



## Subject card

Subject name and code	, PG_00057154						
Field of study	Ocean Engineering						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
Education level	second-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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Energetyki i Automatyki Morskiej -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Mohammad Ghaemi				
	Teachers		mgr inż. Jacek Frost dr inż. Mohammad Ghaemi				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	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 the basic concepts of wind turbine control systems, the method of modeling, analysis and synthesis of these systems in conjunction with operational aspects, and acquiring the ability to apply control systems in industrial practice in the field of offshore energy systems with an emphasis on wind farms.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U04] can apply mathematical methods and models and computer simulations to analyse, design, and assess the functioning of ocean technology objects and systems and their elements		The student has the ability to apply mathematical methods and models, as well as computer simulations for the analysis, design, and evaluation of wind turbine control systems and their components.		[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	K7_W04		The student has knowledge of offshore energy systems in relation to the modeling, analysis, and synthesis of wind turbine control systems.		[SW1] Assessment of factual knowledge		
	[K7_U02] can plan and conduct research experiments on selected problems in ocean technology using various research methods		The student is able to plan and carry out experimental tests in connection with simulation studies for the analysis and synthesis of wind turbine control systems.		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K7_U03] can conduct a detailed analysis of the obtained results and present them in the form of a technical report or presentation, also in English		The student can conduct a detailed analysis of the results obtained during laboratory tests and simulations of wind turbines control systems, and present them in the form of a technical report or presentation, also in English.		[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task		

Subject contents	<ol style="list-style-type: none"> <li>1. Introduction, goal, nomenclature, definitions, basic concepts and types of control systems</li> <li>2. Modeling a wind turbine as an object of a control system, including mechanical, aerodynamic and electrical subsystems</li> <li>3. Modeling of wind influence as an input variable of the control system</li> <li>4. Influence of wind turbine operational aspects including energy conversion, mechanical load, power quality and operating modes, on the analysis and synthesis of control system</li> <li>5. Wind turbine control strategies and methods, including yaw control, active pitch regulation, load control, stall control, aileron control, and generator slip control</li> <li>6. Analysis and synthesis of selected control systems of wind turbines</li> </ol>		
Prerequisites and co-requisites	Basic information on automation and control systems at B.Sc. level in the Ocean Eng. field		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test/colloquium	50.0%	48.0%
	Attendance	0.0%	4.0%
	Lab. report	50.0%	48.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Lubośny Z., Farmy wiatrowe w systemie elektroenergetycznym, Wydawnictwo Naukowe PWN, Warszawa, 2016.</li> <li>2. Bianchi F. D., De Battista H., Mantz R. J., Wind turbine control systems - principles, modelling and gain scheduling design, ISBN-10: 1-84628-492-9, Springer-Verlag London Limited, 2007.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Precup R. E., Kamal T., SHassan S. Z., Advanced Control and Optimization Paradigms for Wind Energy Systems, ISBN 978-981-13-5994-1, Springer Nature Singapore Pte Ltd., 2019.</li> </ol>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	.		
Work placement	Not applicable		