



## Subject card

Subject name and code	Power systems operation and control, PG_00064741						
Field of study	Power Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2025/2026		
Education level	second-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	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Electrical Power Engineering -> Faculty of Electrical and Control Engineering -> Wydziały Politechniki Gdańskiej						
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	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		10.0		45.0	100
Subject objectives	Familiarizing students with the work of the power system in established and unknown states. Understanding the principles of implementing voltage and reactive power regulation as well as active power regulation and frequency.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U01] utilizes acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of energy systems, machines and devices, transmission grids and internal installations		has knowledge of the principles of work of basic devices and systems in the power system		[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	[K7_W03] demonstrates structured and theory supported knowledge encompassing key issues in the field of Power Engineering, enabling design of energy systems, machines and devices, transmission grids and internal installations		has knowledge of work with a system of operating states of the power system		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving		has the ability to think critically and aware of the use of experts		[SK2] Assessment of progress of work		
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 batteries. 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			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	100.0%
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. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego, Oficyna wydawnicza Politechniki Warszawskiej., Warszawa 2007.</li><li>4. Machowski J, Białek J.W., Bumby J.,R.: Power system dynamics and stability. John Wiley &amp; Sons New York1997.</li><li>5. Kundur P.: Power System Stability and Control. McGraw-Hill, Inc. 1994.</li><li>6. 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. Saccommanno 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		
Example issues/ example questions/ tasks being completed	Discuss the process of adjusting the frequency and active power in the power system.		
	Discuss the process of voltage and reactive power in the power system.		
Work placement	Not applicable		

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