

## GDAŃSK UNIVERSITY

## Subject card

Subject name and code	Mathematical modeling and optimization, PG_00062660							
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	Part-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	Division of Applied Computer Science -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology							
Name and surname	Subject supervisor		dr inż. Aleksa					
of lecturer (lecturers)	Teachers							
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
of instruction	Number of study hours	18.0	0.0	0.0	18.0		0.0	36
	E-learning hours included: 0.0							
Learning activity and number of study hours	Learning activity Participation ir classes include plan		didactic Participation in consultation hours		Self-study		SUM	
	Number of study 36 hours			9.0		80.0		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_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		
	[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		

Subject contents	Fundamentals in C# programming:							
	<ul> <li>algorithms and data,</li> <li>implementing/executing a program,</li> <li>command line dialog/controls in Windows Forms,</li> <li>file system usage</li> </ul>							
	Solving one dimensional physical problems defined with differential equation:							
	<ul> <li>damping oscillations of a mass l</li> <li>damping oscillations of a of cub</li> </ul>	mass hanged on spring, of cuboid fallen into water						
	Accessing the functionality of other programs:							
	<ul> <li>creating complex operations in Excell,</li> <li>calculating wetted surface and buoyancy for different draughts of a ship hull in a 3D CAD program.</li> </ul>							
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	Subject passing criteria	Passing threshold	Percentage of the final grade					
and criteria	exercises completion	60.0%	100.0%					
Recommended reading	Basic literature	Nagel Ch., Professional C# and .Net, 8th edition, Wrox Press, 2021						
		Albahari J., Albahari B., C# 10 Pocket Reference: Instant Help for C# 10 Programmers, O'Reilly UK Ltd., 2022						
		Sharp J., Microsoft Visual C# Step by Step, 9th edition, Microsoft Press US, 2018						
	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> <li>defining variables and preforming arithmetic calculations,</li> <li>printing in console and retrieving input data from console,</li> <li>simple calculation algorithm implementation e.g. system of linear equations,</li> <li>creation of vectors/matrices and performing operations on them e.g. search, sort,</li> <li>creation of procedures and functions e.g. factorial</li> <li>defining class hierarchy and objects,</li> <li>window programming (controls)</li> <li>graphics context and painting in a window</li> <li>simulating motion in a graphic window (timer application) e.g. damped movements</li> </ol>							
	Not applicable							

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