



## 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		dr inż. Marta Drosińska-Komor  dr inż. Marzena Banaszek  prof. dr hab. inż. Krzysztof Tesch				
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	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture	50.0%	40.0%
	Lecture - Colloquium	50.0%	30.0%
	Exercises - Colloquium	50.0%	30.0%
Recommended reading	Basic literature	G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, New York, 2000	
	Supplementary literature	G. K. Batchelor, An Introduction to Fluid Dynamics, Cambridge University Press, New York, 2000	
	eResources addresses	Adresy na platformie eNauczanie: Mechanika płynów, W/C/L, E, sem. 3, letni 23/24 (PG_00055894) - Moodle ID: 36705 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36705">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36705</a>	
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		

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