



Subject card

Subject name and code	Water and Wind power stations (WOiO), PG_00042089						
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		English		
Semester of study	6		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Joanna Grzelak				
	Teachers		dr inż. Joanna Grzelak				
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	15.0	30
	E-learning hours included: 0.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=21640#section-19						
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		65.0	100
Subject objectives	<p>1) Familiarization with flow models, in particular incompressible, viscous flows in one-dimensional terms.</p> <p>2) Formation of a boundary layer and generation of energy losses.</p> <p>3) Familiarization with the construction of large onshore and offshore wind turbines.</p> <p>4) Micro wind energy, construction of different types of windmills and their characteristics, innovative solutions</p> <p>5) Construction of traditional water turbines</p> <p>6) Construction and operation of innovative wave energy harvesting systems.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_U01	The student distinguishes between types of facilities and pieces of equipment in hydroelectric and wind power plants, evaluate their suitability for specific conditions both inland and offshore.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
	K6_W06	1) Knowledge of physical laws applicable to wind and hydroelectric power plants 2) Knowledge of types of power plants and principles of their operation, understanding of positive and negative aspects of technical solutions 3) Environmental aspects of wind and hydroelectric power applications.	[SW1] Assessment of factual knowledge
	K6_U05	Identifies and obtains available information necessary to determine the type of facility and equipment for the most beneficial energy extraction.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
Subject contents	<p>Characteristics of fluid - water, air; assumptions and consequences of a continuous medium. Basic equations of behavior and their application to the stationary and incompressible description. Real flow, special flow phenomena. Boundary layer. Wind energy. Horizontal axis windmills. Darrieus rotors.vSavonius rotors. Hydropower generation. Hydro turbines.</p>		
Prerequisites and co-requisites	Basic Fluid Mechanics Course		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	seminar - evaluation from the presentation	51.0%	50.0%
	lecture - assessment test	51.0%	50.0%
Recommended reading	Basic literature	<p>Puzyrewski, R., Fluid mechanics, Scientific Publishing House PWN, 1987;</p> <p>Krzyżanowski, W., Water turbines. Construction and principles of regulation, Scientific and Technical Publishing Houses. Warsaw, 1971;</p> <p>Douglas, J., Gasiorek, J., et al., Fluid Mechanics, Pearson Education, 2005;</p> <p>Gryboś, R., A collection of tasks in fluid mechanics, Scientific Publishing House PWN, Warsaw, 2012;</p> <p>Jeżowiecka-Kabsch, K., Szewczyk, H., Fluid Mechanics, Publishing House of Wrocław University of Technology, Wrocław 2001, ISBN 83-7085-597-0;</p>	

	Supplementary literature	<p>Łaski, A., Water power plants. Ed. Science and Technology, Warsaw, 1975;</p> <p>Hydropower. 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> <p>Rduch, J., Turbine selection for small water power plant, IX Forum of Renewable Energy Sources, Zakopane, 2003.</p>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>Describe the components of Bernoulli's equation</p> <p>State the components of the disposable height.</p> <p>State the characteristic features of a Savonius rotor.</p> <p>Describe the construction and operation of a Francis turbine.</p> <p>Which water turbine is appropriate for very high gradients?</p>	
Work placement	Not applicable	