GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Advanced Fluid Mechanics, PG_00070370		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	Specialty 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	1	Language of instruction	English
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Division of Hydromechanics and Ship Design -> Institute of Naval Architecture -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Paweł Dymarski	
	Teachers	Michał Piotrowicz prof. dr hab. inż. Paweł Flaszyński	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	30.0	0.0	0.0	75

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	75	5.0	20.0	100

Subject objectives

The aim of the course is to expand students' fundamental knowledge of fluid mechanics, with a particular focus on wind energy applications. Students will deepen their theoretical understanding and acquire basic skills in applying numerical methods to flow analysis and in interpreting the results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U01] applies acquired analytical, simulation, and experimental methods, as well as mathematical models for analysis and evaluation of shipborne and offshore systems and processes	The student is able to use basic analytical methods and simulation models to analyse fluid flow processes in wind energy systems	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
[K7_U02] formulates and tests hypotheses concerning problems related to shipborne and offshore systems/processes, as well as simple research problems	The student is able to think analytically and solve technical problems related to fluid mechanics in wind energy systems.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture

Potential flow theory applied to flow around an aerofoil. The boundary layer, laminar–turbulent transition, boundary layer separation and its effects. Flow control methods and their applications in wind energy systems. Turbulent flow and the atmospheric boundary layer in the context of their impact on wind turbines and wind farms. Aeroacoustic sources in the wind turbine rotor and noise reduction methods. Introduction to transonic flow.

Course content – exercises

Application of basic computational methods to the analysis of flow around aerofoils and the determination of aerodynamic loads.

Course content – laboratory

Application of numerical flow modelling methods (RANS – Reynolds-Averaged Navier–Stokes) to the analysis of flow structure around an aerofoil and a wind turbine blade. Analysis of the influence of boundary conditions, the choice of numerical method and its parameters. Assessment of solution convergence and interpretation of the results.

Prerequisites and co-requisites	Fundamentals of fluid mechanics, thermodynamics and mechanics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
raport	60.0%	25.0%
raport	60.0%	30.0%
egzamin pisemny	60.0%	45.0%

Recommended reading

Basic literature	Literature will be provided during the course
Supplementary literature	Literature will be provided during the course
eResources addresses	

Example issues/ example questions/ tasks being completed	
Practical activites within the subject	Not applicable

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