

Subject card

Subject name and code	Fluid Mechanics, PG_00044041								
Field of study	Ocean Engineering,	Ocean Enginee	ring						
Date of commencement of studies			Academic year of realisation of subject			2021/2022			
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific				
	Dort the control of					research in the field of study			
Mode of study	Part-time studies		Mode of delivery			at the university			
Year of study	2		Language of instruction			Polish			
Semester of study	3		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						d Ship		
Name and surname	Subject supervisor		dr inż. Michał Krężelewski						
of lecturer (lecturers)	Teachers		dr inż. Michał Krężelewski						
		mgr inż. Olga Kazimierska							
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
	Number of study hours	10.0	10.0	0.0	0.0		0.0	20	
	E-learning hours included: 0.0								
	Adresy na platformie eNauczanie:								
Learning activity and number of study hours	Learning activity	Participation in classes include plan			Self-study SUI		SUM		
	Number of study hours	20		4.0		26.0		50	
Subject objectives	o familiarize students with the basic concepts and laws of fluid mechanics, such as: - density, viscosity, compressibility, surface tension, - Static equilibrium equations of fluid, hydrostatic pressure, fluid forces on straight surfaces, etc Continuity equation, - The principle of momentum conservation, - Calculation of hydrodynamic forces, - The principle of conservation of energy for non-viscous fluid, incompressible flow (Bernoulli eq.) - Basic issues of viscous liquid flow, determination of losses in the flow The concept of the stress tensor in a real (viscous) fluid.								
Learning outcomes	Course outcome		Subject outcome		Method of verification				
	[K6_U02] can work individually and in a team, communicate through various techniques in professional environment and also record, analyse, and present the results of work, can estimate the time needed to complete a given task		The student is able to solve simple tasks in the field of fluid mechanics (fluid statics, 1D flows of perfect and real liquid). He can estimate the time and resources to solve the task		[SU1] Assessment of task fulfilment				
[K6_W02] has a basic knowledge in physics, including technical mechanics, fluid mechanics, solid-state physics, optics and acoustics necessary to understand basic physical phenomena occurring in ocean technology		Student formulates basic flow problems and solves them based on the laws and methods of fluid mechanics. Applies the laws and methods of fluid mechanics in design and for the purpose of understanding physical phenomena occurring in ocean engineering.			[SW3] Assessment of knowledge contained in written work and projects				

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Subject contents	Scope of the course:						
	The main properties of fluids: - The density, viscosity, compressibility, surface tension,						
	Basic concepts:						
	- Particle fluid						
	- The pressure, shear stress,						
	- Pascal's law. Fluid statics:						
	- The hydrostatic equilibrium equations of fluid						
	- The hydrostatic pressure formula,						
	- Pressure force to the flat surface						
	The concept of the center of pressure force, Calculation of the moment of pressure force.						
	Buoyancy, center of buoyancy.						
	- Stability of floating bodies (ships)						
	Metacentric radius,						
	Metacentric height, Equilibrium conditions.						
	The main issues of fluid kinematics:						
	- A description of the motion of fluids:						
	Eulerian method,						
	- Lagrangian method						
	- Determination of position, velocity and acceleration of the fluid, - The concept of the path of the fluid particles (pathline), streamline, streamsurface, streamtube						
	The concept of the path of the fluid particles (pathline), streamline, streamsurface, streamtube The principle of conservation of mass (continuity equation):						
	- The concept of the mass flow rate the volumetric flow rate,						
	- The concept of control surface, control volume						
	- Calculation of the flow velocity at varying cross channel The principle of conservation of energy for perfect fluid, incompressible flow (Bernoulli's equation):						
	- Solving one-dimensional flow problems in channels: determination of the flow rate and pressure.						
	The principle of conservation of momentum,						
	- The concept of a volume of liquid,						
	- Guiding principles of conservation of momentum in the form of integral,						
	- Calculation of hydrodynamic forces, The concept of the stress tensor in a real(viscous) fluid.						
	Basic issues of the real fluid flow, de						
	- Generalized Bernoulli equation,						
	- Determining the amount of local los	ss and linear :					
	Types of flow of real fluids: Laminar flow						
	Transitional flow,						
	Turbulent flow.						
Prerequisites	Knowledge of the basic concepts of physics / mechanics:						
and co-requisites	- Force (force vector) - Torque,	. ,					
and do requiences							
	 The arm of force, What is the pressure (?) Momentum, potential energy, kinetic energy, Knowledge of units related to above concepts, 						
	l.,						
	Knowledge of the basic concepts of	calculus / calculus					
	- Definite integral,	calculus / calculus					
	 Definite integral, Derivative of the function, Basic ability to apply integrals in pr Ordinary differential equations with 	oblems of physics separated variables					
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Recommended reading	Basic literature	Teoria (wykład): [1] R. Puzyrewski, J. Sawicki: Podstawy mechaniki płynów i hydrauliki. Wydawnictwo Naukowe PWN, Warszawa 2000 [2] R. Gryboś: Podstawy mechaniki płynów. Wydawnictwo Naukowe PWN, Warszawa 1998 Zadania (ćwiczenia): [3] R. Gryboś: Zbiór zadań z technicznej mechaniki płynów. Wydawnictwo Naukowe PWN, Warszawa 2002 [4] E.S. Burka: Mechanika Płynów w Przykładach. Wydawnictwo Naukowe PWN, Warszawa 1994
	Supplementary literature	5] Bar-Meir, Genick, Basics of Fluid Mechanics, Last modified: Version 0.3.4.0 March 17, 2013, www.potto.org/downloads.php [6] Yunus A. Çengel, John M. Cimbala: Fluid Mechanics. Fundamentals and Applications. McGraw Hill Higher Education, Boston, 2006 [7] W.J. Prosnak: Mechanika Płynów (Tom I). Państwowe Wydawnictwo Naukowe, Warszawa 1970. [8] J. Bukowski: Mechanika Płynów. Państwowe Wydawnictwo Naukowe, Warszawa 1959.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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