GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Applied Materials in Wind Energy, PG_00066982		
Field of study	Smart Renewable Energy Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
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	2	Language of instruction	English
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Materials Science and Technology -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Krzysztof Krzysztofowicz	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	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 this course is to provide basic knowledge regarding the properties, shaping of properties, and practical applications of various groups of materials in engineering. It will also provide basic knowledge on the processes of operational material degradation. Additionally, it will present issues related to computer-aided material selection, taking into account ecological aspects.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W03] understands the concept of digital twin technology and its application in optimizing and monitoring energy systems using artificial intelligence methods and large-scale data analytics	The student is able to determine the characteristics and requirements for formulating a digital twin of a material in wind powier generation.	[SW3] Assessment of knowledge contained in written work and projects
[K7_K03] has intercultural communication competencies, essential for international energy projects, and can collaborate effectively with individuals from various cultures and backgrounds, appreciating diversity	Possesses communication skills necessary for international projects and is able to cooperate with people from different cultures and nationalities in scope of wind power generation	[SK1] Assessment of group work skills
[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 able to think analytically and identify technical problems related to renewable and wind energy using engineering methods.	[SU2] Assessment of ability to analyse information
[K7_W02] knows and understands the challenges of effectively integrating decentralized renewable energy generation into the power grid, including energy storage issues, and is particularly familiar with technologies used in wind power	The student knows the general properties of materials from different groups, how they are formed and understands the scope of application of materials in wind power generation	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture 1. Basic groups of materials, their properties, and possible applications in wind energy. 2. Principles of materials selection in engineering practice, with particular emphasis on wind energy applications and computer-aided material selection. 3. Material standards and other regulations specifying requirements for materials used in wind energy. 4. Characteristics of composite materials used in wind turbine blades. 5. Characteristics of aluminum and titanium alloys used in wind energy. 6. Materials with increased fatigue resistance used in wind energy. 7. Protective coatings. 8. Durability and degradation of materials under various environmental impacts, including offshore operating conditions. 9. Eco-audit and recycling of materials used in wind energy. 10. Aspects of life cycle analysis of materials used in wind energy.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Colloquim - lecture	55.0%	50.0%
Colloquim - laboratory	55.0%	50.0%

Recommended reading

Basic literature	1. Adamczyk J., Szkaradek K.: Materiały metalowe dla energetyki jądrowej. Wyd. Politechniki Śląskiej, Gliwice 1992. 2. Ashby M., Jones D.: Materiały inżynierskie. Tom I właściwości i zastosowanie. WNT, W-wa 1995. 3. Ashby M., Jones D.: Materiały inżynierskie. Tom II Kształtowanie struktury i właściwości, dobór materiałów. WNT, Wwa 1996. 4. Baczkowska A. i in.: Kompozyty. Oficyna Wydawnicza Politechniki Warszawskiej, W-wa 2000. 5. Blicharski M.: Inżynieria materiałowa. Stal. WNT, Warszawa 2012. 6. Chodorowski J., Ciszewski A., Radomski T.: Materiałoznawstwo lotnicze. Oficyna Wydawnicza Politechniki Warszawskiej, W-wa 1996. 7. Ciszewski B., Przetakiewicz W.: Nowoczesne materiały w technice. Wyd. Bellona, W-wa 1993.
Supplementary literature	1. Mikułowski B.: Stopy żaroodporne i żarowytrzymałe. Wyd. Akademii Górniczo-Hutniczej, Kraków 1997. 2. Oczoś K.: Kształtowanie ceramicznych materiałów technicznych. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1995. 3.Pampuch R.: Siedem wykładów o ceramice. Wyd. Akademii Górniczo-Hutniczej, Kraków 2001. 4. Śledziona J.: Podstawy technologii kompozytów. Wyd. Politechniki Śląskiej, Gliwice 1998
eResources addresses	

Example issues/ example questions/ tasks being completed	Possibilities of using materials in wind energy, what material properties are important from the point of view of wind energy, whether and what regulations specify basic requirements for materials used in wind energy, what composite materials are suitable for use in wind energy, how to ensure increased durability of materials used in off-shore conditions, whether alloys of aluminum, titanium and other light metals are suitable for use in wind energy, what is the recycling of materials used in wind energy?
Practical activites within the subject	Not applicable

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