



## Subject card

Subject name and code	Integration of wind farms with the power grid, PG_00060402						
Field of study	Ocean Engineering						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	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		dr hab. inż. Jacek Klucznik				
	Teachers		dr hab. inż. Jacek Klucznik				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	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		0.0		0.0	30
Subject objectives	Knowledge about the transmission of electrical energy from the wind farm to the power system. Learning about the basic equipment of a wind farm power output system. Calculation of the of voltage levels, power losses, short-circuit currents. Using computer software in wind farm analysis.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_K82] is equipped to participate actively in lectures, seminars and laboratory classes conducted in foreign language	Knowledge of specialist terminology. Ability to understand lectures. Ability to understand professional literature.			[SK2] Assessment of progress of work		
	[K7_U82] is able to proficiently obtain and process information related to field of study and academic environment in foreign language at B2+ level of the Common European Framework of Reference for Languages (CEFR)	Knowledge of professional vocabulary. Ability to understand specialist texts. Ability to use online sources in English. Ability to prepare/present a report in English			[SU5] Assessment of ability to present the results of task		
	[K7_W06] has an organized, widened knowledge on engineering methods and design tools allowing the conducting of advanced projects within the construction and operation of ocean technology objects and systems	The student explains the equivalent diagrams and parameters of a cable line, transformer, shunt reactor.			[SW1] Assessment of factual knowledge		
	[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	The student calculates power losses and voltage levels in a wind farm network. The student analyses the reactive power management of a wind farm.			[SW3] Assessment of knowledge contained in written work and projects		
Subject contents	Power system structure. Devices for generation and transmission of electric energy. Generation of active and reactive power in power system. Wind turbines PQ characteristics. Offshore and onshore electrical network of wind farms - structure, parameters and purposes. AC and DC transmission systems. Equivalent circuits for power system elements. Power flow calculation in radial and interconnected networks. Energy losses calculations. Reactive power management. Voltage control. Requirements and legal documents concerning wind farm integration with the power system						
Prerequisites and co-requisites	Electric circuits theory						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Individual work, assessment of the prepared report	60.0%	70.0%
	Knowledge test in the subject	60.0%	30.0%
Recommended reading	Basic literature	Turan Gonen, Electrical Power Transmission System Engineering: Analysis and Design, Third Edition, CRC Press, 2014  J. D. Glover, M. S. Sarma , T.J. Overbye, Power System Analysis	
	Supplementary literature	Selected papers - Przegląd Elektrotechniczny, IEEE Xplore	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Wind farm cable selection  Calculation of power and energy losses in a wind farm  Selection of reactive power compensation devices for wind farms		
Work placement	Not applicable		