GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to material technologies, PG_00062717		
Field of study	Technologies for Industry 5.0		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2024/2025
Education level	first-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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Gazda	
	Teachers	prof. dr hab. inż. Maria Gazda	

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	2.0	18.0	50

Subject objectives

The aim of the course is to learn the basics of modern materials science, in particular aimed at achieving the first two (out of three) goals of industry 5.0, i.e. industry oriented towards improving a sustainable, and humancentric European industry, An important goal of the course is to provide an initial understanding of where the properties of materials come from and how they can be modified appropriately for various applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W03] demonstrates knowledge on materials used in industrial technologies, their structure and fabrication, knows the principles of conducting research, analyzing it and creating technical documentation	has basic knowledge of the structure, production and properties of materials, especially those used for sustainable development and improving the human condition. Knows the principles of conducting material tests and interpreting the results as well as creating technical documentation.	[SW1] Assessment of factual knowledge
[K6_U03] has the ability to plan, prepare and carry out engineering activities using practical knowledge and understanding of the specificity of materials, devices and tools, processes and technologies, and prepare a substantive report	is able to develop and carry out activities related to the use of selected materials, using basic knowledge of materials and their testing. Is able to prepare a substantive report	[SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>

Introduction: history of materials science; division of materials into groups according to various criteria; interdependencies between composition, structure, microstructure, technology used, properties and applications. 1 hour

Basic knowledge of materials technologies: elements of thermodynamics, Gibbs phase rule, phase equilibrium systems; a brief description of selected methods of producing materials. 4 hours

Basic knowledge of materials: chemical bonds, structure (crystalline, amorphous, partially crystalline), structural defects and microstructure; mechanical properties of materials; thermal properties; electrical, magnetic and optical properties; Selected methods for testing properties. 10 hours

Groups of materials particularly important for Industry 5.0: electronic and electrotechnical materials (metals, semiconductors, dielectrics); materials that change electrical properties when exposed to light, the surrounding atmosphere and other environmental factors; materials and structures with special optical properties (photosensitive, electro-, chemo-, etc. - luminescent materials, photonic crystals); ferroelectric and piezoelectric materials; ferromagnetic and magnetostrictive materials; shape memory materials; other new multifunctional materials. 13 hours.

Summary: the importance of materials, their impact on humans and the environment, creating devices composed of many materials, reusing and recycling materials.During the lecture, students will receive a homework assignment consisting in analyzing one specific material in terms of the issues discussed in class.

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<tr><td>Prerequisites and co-requisites</td><td>None</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>Homework</td><td>55.0%</td><td>10.0%</td></tr>
<tr><td>Written test</td><td>55.0%</td><td>90.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Marek Blicharski, Wstęp do inżynierii materiałowej</td></tr>
<tr><td>Supplementary literature</td><td>Krzysztof Kurzydłowski, Małgorzata Lewandowska, Nanomateriały inżynierskie</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Wstęp do materiałoznawstwa - Moodle ID: 337
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=337</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Explain why a material with a strong bond has a high melting point, a large Young's modulus and low thermal expansion,2. Similarities and differences between the structure of SiO2: monocrystalline, polycrystalline and amorphous.3. Suggest materials that need to be used to make a resistor/UV filter/oxygen sensor/....4. What factors determine the optical properties of dielectric materials?5. What materials and phenomena can be used to convert electrical energy into mechanical energy (and vice versa)?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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