GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Design of Sustainable Materials, PG_00072447		
Field of study	Materials Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2026/2027
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ewa Głowińska	
	Teachers	dr inż. Ewa Głowińska	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	15.0	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	0.0	0.0	30

Subject objectives

The aim of the course is to prepare students to design pro-ecological materials using the principles of green chemistry, analysis of material properties and best available technologies (BAT), as well as to shape attitudes related to the responsible design of material solutions in the context of sustainable development and limiting the impact of technological processes on the environment.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U03] Can critically analyze and evaluate the functioning – particularly in the context of materials engineering –existing technical solutions, particularly equipment, objects, systems, processes.	The student is able to critically analyze the technologies for producing pro-ecological materials and assess their environmental impact, applying the principles of green chemistry, material life cycle analysis and BAT criteria to the design and improvement of material processes.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W07] Has detailed knowledge of selected problems of materials science.	The student knows and understands the principles of designing pro-ecological materials, in particular the selection of raw materials, manufacturing technologies and solutions that limit the negative impact of materials on the environment.	[SW2] Assessment of knowledge contained in presentation
[K6_W03] Has knowledge of materials science and can relate the properties of materials with their structure and composition, knows the theoretical description of phenomena occurring in materials subjected to external factors.	The student knows and understands the relationships between the structure, composition and properties of pro-ecological materials and the influence of environmental and operational factors on the durability and functionality of designed materials.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Topics covered in the lecture:
• The essence and concept of eco-friendly materials design.
• Stages of material design and the influence of material structure on its properties.
• Principles of green chemistry in eco-friendly materials design.
• Sustainable development in eco-friendly materials production technologies.
• Best Available Technologies (BAT) and their application in eco-design.
• Material life cycle assessment.

Course content – seminar
Topics covered during the seminar:
• Principles of green chemistry in the design of modern, eco-friendly materials.
• Designing packaging materials consistent with the circular economy.
• The impact of additives on the properties of eco-friendly materials.
• Designing energy-efficient materials for eco-friendly construction.
• Assessing recycling technologies for selected materials in terms of BAT.
• Analyzing the impact of material composition on reusability.
• he use of renewable raw materials in the design of materials of the future.
• Using AI tools to design eco-friendly materials.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the basics of materials engineering.</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>Test</td><td>60.0%</td><td>50.0%</td></tr>
<tr><td>Presentation</td><td>60.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Rabek, J. F. (2017). Współczesna wiedza o polimerach. Tom 1., Wydawnictwo Naukowe PWN.

2. Rabek, J. F. (2017). Współczesna wiedza o polimerach. Tom 2. Wydawnictwo Naukowe PWN.

3. Michael F. Ashby (1998) Dobór Materiałów W Projektowaniu Inżynierskim. Wydawnictwa Naukowo-Techniczne.</td></tr>
<tr><td>Supplementary literature</td><td>1. Królikowski W. (2012) Polimerowe kompozyty konstrukcyjne, Wydawnictwo Naukowe PWN.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. How do the principles of green chemistry apply to the design of eco-friendly materials? A critical assessment of selected examples.
2. How can single-use materials be designed in accordance with the principles of green chemistry and in line with sustainable development goals?
3. How can artificial intelligence tools be used to modify conventional materials into eco-friendly materials?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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