				
Lectures	Exercises	OFE	Study and research work	Other classes
				2
Teaching methods				
Grade (maximum number of points 100)				
Pre-exam duties		Points	Final exam	Points
Activity during lectures			Written exam	50
Exercises			Oral exam	50
Colloquia				
Projects				