

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056280							
Field of study	Ocean Engineering							
Date of commencement of studies	October 2022		Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies		Subject group					
Mode of study	Full-time studies		Mode of delivery			at the university		
Year of study	2		Language of instruction			Polish		
Semester of study	3		ECTS credits			4.0		
Learning profile	general academic profile		Assessment form			assessment		
Conducting unit	Institute of Naval Arcl	Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname	Subject supervisor dr inż. Michał Krężelewski							
of lecturer (lecturers)	Teachers		mgr inż. Olga Kazimierska					
			dr inż. Michał Krężelewski					
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
of instruction	Number of study hours	30.0	15.0	0.0	0.0		0.0	45
	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	45		5.0		50.0		100
Subject objectives	Fmiliarize 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 n physics, including technical mechanics, fluid mechanics, solid- state physics, optics and acoustics necessary to understand basic physical phenomena occurring in pcean 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		

Subject contents	Scope of the course: The main prop Basic concepts:- Particle fluid- The p equilibrium equations of fluid - The h concept of the center of pressure for	erties of fluids:- The density, viscosit pressure, shear stress,- Pascal's law ydrostatic pressure formula,- Pressu ce, Calculation of the moment of p	y, compressibility, surface tension. Fluid statics:- The hydrostatic ire force to the flat surface The iressure force Buoyancy, center			
	of buoyancy Stability of floating boo conditions. The main issues of fluid k Lagrangian method- Determination of path of the fluid particles (pathline), s mass (continuity equation):- The cor control surface, control volume- Cala conservation of energy for perfect flu flow problems in channels: determin momentum,- The concept of a volum of integral,- Calculation of hydrodyna fluid.Basic issues of the real fluid flov Determining the amount of local loss Transitional flow, Turbulent flow.	dies (ships) Metacentric radius, I inematics:- A description of the motio of position, velocity and acceleration streamline, streamsurface, streamtult iccept of the mass flow rate the volum culation of the flow velocity at varying id, incompressible flow (Bernoulli's e ation of the flow rate and pressure.The of liquid,- Guiding principles of con amic forces,The concept of the stress w, determination of loss in the flow:- s and linear : Types of flow of real f	Metacentric height, Equilibrium on of fluids: Eulerian method, of the fluid,- The concept of the peThe principle of conservation of uetric flow rate,- The concept of gquation): - Solving one-dimensional he principle of conservation of nservation of momentum in the form is tensor in a real(viscous) Generalized Bernoulli equation,- luids: Laminar flow			
Prerequisites and co-requisites						
	Knowledge of the basic concepts of physics / mechanics:- Force (force vector)- Torque,- The arm of force,- What is the pressure (?)- Momentum, potential energy, kinetic energy,- Knowledge of units related to above concepts.Knowledge of the basic concepts of calculus / calculus- Definite integral,- Derivative of the function,- Basic ability to apply integrals in problems of physics- Ordinary differential equations with separated variables- The surface integral, volume integral. Knowledge of algebra:- The transformation of algebraic expressions,- The ability to "take before the parenthesis" (!!!)Algebra of vectors:- The scalar product,- Vector product,- Vector component,- The projection of the vector on the direction of the specified unit vector. Knowledge of trigonometric functions- Sine, cosine, tangent, cotangent. Basic knowledge of stereometry (3D geometry)- Eg .: calculating the volume of a cylinder, cuboid, and the like Eg .: calculating the area of the cylinder.Knowledge of floating point notation, eg .: * 10 ^ 6- Ability to use scientific calculator.					
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	Lecture - Colloquium	50.0%	60.0%			
	Exercises - Colloquium	50.0%	40.0%			

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: Version0.3.4.0 March17, 2013, www.potto.org/downloads.php
		\[6] Yunus A. Çengel, John M. Cimbala: Fluid Mechanics. Fundamentalsand 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	Adresy na platformia eNauczonio:
Example issues/		
example questions/ tasks being completed		
Work placement	Not applicable	

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