



## Subject card

Subject name and code	Protection Automatics in Electric Power Systems, PG_00048255						
Field of study	Electrical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
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	prof. dr hab. inż. Zbigniew Lubośny					
	Teachers	prof. dr hab. inż. Zbigniew Lubośny dr hab. inż. Jacek Klucznik					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	5.0		15.0		50
Subject objectives	Understanding the purpose and operating principles of power protection systems. Ability to select power station equipment elements in the field of power protection and automation.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K7_K04	Is able to react in abnormal and emergency situations, threats to health and life when using automation and robotics elements and systems.			[SK5] Assessment of ability to solve problems that arise in practice		
	K7_U10	For the selection of power system elements, it can calculate short-circuit currents and protection automatics settings.			[SU3] Assessment of ability to use knowledge gained from the subject		
	K7_W05	Knows the theory and practice of the electric power system functioning in transient states.			[SW1] Assessment of factual knowledge		
	K7_K04	Correctly identifies and resolves dilemmas related to the operation of power systems, in particular those related to responsibility for one's own and others' safety.			[SK5] Assessment of ability to solve problems that arise in practice		
K7_W11	Knows the construction of high-voltage power stations and knows the principles of selecting station components.			[SW1] Assessment of factual knowledge			
Subject contents	The power system as a secured object. The role of security automation and its requirements. Transformers for protection. Current transformers and their connection systems. Voltage transformers and their connection systems. Theoretical foundations of protection automation. Analog and digital systems of protection automation. The basic types of protections used: overcurrent, voltage, differential, impedance and angle. Information transfer rules. Medium voltage line protection automatics. Disturbance in the operation of the line. Time delayed overcurrent protection and instantaneous overcurrent protection. Time delayed overcurrent protection with directional block. Differential protection. Protection against earth faults.						
Prerequisites and co-requisites	Power system: structure, principle of operation						
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Test	60.0%			100.0%		

Recommended reading	Basic literature	<p>J. Żydanowicz, M. Namiotkiewicz: Automatyka zabezpieczeniowa w elektroenergetyce. WNT, Warszawa 1983.</p> <p>W. Winkler, A. Wiszniewski: Automatyka zabezpieczeniowa w systemach elektroenergetycznych. WNT, Warszawa 1999.</p> <p>W. Korniluk, K. W. Woliński: Elektroenergetyczna automatyka zabezpieczeniowa. Wydawnictwo Politechniki Białostockiej, Białystok 2008, 2012</p>
	Supplementary literature	<p>B. Synal, W. Rojewski, W. Dzierżanowski: Elektroenergetyczna automatyka zabezpieczeniowa. Oficyna wydawnicza Politechniki Wrocławskiej, Wrocław 2003.</p> <p>R. Kowalik, M. Januszewski, A. Smolarczyk: Cyfrowa elektroenergetyczna automatyka zabezpieczeniowa. Oficyna wydawnicza Politechniki Warszawskiej, Warszawa 2006.</p> <p>J. Lorenc: Admitancyjne zabezpieczenia zwarciowe, Wydawnictwo Politechniki Poznańskiej, Poznań 2007</p>
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>ELEKTROENERGETYCZNA AUTOMATYKA ZABEZPIECZENIOWA [2023/24] - Moodle ID: 28393  <a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=28393">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=28393</a></p>
Example issues/ example questions/ tasks being completed	Select the settings of the delayed and instantaneous overcurrent protection in the HV / MV substation.	
Work placement	Not applicable	