



## Subject card

Subject name and code	, PG_00037314						
Field of study	Technical Physics						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2022/2023		
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		
Semester of study	6		ECTS credits		1.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Piotr Grygiel				
	Teachers		dr inż. Piotr Grygiel				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		8.0	25
Subject objectives	Learning construction and characteristics of wind turbine including types of turbines, generators, supply and control systems. Issues of wind energy resources calculation.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U01		Can learn independently, obtain information from literature, databases and other properly selected sources regarding the operation of wind energy systems.		[SU4] Assessment of ability to use methods and tools		
	K6_W01		Understands the civilization importance of physics and its applications in the context of the functioning of wind energy systems.		[SW1] Assessment of factual knowledge		
	K6_W02		W02] Has structured knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism to the extent necessary to understand and describe the functioning of wind energy systems. [SW1] Assessment of factual knowledge		[SW1] Assessment of factual knowledge		
Subject contents	<ol style="list-style-type: none"><li>1. Characteristics and construction of wind farms.</li><li>2. Wind farms in Poland and in the world.</li><li>3. Wind as an energy source: wind characteristics, wind speed profiles, changes in wind speed over time and their statistical representation, wind energy and power.</li><li>4. Wind energy resources in a given location, wind farm power forecasting.</li><li>5. One-dimensional model of wind turbines.</li><li>6. Types of wind turbines.</li><li>7. An exemplary construction of a wind turbine.</li><li>8. Power characteristics of wind turbines.</li><li>9. Wind turbine power control, breaking the air stream, adjusting the angle of attack of the rotor blades.</li><li>10. Co-operation of a wind farm with an energy system.</li><li>11. Wind farms and their impact on the energy system, its stability and energy quality.</li><li>12. Economic aspects of wind farm operation.</li><li>13. The impact of wind farms on the environment.</li></ol>						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Oral credit for a written paper on a selected topic	100.0%	100.0%
Recommended reading	Basic literature	1. E. Hau Eric, Windturbines, Fundamentals, Technologies, Application and Economics. Springer 2000	
	Supplementary literature	1. J. F. Manwell, J. G Mc Gowan, A. L. Rogers, Wind Energy Explained. Theory, Design and Application. John Wiley & Sons, Ltd, 2009	
	eResources addresses	Podstawowe <a href="https://enauczanie.pg.edu.pl/moodle/user/index.php?id=30491">https://enauczanie.pg.edu.pl/moodle/user/index.php?id=30491</a> - Course on e-learning platform Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	1. Characterize wind as an energy source. 2. Present a one-dimensional model of wind turbines. 3. Discuss the cooperation of a wind farm with the energy system.		
Work placement	Not applicable		