



Subject card

Subject name and code	Hydropower and wind power plants, PG_00064054						
Field of study	Technical Physics						
Date of commencement of studies	October 2025		Academic year of realisation of subject			2027/2028	
Education level	first-cycle studies		Subject group			Optional subject group 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 Classes are conducted in Polish and English; in the case of foreign students, classes are conducted exclusively in English.	
Semester of study	5		ECTS credits			2.0	
Learning profile	general academic profile		Assessment form			assessment	
Conducting unit	Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Piotr Grygiel				
	Teachers						
Lesson types	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		5.0		15.0	50
Subject objectives	Learning about the structure and operating principles of hydroelectric and wind power plants, as well as their impact on the environment. Learning about the principles of estimating water and wind energy resources.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U01] learns independently, obtains information from literature, databases and other properly selected sources		They are able to independently acquire knowledge on various aspects of hydro and wind energy, independently obtaining information from literature, databases and industry sources.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools	
	[K6_W01] understands the importance of physics and its applications in connection to civilization		Understands the civilisational significance of various fields of physics and technology applicable in hydro and wind energy.			[SW1] Assessment of factual knowledge	

Subject contents	Course content – lecture 1. History of hydroelectric power plants. 2. Types of hydroelectric power plants. 3. Functions of hydroelectric power plants in the power system. 4. Hydroelectric power plants in Poland and worldwide and their share in energy production. 5. Construction of hydroelectric power plants. 6. Types of turbines used in hydroelectric power plants. 7. Energy conversion in a hydroelectric power plant: water flow energy, energy transferred to the turbine, mechanical energy converted into electrical energy. 8. Operational problems of hydroelectric power plants: cooperation of generators with the power grid, distributed generation and energy storage. 9. Available electrical quantities and their measurement. 10. The impact of hydroelectric power plants on the environment. 11. History of wind power plants. 12. Characteristics and construction of wind power plants. 13. Wind power plants in Poland and worldwide. 14. Wind as a source of energy: wind characteristics, wind speed profiles, changes in wind speed over time and their statistical representation, wind energy and power. 15. Wind energy resources in a given location, forecasting the power of a wind farm. 16. One-dimensional model of wind turbines. 17. Types of wind turbines. 18. Example of wind turbine construction. 19. Power characteristics of wind turbines. 20. Wind turbine power control, airflow separation, rotor blade angle adjustment. 21. Cooperation between wind power plants and the energy system. 22. Wind farms and their impact on the energy system, its stability and energy quality. 23. Economic aspects of wind power plant operation. 24. Impact of wind power plants on the environment.		
Prerequisites and co-requisites	Basic, academic physics course in mechanics, thermodynamics, electricity and magnetism.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Oral assessment of a term paper on a topic chosen independently and agreed in advance with the course lecturer.	51.0%	100.0%
Recommended reading	Basic literature	1. H.J. Wagner and J. Mathur, Introduction to Hydro Energy Systems, Springer-Verlag GmbH, 2011	
	Supplementary literature	1. J. Raabe J, Hydro Power, VDI-Verlag GmbH, Duesseldorf, 1985. 2. J. F. Manwell, J. G Mc Gowan, A. L. Rogers, Wind Energy Explained. Theory, Design and Application. John Wiley & Sons, Ltd, 2009	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Describe the stages of energy conversion in a hydropower plant. 2. Describe the types of turbines used in hydropower plants. 3. Describe the problems of cooperation of the electric generator with the power grid. 4. Characterize wind as an energy source. 5. Present a one-dimensional model of wind turbines. 6. Discuss the cooperation of a wind farm with the energy system.		
Practical activities within the subject	Not applicable		

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