GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00062827		
Field of study	Power Engineering, Power Engineering, Power 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	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 inż. Marcin Jaskólski	
	Teachers	dr inż. Marcin Jaskólski prof. dr hab. inż. Zbigniew Lubośny	

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	The aim of the course is to familiarize students with the concept of a zero-emission energy system, methods of its planning and modeling, and selected power technologies, in particular wind farms.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W02] has extended and deepened knowledge of physics, chemistry, thermodynamics, fluid mechanics, material science, necessary to understand and describe basic thermal and flow phenomena occurring in and around power equipment and systems, transmission networks and internal installations	Has extended and deepened knowledge of complex energy systems	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
[K7_U06] is able to apply basic and advanced knowledge of power equipment and transmission network and internal installations to the preliminary design of a modern power plant or part thereof	Can use basic and advanced knowledge of energy devices in wind farms and biogas plants	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_U05] is able to integrate technical and economic analysis of the use of various energy technologies, including technologies using renewable energy sources and conventional and nuclear energy	Can integrate issues of technical and economic analysis into the process of planning the development of zero-emission energy systems	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K7_W04] has advanced, ordered and theoretically grounded knowledge in the field of operation and selection of electrical machines, power transmission systems and power electronic devices, classical and forward-looking power technologies and their receivers, knows the principles of selection of power equipment and installations and their receivers and their operation	Has advanced, structured and theoretically based knowledge of wind farms and biogas plants	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge

Subject contents

PART I. Energy planning - need and essence. Energy systems modeling - methods and tools. Characteristics of selected models of energy systems. Examples of system analyzes in the field of development planning in the energy sector. Complex energy stytems - low- and zero-emission.

PART II. Wind energy - development, resources. Calculation of energy resources in a given location for a given type of wind farm. Wind farm structures. Wind farms. Methods of connection to the power system. Power plant and wind farm control. The impact of wind farms on the power system.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Presentation of a topic	60.0%	50.0%
Colloquium	60.0%	50.0%

Recommended reading

Basic literature

1. Jaskólski, M. (2023). *Modelowanie systemów energetycznych wytwarzania energii elektrycznej i ciepła do celów planowania rozwoju - wybrane zagadnienia*. 1-138.

2. Lubośny, Z., (2012). Farmy wiatrowe w systemie elektroenergetycznym, PWN

	Supplementary literature	Lubośny, Zbigniew. Wind Turbine Operation in Electric Power Systems: Advanced Modeling. (2003). Jaskólski, M. (2016). Modelling long-term technological transition of Polish power system using MARKAL: Emission trade impact. *ENERGY POLICY*, *97*, 365-377. https://doi.org/10.1016/j.enpol.2016.07.017 Jaskólski, M., & Bućko, P. (2021). Modelling LongTerm Transition from CoalReliant to LowEmission Power Grid and District Heating Systems in Poland. *ENERGIES*, *14*, 8389. https://doi.org/10.3390/en14248389
	eResources addresses	Adresy na platformie eNauczanie: Zeroemisyjne systemy energetyczne [2023/24] - Moodle ID: 35853 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35853
Example issues/ example questions/ tasks being completed	1. Why do we use energy systems expansion planning? 2. Describe the division of energy system modeling tools. 3. Characteristics of the selected tool for modeling the expansion of energy systems. 4. State energy policy supported by modeling of systems expansion. 5. CCS/CCUS systems. 6. How do we connect wind farms to the power system? 7. Methods of controlling a power plant and a wind farm. 8. What impact do wind farms have on the power system?	
Work placement	Not applicable	