GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Introduction to Materials Science, PG_00065040		
Field of study	Nanotechnology		
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 no
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division Of Ceramics -> Institute Of Nanotechnology And Materials Engineering -> Faculty Of Applied Physics And Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Maria Gazda	
	Teachers	Joanna Pośpiech Martyna Czudec prof. dr hab. inż. Maria Gazda	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	27.0	0.0	6.0	3.0	0.0	36
	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	36	2.0	12.0	50

Subject objectives	Knowing and understanding the relationships between chemical composition, structure, structural defects, microstructure, manufacturing methods and properties of materials.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U04] can plan and conduct experiments, critically analyze their results, draw conclusions and formulate opinions. Has laboratory experience.	is able to plan and conduct experiments concerning the study of materials, critically analyze their results, draw conclusions and formulate opinions. Has experience in the work of a materials research laboratory.	[SU1] Assessment of task fulfilment
[K6_W07] has systematic knowledge of the physical and chemical principles of nanotechnology (methods of obtaining nanostructures, types of nanostructures, their properties, basic research methods).	has systematic knowledge of the physical and chemical foundations of materials science (methods of production, types of materials, their properties, basic research methods).	[SW1] Assessment of factual knowledge
[K6_W05] has knowledge of inorganic and organic chemistry, physical chemistry and chemical thermodynamics.	has knowledge of inorganic and physical chemistry, knows the Gibbs phase rule	[SW1] Assessment of factual knowledge
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	has knowledge of materials science and understands its key role in the progress of civilization	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Lecture:Introduction: What is materials science?Materials and their classification;Chemical bonds;Gibbs phase rule, phase equilibrium systems;Mechanical properties of materials, fracture, non-destructive testing methods.Main groups of materials: metals and alloys, semiconductors, ceramics, amorphous materials, polymers, composites;Relationships between composition, structure, microstructure, defects and properties of materials.Laboratory: The laboratory includes exercises: material recognition, testing the hardness of materials, determining a fragment of the phase equilibrium system. Exercises will be performed in groups of 2-3 people.Project: As part of the project, groups of 2-3 people will receive sample material to examine and describe in terms of structure, microstructure, probable defects and properties.
Prerequisites and co-requisites	no
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
lab report	55.0%	20.0%
project report	55.0%	5.0%
written text	55.0%	75.0%

Recommended reading	
Basic literature	Podstawy Inżynierii Materiałowej. Blicharski
Supplementary literature	any textbook on materials science or solid-state physics
eResources addresses	Adresy na platformie eNauczanie: Podstawy nauki o materiałach - Moodle ID: 27779 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27779
Example issues/ example questions/ tasks being completed	1. What is ionic bonding? Give at least two examples of materials with ionic bonding. What thermal, mechanical, electrical, and optical properties can a material (in the solid state) with ionic bonding have?2. The most important moduli of elasticity are Young's modulus (E), shear modulus (G), and Poisson's ratio (). The same compressive stress acts on two rods made of different materials.E (GPa)G (GPa)Rod no. 115050Rod no. 2250110Knowing thatJustify which rod will shorten more and which will become thicker.3. Describe the study of the state of a material using eddy currents. What materials can be studied using this method?4. Consider an alloy of lead and tin. What is the eutectic transformation temperature and eutectic composition? (eutectic and 10% tin). Sketch the cooling curves of the eutectic and 80% tin alloys, describing the individual cooling stages. Sketch what the microstructure of these alloys might look like.5. What is a metallic glass? Give an example, briefly describe the main properties and structure of a metallic glass.
Work placement	Not applicable

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