GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fluid Dynamics and Aeroelasticity, PG_00066975		
Field of study	Smart Renewable Energy Engineering		
Date of commencement of studies	October 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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Paweł Flaszyński	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	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	4.0	16.0	50

Subject objectives

The aim of the course is to familiarize students with fundamentals of aerodynamic and hydrodynamic loading on wind turbines.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] is capable of creating and analyzing digital models of renewable energy systems, including wind power systems, and utilizes digital tools for project analysis, evaluation, supervision, and optimization	The student is capable of analytical thinking and solving technical problems related to renewable energy systems, including wind energy, using engineering methods.	[SU3] Assessment of ability to use knowledge gained from the subject
[K7_K02] recognizes technological innovations in the field of wind energy, is ready to adapt to and implement new technologies in energy systems	The student is prepared to assess projects and operate wind energy systems, demonstrating competencies in the design and optimization of renewable energy system operations, including wind energy systems.	[SK2] Assessment of progress of work
[K7_W04] knows the specifics of designing, constructing, and operating onshore/offshore wind farms, as well as the technical and logistical challenges involved in their implementation, including measurement and diagnostic technologies	The student knows and understands the theories related to wind energy generation and is able to explain the principles of wind turbine operation and the process of converting wind energy into electrical energy.	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

1. Airfoil/blade aerodynamics
2. 3D flow structure topology
3. Wakes airfoil, blade, turbine, wind farm
4. Unsteady 2D and 3D aerodynamics, unsteady loads
5. Blade Element Momentum method to model the aerodynamic forces on a rotor
6. Flow control aerodynamic performance improvement
7. Basic information about the types of support structures
8. Hydrostatics of floating marine structures
9. Environmental impact on offshore structures
10. Determination of hydrodynamic forces on offshore structures (wave and current)
11. Introduction to the dynamics of floating structures
12. Model tests of offshore structures (laboratories)

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Laboratory</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Aerodynamics of Wind Turbines, Hansen M., Routledge, 2007

Introduction to Wind Turbine Aerodynamics, A. P. Schaffarczyk, Springer-Verlag Berlin Heidelberg 2014</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">Bibliography will be provided during the course</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Practical activites within the subject</td><td colspan="3">Not applicable</td></tr>
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