



Subject card

Subject name and code	Power engineering for automation engineers, PG_00059855						
Field of study	Automation, Robotics and Control Systems						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Robert Kowalak					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	45		10.0		45.0	100
Subject objectives	To introduce the student to the structure of the power system, its operation and regulation processes.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W11] knows the hazards arising from devices, installations, systems and technical systems, basic principles of occupational health and safety, taking into account the role of control and security systems in controlling automation and robotics facilities	The student knows the threats in the operation of the power system and how to reduce and eliminate them.			[SW1] Assessment of factual knowledge		
	[K6_W06] knows the structure of computers and microprocessors and the tasks of operating systems, has basic knowledge of the basics of computer software, drivers, microprocessor technology, design of simple algorithms and the operation of information networks	The student knows the structures of basic control and protection systems used in the power industry. The student knows the structures of systems for collecting, visualizing, processing, and archiving data used in the power industry.			[SW1] Assessment of factual knowledge		
	[K6_W07] has basic knowledge related to control and automation systems	The student knows the principles of regulating the operation of the power system. Knows the basic regulation and protection systems in power equipment.			[SW1] Assessment of factual knowledge		
	[K6_K05] can think and act in an entrepreneurial way	The student identifies threats related to the operation of the power system.			[SK5] Assessment of ability to solve problems that arise in practice		
[K6_U04] has the ability to self-educate, among other things, in order to improve professional qualifications	The student calculates current and power flows as well as voltage levels in the power system.			[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment			
Subject contents	Basic knowledge of the structure of the electricity system, the main devices which are elements of the electricity generation, transmission and distribution systems. Equivalent diagrams of transformers and overhead and cable lines. Calculation of current and power flows, power losses, voltage levels in single and double sided networks. Calculation of short-circuit currents in symmetrical short circuits. Generation and regulation of active and reactive power in the power system. Frequency regulation in the power system. Primary and secondary regulation - ARCM systems. Voltage regulation in the power system - ARNE and ARST systems. EAZ systems. System operation control - data acquisition, visualisation, processing and archiving systems.						

Prerequisites and co-requisites	Electrical engineering		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final pass	60.0%	60.0%
	Colloquia during the semester	60.0%	40.0%
Recommended reading	Basic literature	<p>1. Kremens Z., Sobierajski M.: Analiza systemów elektroenergetycznych. WNT Warszawa 1996.</p> <p>2. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych WNT Warszawa 2013.</p> <p>3. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego, Oficyna wydawnicza Politechniki Warszawskiej., Warszawa 2007.</p>	
	Supplementary literature	<p>1. Wasiaś I.: ELEKTROENERGETYKA W ZARYSIE Przesył i rozdział energii elektrycznej, Politechnika Łódzka, Łódź 2010.</p> <p>2. Kahl T.: Sieci elektroenergetyczne, WNT Warszawa 1981.</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>Determine the current distribution and voltage levels in a power network.</p> <p>Discuss the process of voltage and reactive power regulation in a power system.</p> <p>Discuss the process of active power and frequency regulation in a power system.</p>		
Work placement	Not applicable		