GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Measurements in marine power systems, PG_00065621		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Specialty 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Marine Power Plants -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Zbigniew Korczewski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	15.0	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	8.0	22.0	75

Subject objectives

To teach the theoretical foundations of metrology within the selected aspect of offshore wind farms, with particular emphasis on the technology of measuring the control parameters of the offshore wind turbine drive train unit for diagnostic purposes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of Naval Architecture and Offshore Structures	Is able to balance energy processes: basic and accompanying, implemented in the main components of the power transmission system of an offshore wind turbine based on the measurement of control parameters.	[SU1] Assessment of task fulfilment
[K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice	Has basic knowledge of legal acts, standards and industry regulations which determine the operation of offshore wind farms, in terms of monitoring their operation.	[SW3] Assessment of knowledge contained in written work and projects
[K7_W04] demonstrates knowledge encompassing selected issues in the field of advanced knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Naval Architecture and Ocean Engineering	Has basic knowledge of measurement systems used in offshore wind turbine drive systems and their usage for controlling and operational diagnostics.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Course content – lecture **Lecture - 15 hours** Uncertainties and errors in technological measurements Wind speed measurement technologies. Energy balance of the offshore wind turbine drive train system - basic and accompanying processes Basic and control parameters of an offshore wind turbine Destructive impact of the marine environment on a wind turbine States of operational failure of the main components of an offshore wind turbine **Laboratory exercises - 15 hours** Measurement of velocity and kinetic energy of the air stream from the wind generator Measurement of torque and rotational speed in a simple mechanical system Measurement of electrical parameters of a wind turbine power systems generator Vibration measurement in a rotating mechanical system Identification of drive shaft fatigue by thermal imaging method **Project - 15 hours** Work out the energy balance of the offshore wind turbine drive system for the given design form and the range of variability of the kinetic energy of the wind.
Prerequisites and co-requisites	Knowledge of machine building and electrical engineering

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	51.0%	50.0%
	100.0%	25.0%
	100.0%	25.0%

Recommended reading

Basic literature	1. Letcher T. M. Wind Energy Engineering. A Handbook for Onshore and Offshore Wind Turbines. Academic Press. Elsevier Inc. 2017. 2. Passon P.,Branner K., Larsen S.E., Hvenekær R.J.: Offshore Wind Turbine Foundation Design. Technical University of Denmark, Department of Wind Energy 2015. 3. Wu B., Youngqiang L., Navid Z., Samir K.: Power Conversion and Control of Wind Energy, John Wiley & Sons, INC., Publication, 2011.
Supplementary literature	Ajid Bastankhah, Fernando Porté-Age: A New Miniature Wind Turbine for Wind Tunnel Experiments. Part I: Design and Performance. Energies 10(7), March 2018. Korczewski, Z., & Rudnicki, J. (2024). Active Diagnostic Experimentation on Wind Turbine Blades with Vibration Measurements and Analysis. *Polish Maritime Research*, 126-134. https://doi.org/10.2478/pomr-2024-0042

	eResources addresses	
Example issues/ example questions/ tasks being completed	*1. Explain the notion of standard uncertainty type A and B.* *2. Characterize remote sensing methods of measuring wind speed (SODAR and LIDAR).* *3. Betz limit - simplifying assumptions.* *4. Determine the energy balance of a wind turbine - Sankey diagram.* *5. Perform the external characteristics of a wind turbine.*	
Practical activites within the subject	Not applicable	

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