



Subject card

Subject name and code	Hydro and Wind Power Plants, PG_00033730						
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Piotr Doerffer					
	Teachers	prof. dr hab. inż. Piotr Doerffer dr inż. Joanna Grzelak dr inż. Krzysztof Doerffer					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	0.0	45
	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	45		5.0		50.0	100
Subject objectives	<ol style="list-style-type: none">1) Flow modeling, incompressible, viscous in one dimensional approach.2) Formation of boundary layer and generation of losses.3) Large wind turbines on-land and off-shore.4) Micro-wind energy, different types of wind turbines and their characteristics, innovative concepts.5) Construction of traditional water turbines6) Innovative concepts of waves energy harvesting.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_W06	1) Knowledge of physical laws adequate for wind and water power plans. 2) Knowledge of power plants types and understanding of positive and negative aspects of technical solution 3) Environmental aspects of wind and water energy systems application.	[SW1] Assessment of factual knowledge
	K6_U04	Ability of critical analysis of wind and water turbines offers for prosumer market. Ability to design devices extraction power from wind and water. Ability to analyse economic aspects of wind and water energy extraction.	[SU3] Assessment of ability to use knowledge gained from the subject
Subject contents	<p>Characteristics of the medium - water and air, assumption and consequences of medium continuity</p> <p>Basic equations of state, implementation for stationary and incompressible flows</p> <p>Real flows, special flow phenomena</p> <p>Boundary layers</p> <p>Wind energy</p> <p>Horizontal axis wind turbine rotors</p> <p>Darrieus rotors</p> <p>Savonius rotors</p> <p>Water energy</p> <p>Water turbines</p>		
Prerequisites and co-requisites	Basic knowledge of fluid mechanics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	egzam	50.0%	50.0%
	test, 3x	50.0%	50.0%
Recommended reading	Basic literature	<p>Fluid Mechanincs (in Polish) Mechanika Płynów; Krystyna Jeżowiecka-Kabsch, Henryk Szewczyk; Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2001, ISBN 83-7085-597-0</p> <p>Fluid Mechanincs (in Polish); Mechanika Płynów; Romulad Puzyrewski, Wydawnictwo Naukowe PWN, 1987</p> <p>Introduction to Hydro Energy Systems, Kötter Manuela, Mathur Jyotirmay, ISBN 978-3-642-20709-9</p> <p>Wind Turbines; Erich Hau, ISBN 978-3-540-29284-5,</p>	

	Supplementary literature	Fluid Mechanics (in Polish); Mechanika Płynów; Włodzimierz Prosnak, Wydawnictwo PWN, 1970 Water Turbines (in Polish); Turbiny Wodne; Władysław Krzyżanowski, Wydawnictwo Naukowo Techniczne 1971
	eResources addresses	Adresy na platformie eNauczanie: Siłownie wodne i wiatrowe, W/L, Energetyka sem. 5 zima 22/23 PG_00033730 - Moodle ID: 23044 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=23044
Example issues/ example questions/ tasks being completed	<p>For which flows the trace of flow article coincides with streamline?</p> <p>Give the components of disposable height</p> <p>Explain the characteristic features of Savonius rotor</p> <p>Explain the characteristic features of Darrieus rotor</p> <p>Which water turbine is adequate for extreme large dips.</p>	
Work placement	Not applicable	