GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fluid Mechanics, PG_00055894		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2023/2024
Education level	first-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	2	Language of instruction	Polish none
Semester of study	4	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Hydromechanics and Hydroacoustics -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Krzysztof Tesch	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	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	5.0	60.0	125

Subject objectives

The aim of the course is to provide the student with theoretical and practical knowledge of fluid mechanics, enabling them to solve engineering computational problems related to fluid mechanics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K01] is aware of the need for training and self-improvement in the profession of energy and the possibility of further education; can think and act in a creative and entrepreneurial manner; can define priorities for the implementation of an individual or group task	The 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 understanding the physical phenomena occurring in ocean engineering.	[SK2] Assessment of progress of work
[K6_W02] has a basic knowledge of physics (including optics, electricity and magnetism), chemistry, technical thermodynamics, fluid mechanics and general mechanics needed to understand and describe the basic phenomena occurring in devices and systems, energy plants and transmission networks and their environment	The 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 understanding the physical phenomena occurring in ocean engineering.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE: Kinematics and fluid dynamics. Energy and entropy for continuous media. Conservation equations. Constitutive equations. Closed systems of equations. Statics. inviscid fluids. Dynamics of gases.

PRACTICAL EXERCISES Kinematics of flows. Laminar and turbulent flows in a pipe - averaging of flow parameters. Practical application of Bernoulli's equation. Determination of forces acting on channel walls and surfaces of streamlined bodies. Solving simplified forms of the Navier-Stokes equation.

Prerequisites and co-requisites

Knowledge of differential and integral calculus, differential equations and the basics of vector calculus. Knowledge of the fundamentals of classical solid mechanics

Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Lecture</td><td>50.0%</td><td>40.0%</td></tr><tr><td>Lecture - Colloquium</td><td>50.0%</td><td>30.0%</td></tr><tr><td>Exercises - Colloquium</td><td>50.0%</td><td>30.0%</td></tr></table>
Recommended reading	<table><tr><td>Basic literature</td><td>G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, New York, 2000</td></tr><tr><td>Supplementary literature</td><td>G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, New York, 2000</td></tr><tr><td>eResources addresses</td><td></td></tr></table>
Example issues/ example questions/ tasks being completed	1. Provide a definition of stream lines and surfaces and vortex lines and surfaces. What differential equation are the current lines and vortex lines described by? 2. Which velocities does the velocity of any point in a fluid element consist of? Provide the formula with the figure and explain the meaning of the various symbols and their physical interpretation 3. Provide (formula and figure) and explain the content of Helmholtz's first vorticity theorem. 4. Provide the differential form of the mass conservation equation. What do the different symbols mean? How can this equation be simplified in the stationary, incompressible and potential case? 5. Provide the differential form of the momentum conservation equation. What do the individual symbols mean? What is the physical interpretation of the whole equation and the individual expressions? 6. Provide the Newton's hypothesis for a compressible fluid. What do the individual symbols mean? Why is it introduced? 7. Provide the forms of the Navier-Stokes equation as a function of density and viscosity coefficient. 8. Explain Pascal's law. 9. Provide and explain Archimedes' law.
Work placement	Not applicable