



Subject card

Subject name and code	Application of power electronic systems in power system , PG_00057621						
Field of study	Electrical Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2025/2026		
Education level	second-cycle studies		Subject group				
Mode of study	Part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Power Electronics and Electrical Machines -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Robert Małkowski				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	10.0	0.0	0.0	20
	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	20		10.0		45.0	75
Subject objectives	Describing FACTS systems as control objects in the power system.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U02] is able to prepare and deliver a short oral presentation on a selected technical topic		does not apply to the content of classes		[SU1] Assessment of task fulfilment		
	[K7_W02] has an in-depth and structured knowledge of electrical measurements electrical measurements, the methods and equipment used for electrical measurements of non-electrical quantities, he/she knows the principles of testing operation tests of electrical equipment, has a structured knowledge of electricity quality issues		does not apply to the content of classes		[SW1] Assessment of factual knowledge		
	[K7_U03] is able to obtain information from literature, databases and other sources, also in English, draw conclusions, formulate and fully justify opinions. substantiate opinions; is able to identify directions for further learning and implement the process of self-education		Ability to prepare a synthetic study based on literature sources, including in English.		[SU2] Assessment of ability to analyse information		
	[K7_W06] has in-depth knowledge of industrial electronics, microprocessor control systems, programmable logic systems and printed circuit design and prototyping computer-aided prototyping		Can select and parameterize the appropriate power electronic device to limit the level of modeled interference.		[SW3] Assessment of knowledge contained in written work and projects		

Subject contents	<p>Course content – lecture</p> <p>LECTURE: Selected problems in the control of the power system operation. The range of power electronics application in the power system. Power electronic switches and their properties. selected of FACTS (Flexible AC Transmission Systems) used in power systems. Influence of FACTS systems on the power system - voltage and P, Q power flow regulation. Construction and principle of operation - shunt systems, series systems and series-shunt systems. Structures and principle of operation. Impact on power systems. Range of application.</p> <p>LABORATORY: Modeling the work of selected FACTS systems. Testing the operation of FACTS systems with the use of physical models (UPFC, STATCOM, SVC).</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Laboratories</td><td>50.0%</td><td>40.0%</td></tr><tr><td>Lectures</td><td>50.0%</td><td>60.0%</td></tr></table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratories	50.0%	40.0%	Lectures	50.0%	60.0%		
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Laboratories	50.0%	40.0%										
Lectures	50.0%	60.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none">1. Acha E., Fuente-Esquivel C. R., Ambriz-Perez H., Angeles-Comacho C.: FACTS Modelling and Simulaton In Power Networks, John Wiley & Sons, LTD, 2004.2. Aririllaga J., Smith B.: AC-DC Power System Analysis, London1998, The Institution of Electrical Engineers.3. Machowski J.: Regulacja i stabilność systemu elektroenergetycznego, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2007.4. Sood V. K.: HVDC and FACTS Controllers. Applications of Static Converters in Power Systems. Kluwer Academic Publishers Boston, 2004.5. Machowski, J., Lubośny, Z., Bialek, J., & Bumby, J. (2020). Power System Dynamics. Stability and Control. 3rd edition. 1-888..										
	Supplementary literature	IEEE, Elsevier, CIGRE papers.										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none">1. Types of modern power electronic systems supporting the operation of the power system and their classification.2. List and describe the types of shunt power compensators3. UPFC circuits - application, method of connection to the system, advantages and disadvantages.4. Hybrid FACTS systems - characteristics, application.											
Practical activites within the subject	Not applicable											

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