



Subject card

Subject name and code	Numerical Fluid Mechanics, PG_00057301						
Field of study	Ocean Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group 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	2	ECTS credits			2.0		
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. Michał Krężelewski					
	Teachers	mgr inż. Hanna Pruszek dr inż. Michał Krężelewski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	9.0	0.0	9.0	0.0	0.0	18
	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	18	5.0		27.0		50
Subject objectives	Getting to know the mathematical models of flows, the basics of numerical methods used in flow calculations and learning how to use the software for the implementation of calculations.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	Knowledge of mathematical models of flows and their applications. Ability to prepare a computer simulation of the flow and interpretation of the results.			[SW1] Assessment of factual knowledge		
	[K7_W06] has an organized, widened knowledge on engineering methods and design tools allowing the conducting of advanced projects within the construction and operation of ocean technology objects and systems	Knowledge of mathematical models of flows and their applications. Ability to prepare a computer simulation of the flow and interpretation of the results.			[SW1] Assessment of factual knowledge		
	[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	Knowledge of mathematical models of flows and their applications. Ability to prepare a computer simulation of the flow and interpretation of the results.			[SU5] Assessment of ability to present the results of task		
Subject contents	Review of numerical fluid mechanics. Application of numerical fluid mechanics in shipbuilding. Potential flows, Navier-Stokes equations, Reynolds decomposition. Finite difference method, finite volume method, discretization schemes. Modeling of turbulence, DNS, LES, RANS. Principle of iterative calculations, convergence, relaxation. Performing calculations using dedicated software.						

Prerequisites and co-requisites	<p>Knowledge of differential calculus.</p> <p>Basic knowledge of fluid mechanics.</p> <p>Basic computer skills</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - test	60.0%	30.0%
	Laboratory - raports	60.0%	70.0%
Recommended reading	<p>Basic literature</p> <p>Betram V. Practical Ship Hydrodynamics. Butterworth Heinemann, Oxford 2000.</p> <p>Krężelewski M. Hydromechanika ogólna i okrętowa, skrypt PG Tom II, Gdańsk 1982</p> <p>Versteeg H.K., Malalasekera W. , An introduction to computational fluid dynamics. The finite volume method. Pearson, 2007.</p> <p>Tesch K., Numeryczna Mechanika płynów. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2021.</p>		
	<p>Supplementary literature</p> <p>Ferziger J., Perić M., Computational Methods for Fluid Dynamics, Springer, 2002.</p> <p>Newman J. N., Marine Hydrodynamics 40th Anniversary Edition, MIT Press 2017.</p>		
	eResources addresses		Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>Determination of the free surface flow around the hull of a ship. Determination of the characteristics of a ship propeller. Determination of the characteristics of a foil.</p>		
Work placement	Not applicable		