



## Subject card

Subject name and code	Electric Power Systems, PG_00053196						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			3.0		
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. Ryszard Zajczyk					
	Teachers	dr hab. inż. Robert Kowalak prof. dr hab. inż. Ryszard Zajczyk					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	3.0		27.0		75
Subject objectives	To acquaint students with the work of the power system.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_K01	The student learns the principles of operation of the power system			[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice		
	K6_U06	Knowledge of the structure of the KSE and its functioning			[SU2] Assessment of ability to analyse information		
	K6_W09	Knowledge of the processes of generation, transmission and distribution of electricity in the power system			[SW1] Assessment of factual knowledge		
Subject contents	Generating active Power in the Power system. The sources of active power and their profiles. Turbine regulators. Generating and compensation of reactive Power in the Power system. The sources of reactive power and their profiles. Synchronous generators as a regulated source of reactive power. Induction systems of synchronous generators. Regulators of the generator. Capacitors and chokes as a static source of reactive power. Regulators of condensers baterries. The principles of reactive power compensation in transmission and distributive grids. Automatic regulation of tension and frequency in the power system. Frequency regulation in the power system. Primary and secondary regulation. ARCM grids. Frequency regulation of the Power system. Integrated control of ARNE and ARST.						
Prerequisites and co-requisites	Electrical Power Engineering						
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Practical exercise	60.0%			40.0%		
	Midterm colloquium	60.0%			60.0%		

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Zajczyk R.: Regulacja częstotliwości i mocy w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf).</li> <li>2. Zajczyk R.: Regulacja napięcia i mocy biernej w systemie elektroenergetycznym. Wer_2014. Wydanie elektroniczne (pdf).</li> <li>3. Kremens Z., Sobierajski M.: Analiza systemów elektroenergetycznych. WNT Warszawa 1996.</li> <li>4. Kacejko P., Machowski J.: Zwarcia w systemach elektroenergetycznych WNT Warszawa 2013.</li> <li>5. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego, Oficyna wydawnicza Politechniki Warszawskiej, Warszawa 2007.</li> <li>6. Machowski J., Białek J.W., Bumby J.,R.: Power system dynamics and stability. John Wiley &amp; Sons New York 1997.</li> <li>7. Kundur P.: Power System Stability and Control. McGraw-Hill, Inc. 1994.</li> <li>8. Anderson P.M., Fouad A.A.: Power system control and stability IEEE Press Power Engineering Series and John Wiley &amp; Sons, New York 2003.</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Hellmann W., Szczerba Z.: Regulacja częstotliwości i napięcia w systemie elektroenergetycznym. Warszawa: WNT, 1978.</li> <li>2. Machowski J., Bernas S.: Stany nieustalone i stabilność systemu elektroenergetycznego. Warszawa WNT 1989.</li> <li>3. Saccomanno F.: Electric Power Systems Analysis and Control IEEE Press Series on Power Engineering, New York, 2003</li> <li>4. Wood A.J., Wollenberg B.F.: Power generation, operation &amp; control John Wiley &amp; Sons, New York 1984</li> <li>5. Weedy B.M.: Electric power systems John Wiley &amp; Sons, Chichester 1987</li> </ol>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>Discuss the process of adjusting the frequency and active power in the power system.</p> <p>Discuss the process of voltage and reactive power in the power system.</p>	
Work placement	Not applicable	