



Subject card

Subject name and code	Mathematical Modeling and Optimization, PG_00062666						
Field of study	Naval Architecture and Offshore Structures						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study 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	1	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Informatyki Technicznej -> Institute of Ocean Engineering and Ship Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Aleksander Kniat				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	30.0	0.0	60
	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	60		10.0		55.0	125
Subject objectives	The aim of the subject is to apply mathematical modelling for solving physical problems. In particular subject includes numerical methods and enhances the skills to create algorithms / computer programs, as well as using ready-made software tools to perform simulations in shipbuilding.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W03] Demonstrates advanced skills in applying analytical methods and problem-solving techniques related to ocean engineering, using appropriate tools		Student is able to describe physical phenomena with differential equation and implements numerical solution method.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		
	[K7_K02] Is aware of their social role as a graduate of a technical institution, understanding the importance of adhering to professional ethics and respecting diverse perspectives		Student is able to present results of her/his work, assesses it and understands its impact on the environment.		[SK5] Assessment of ability to solve problems that arise in practice		
	[K7_W04] Conducts thorough analysis of complex problems, based on credible data and appropriately chosen methods, striving to achieve logical solutions		Student knows principles of algorithm creation and uses structural/objective programming language to implement algorithms.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Fundamentals in C# programming:</p> <ul style="list-style-type: none"> • structural and object oriented programming, • algorithms and data, • implementing/executing a program, • command line dialog/controls in Windows Forms, • file system usage <p>Solving one dimensional physical problems defined with differential equation:</p> <ul style="list-style-type: none"> • damping oscillations of a mass hanged on spring, • damping oscillations of a of cuboid fallen into water <p>Accessing the functionality of other programs:</p> <ul style="list-style-type: none"> • creating complex operations in Excell, • calculating wetted surface and buoyancy for different draughts of a ship hull in a 3D CAD program. 		
Prerequisites and co-requisites	fundamental skills in using personal computer, basic knowledge about operating system and file system, bachelor's course in mathematics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
Recommended reading	Basic literature	<p>Nagel Ch., Professional C# and .Net, 8th edition, Wrox Press, 2021</p> <p>Albahari J., Albahari B., C# 10 Pocket Reference: Instant Help for C# 10 Programmers, O'Reilly UK Ltd., 2022</p> <p>Sharp J., Microsoft Visual C# Step by Step, 9th edition, Microsoft Press US, 2018</p>	
	Supplementary literature	Wirth N., Algorytmy + struktury danych = programy, ISBN: 83-204-2740-1, WNT 2002	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. defining variables and performing arithmetic calculations, 2. printing in console and retrieving input data from console, 3. simple calculation algorithm implementation e.g. system of linear equations, 4. creation of vectors/matrices and performing operations on them e.g. search, sort, 5. creation of procedures and functions e.g. factorial 6. defining class hierarchy and objects, 7. window programming (controls) 8. graphics context and painting in a window 9. simulating motion in a graphic window (timer application) e.g. damped movements 10. accessing other programs e.g. geometric calculations in SolidEdge 		
Work placement	Not applicable		