GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	New material technologies, PG_00063622		
Field of study	Materials Engineering		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2026/2027
Education level	second-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
Semester of study	4	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Aleksandra Mielewczyk-Gryń	
	Teachers	dr hab. inż. Aleksandra Mielewczyk-Gryń dr hab. inż. Łukasz Piszczyk	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	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	3.0	17.0	50

Subject objectives

The course aims to develop the ability to analyze and evaluate modern technologies for material manufacturing, processing, and modification, as well as to understand their applications in various industrial sectors. Students will gain knowledge about innovative materials, research methods, and sustainable development in the context of materials engineering. Moreover, the course fosters the ability to critically assess available technologies and select optimal solutions for specific engineering applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K01] Understands the need for lifelong learning, can inspire and organize the learning process of others. Is aware of own limitations and knows when to turn to experts, can accurately determine priorities helping to achieve the tasks specified by themselves or others.	Understands the importance of lifelong learning, can motivate and support others in their learning process. Aware of their limitations, knows when to seek advice from experts. Able to set priorities effectively to successfully accomplish tasks, both their own and those assigned by others.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice
[K7_W07] Has knowledge of the development trends and most important new achievements of the fields of science and scientific disciplines relevant to materials engineering and related disciplines.	Knows developmental trends and key innovations in science and disciplines related to materials engineering and associated scientific areas.	[SW1] Assessment of factual knowledge
[K7_U01] Can obtain information from literature, databases and other properly selected sources, also in English; can integrate the obtained information, interpret and draw conclusions, formulate and justify opinions	Able to acquire information from literature, databases, and other appropriately selected sources, including in English. Can analyze and integrate the obtained data, interpret it, draw conclusions, and formulate and justify opinions.	[SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td>The subject's scope focuses on the latest development trends in the field of materials engineering, with particular emphasis on their practical applications in various industrial sectors. The discussed topics cover both modern materials manufacturing and processing technologies, as well as innovative approaches to designing structures with unique properties.

The course analyzes contemporary trends in materials engineering, such as the development of nanomaterials, smart adaptive materials, and ecological alternatives supporting sustainable development. Special attention is also given to materials used in strategic sectors such as automotive, aerospace, energy, electronics, and medicine.

Additionally, students will familiarize themselves with methods for testing and evaluating material properties and the challenges associated with implementing these materials in industrial conditions. The course also includes case studies of real-world applications of modern materials technologies, providing a better understanding of the impact of innovations on technological and economic development.

Sample topics include:

• The fundamentals of materials engineering in a historical context analysis of the evolution of materials from prehistoric times to the present, with particular attention to groundbreaking discoveries and innovations that contributed to the development of modern materials technologies. This includes the development of metals, ceramics, polymers, and composites and their applications in different eras.

• Energy modern materials used in energy production, including renewable energy sources such as photovoltaics, wind turbines, and fuel cells, with special emphasis on the hydrogen economy and the entire value chain.

• New consumer solutions innovative materials used in consumer electronics, medicine, smart textiles, and biocompatible implants.

• Materials for the military, aerospace, and transportation sectors the development of modern composites, light metal alloys, and materials resistant to extreme environmental conditions.

• New current trends based on the latest scientific publications.

The course program covers all classes of materials, including ceramic and polymer materials.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>final test</td><td>50.0%</td><td>100.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Energy materials / ed. by Duncan W. Bruce, Dermont O'Hare, Richard I Walton.

Bruce, Duncan W. Red. | O'Hare, Dermot. Red. | Walton, Richard I. Red. 2011</td></tr>
<tr><td>Supplementary literature</td><td>Advances in polymer friction and wear / edited by Lieng-Huang Lee.

American Chemical Society International Symposium on Advances in Polymer Friction and Wear (1974 : Los Angeles)</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>• Provide examples of the application of transparent ceramics.
• What are the causes of hydrogen embrittlement in pipelines?
• What are the examples of the application of polymer materials in modern sports products?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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