



## Subject card

Subject name and code	Numerical methods in fluid flow problems, PG_00055947						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject			2024/2025	
Education level	first-cycle studies		Subject group			Optional subject group 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	3		Language of instruction			Polish	
Semester of study	6		ECTS credits			3.0	
Learning profile	general academic profile		Assessment form			assessment	
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Wojciech Włodarski				
	Teachers		dr inż. Wojciech Włodarski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	30.0	0.0	30
	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	30		8.0		37.0	75
Subject objectives	The aim of the course is to familiarise students with CFD problems and methods in flow problems.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_U08] can design the basic parameters of the selected technology related to energy conversion and select auxiliary devices and evaluate the project in terms of technical and economic		Students will be able to design the basic parameters of a selected energy conversion technology and select auxiliary equipment and evaluate the design from technical and economic points of view.			[SU4] Assessment of ability to use methods and tools	
	[K6_W12] has basic knowledge of the life cycle and repairs of energy equipment in the field of thermal power stations, thermal and energy systems and heating systems, internal combustion engines and compressors as well as rotating machines		The student has a basic knowledge of the life cycle and overhaul of power equipment in the field of thermal power plants, thermal power and heating systems, internal combustion engines and compressors and rotating machinery			[SW1] Assessment of factual knowledge	
	[K6_U07] is able to use basic knowledge of fluid flow machines and methods related to their design in an analytical and numerical approach to the preliminary design of an energy installation		The student is able to apply basic knowledge of turbomachinery and methods related to their design in an analytical and numerical approach to the preliminary design of an energy plant			[SU1] Assessment of task fulfilment	
Subject contents	The topics covers the basics of CFD software, correct setting of boundary conditions and the basics of turbulence modelling. The characteristics of methods for solving systems of equations, convergence criteria and possibilities to assess the correctness of the obtained solution will be presented. During the class, the individual modelling steps will be performed using a commercial software as an example: - generation of meshes for selected geometries - correct definition of the computational model and selection of computational parameters - execution of simulations for several selected flow systems - visualisation and interpretation of results						
Prerequisites and co-requisites	Basics of thermodynamics and fluid mechanics.						
Assessment methods and criteria	Subject passing criteria		Passing threshold			Percentage of the final grade	
	Practical exercise		100.0%			100.0%	

Recommended reading	Basic literature	1. Tesch K. Numeryczna Mechanika Płynów, Wyd. PG. 2022  2. Tesch K. Mechanika Płynów, Wyd. PG 2014
	Supplementary literature	Fletcher C.A.J. Computational Techniques for Fluid Dynamics
	eResources addresses	Adresy na platformie eNauczanie: Metody numeryczne w zagadnieniach przepływowych 2025 - Moodle ID: 45164 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45164">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45164</a>
Example issues/ example questions/ tasks being completed	1. Conservation equations  2. Boundary conditions  3. Dimensionless numbers  4. Turbulence	
Work placement	Not applicable	

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